

Investing in Technology: Beyond the IT Sector

Investing in technology is investing in the future. It is indisputable that our lives are becoming increasingly entwined in – and reliant on – technology, for everything ranging from day-to-day tasks and interactions to medical diagnoses, procedures, and treatments. At the same time, businesses are actively integrating technology into their operations, supply chains, marketing and sales, and back offices. The artificial intelligence industry alone is projected to grow from \$428 billion in 2022 to \$2.03 trillion by 2030, a CAGR of 21.6%. Over the same period, cloud computing is projected to grow at a similar CAGR of 20.0% from \$569 billion to \$2.4 trillion.¹ These are just two of 20 distinct areas within the technology universe. Technology, in our view, is the epitome of growth and opportunity in the 21st century.

How Not to Invest in Technology

What is the best way to capture technology’s investment potential?

While we do not have a definitive answer to that question – and we would contend no one really does -- we firmly believe it is not by investing in a passive vehicle that tracks the GICS Information Technology (IT) sector.

The issues with the GICS classification system are three-fold. First, many of the leading companies of today span multiple industry verticals. For example, **Amazon.com, Inc.** started as an online bookseller before evolving into the e-commerce everything store, but it is also the world’s leading cloud computing vendor. The difficulty in categorizing multi-industry businesses under one sector becomes immediately apparent when you consider that four of the seven companies that make up the “Magnificent Seven” mega-cap technology stocks – **Alphabet, Inc., Meta Platforms, Inc.** (both in Communication Services), **Amazon**, and **Tesla, Inc.** (both in Consumer Discretionary) – are not in the IT sector.

The second issue is that technology permeates virtually every industry in today’s economy. Consequently, it can be challenging to determine which criteria should dictate a company’s categorization. For instance, in May 2023, GICS reclassified eight payment processing companies – including **Mastercard Inc., Visa Inc.,** and **PayPal Holdings Inc.** – from IT to Financials. In 2018, GICS did the same thing with **Meta, Alphabet,** and **Netflix, Inc.,** moving them out of IT into the newly created Communication Services sector. With these companies and many others, while

the bedrock of their business is technology, their end market is not.²

The third issue is that, as a result of the 2023 GICS reclassification, just three stocks – **Apple, Inc., Microsoft Corporation,** and **NVIDIA Corporation** – now comprise more than two-thirds of the IT sector by weight. This lopsided weighting means that an investment in a passive fund tracking the IT sector is essentially a bet on these three stocks.



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How We Invest in Technology

GICS Sector Breakdown	Technology-related Businesses
Communications Services	Digital advertising, interactive media and entertainment
Consumer Discretionary	E-commerce, electric vehicles, autonomous driving
Consumer Staples	E-commerce
Financials	Payments infrastructure, fintech
Health Care	Healthcare IT providers, non-invasive surgery technology, genetics/genomics
Industrials	Space technology, B2B data services, tech-enabled HR services
Information Technology	Semiconductors, software, internet, IT services
Real Estate	Data centers, technology-enabled real estate services

Technology: not just IT

We define technology as broader than the IT sector. As seen in the chart above, we find technology-driven businesses not just in IT but across virtually every sector and in a wide range of

¹ Source: Fortune Business Insights

² When the S&P and MSCI developed GICS, in 1999, things were arguably simpler. For instance, the top five companies included two automobile manufacturers (General Motors and Ford Motor Company), one retailer (Wal-Mart), one energy company (Exxon Mobil), and one appliance company (GE). Four fell neatly under Consumer Discretionary and one under the Energy sector.

industry groups. We have identified and invest in 20 different industries that are technology driven.

For example, in addition to companies like Alphabet, Meta, and Tesla, we include names like **Equinix, Inc.**, a data center company, and **CoStar Group, Inc.**, a technology-enabled real estate service, both in the Real Estate sector, within our broader technology universe. In Health Care, **Intuitive Surgical, Inc.**, maker of the da Vinci robotic surgical system, falls within our technology rubric. An example in the Industrials sector is **Space Exploration Technologies Corporation (SpaceX)**, which manufactures reusable rockets, operates the satellite-based internet service Starlink, and has the ultimate goal of enabling people to live on other planets.

While GICS does not include them within the IT sector, for all these companies and many more, technology innovation is at the core of their business.

Wide dispersion favors an active approach

By definition, a broader, more encompassing definition of technology companies requires an active investment approach because these stocks must be researched simply to be identified.

The wide dispersion of returns is another reason the technology space favors active investing. Results just within the IT sector over the past 10 years illustrate this point. IT stocks that performed in the top 10th percentile returned almost 40% on an annualized basis while stocks in the bottom 10th percentile lost more than 40% annualized. In other words, the performance of the companies within this sector varied significantly. This dispersion dynamic existed in nearly every sub-industry within IT, from application and system software companies to internet services to semiconductors and hardware.

We think the disruptive impact of the rapid pace of innovation and significant breakthroughs in technology is, in large part, responsible for this dispersion. At the high end of the bar, technology innovation has powered some of the biggest winners in stock market history and driven more upside than any other segment of the market. At the lower end, disruption has caused significant loss of market share and some outright business failures.

We also have little doubt that technology disruption will continue for many years. Generative AI (GenAI) is a case in point. GenAI, which was introduced to the public via ChatGPT in November 2022, is such a transformative technology it was the subject of a key negotiating point in the 148-day strike by the Writers Guild of America in 2023. Many industry experts, including Microsoft founder Bill Gates, consider GenAI to be the most revolutionary technology in decades, and it is just getting started.

Key attributes of top performers

We believe the basis for successful active investing is identifying the defining characteristics of the likely winners – the potential top performers – versus the others more likely to run in place or be left behind. What companies can grow revenue and profits faster for longer? As seen in the chart below, we look for four key attributes. When you find the companies that do these things right, you can see how it can translate to outsized earning growth and exceptional long-term outperformance.

						
Strong competitive moat	✓	✓	✓	✓	✓	✗
Exploit technology change and avoid innovator's dilemma	✓	✓	✓	✗	✗	✗
Effective capital allocation	✓	✓	✓	✓	✗	✗
Finding 2nd and 3rd acts	✓	✓	✓	✗	✗	✗
10-year EPS growth ^{3,4}	+7,191%	+4,370%	+280%	+91%	+54%	-67%
10-year total shareholder return ^{3,4}	+839%	+12,805%	+1,083%	+353%	+120%	+85%

Strong competitive moat Technology is a fast moving, highly competitive arena in which companies ranging from conglomerates to startups are all jockeying for market share. Being a first mover, while important, is not enough, as competition can quickly challenge leadership, undercut pricing, and erode margins. We look for companies that benefit from products or services with high switching costs, ecosystems or network effects, unique and/or proprietary data, intellectual property, and/or economies of scale, all of which deepen moats and raise barriers to entry.

For example, Amazon benefits from the network effect, having created an ecosystem of third-party vendors who want access to its massive customer base and customers who like its vast selection, competitive pricing, and customer reviews and ratings. Its Prime membership feature, which provides free shipping on many products along with other benefits, helps retain customers. Economy of scale is another advantage; having built its platform, it can bring in additional vendors and customers at minimal cost.

Avoiding the innovator's dilemma The fast moving playing field in technology means that leading products today can become obsolete tomorrow. To maintain or grow market share, companies need to be willing and able to proactively disrupt themselves and exploit the innovator's dilemma for long-term gain. For instance, despite its market dominance

³ Reflects Non-GAAP EPS growth between Fiscal Year 2013 and Fiscal Year 2023 for the six vendors. For Amazon, NVIDIA, eBay, and Intel, FY2023 ends December 31 and the number above reflects the FactSet consensus median estimate for FY2023 EPS as of June 30, 2023. Microsoft and Oracle reflect fiscal year end results with fiscal years ended June 30, 2023.

⁴ Reflects total shareholder return inclusive of dividends over the 10-year period ended June 30, 2023.

at the time, Microsoft moved away from on-premises software solutions to embrace cloud computing and artificial intelligence.

On the other hand, companies that cling to their legacy products for too long in the face of change can fall victim to this innovator's dilemma. A textbook example is Research In Motion, a Canadian company that made the Blackberry smartphone. In just five years, Blackberry went from dominating the market to ceasing production because it failed to move away from its keyboard.

Effective capital allocation We look for management teams that are effective capital allocators. For technology-driven businesses, this translates to ongoing, intelligent investment in innovation buttressed by strategic M&A to capture market opportunities and reinforce competitive moats.

Second and third acts The most successful technology companies are able to leverage their competitive advantages into new areas, products, and services that expand their existing markets or add new ones. We have already discussed how Microsoft engineered its transformation. Other examples include Netflix, which disrupted its own business model as a DVD-by-mail company to become the world's biggest media streaming service. Amazon, which started as an e-commerce company, is now also the world's largest cloud computing provider. NVIDIA's key end market was video games for most of its existence; the company is now disrupting datacenter compute and has roughly 95% of the market for AI chips.

The growth trajectory of almost all businesses follows a specific curve, commonly known as an S-curve. The steepest part of the growth curve tends to be in the middle and where we seek to invest. It includes proven winners still achieving solid growth as well as emerging winners and high-growth disruptors.

For example, Tesla started with the very expensive and niche Roadster model, expanded into the premium segment with Models S and X, and now has the best-selling vehicle in the world with the mass market Model Y. It also has battery storage, autonomous driving, robotics, solar energy, and car insurance businesses. Microsoft, which started with the Windows PC operating system, is now a leading cloud software provider with Office 365 and a leading cloud computing provider with Azure. It also offers hardware like the Surface and services like LinkedIn.

Some of these businesses are stacking multiple S-curves on top of one another, such as Amazon, which has leveraged its brand built through its e-commerce platform to enter markets such as video streaming and groceries and its technology infrastructure to pioneer cloud computing via Amazon Web Services.

High-growth, emerging winners are disruptors with years of potential growth ahead. Examples include **The Trade Desk**, which has the leading demand-side platform for data-driven digital advertising, and **argenx SE**, a biotechnology company developing treatments for autoantibody immune disorders.

Secular growth trends

We believe durable secular trends will be the predominant underpinning of market leadership over the long term for both individual businesses and industries. We spend significant time on mapping S-curves across the trends impacting the economy, and we believe all the trends we invest in have many years of growth ahead. The leading companies driving or riding these trends are finding better, more efficient, less costly ways to deliver goods and services. They are leveraging advances in technology – or developing technologies themselves – to disrupt their industries.

These trends include:

- Cloud computing
- SaaS and vertical software & services
- Artificial Intelligence
- Cybersecurity
- E-commerce and electronic payments
- Digital media, advertising & entertainment
- EVs/autonomous driving
- Genomics, genetic medicine, & modern surgery

Cloud computing While more and more companies migrate their workloads from on-premise data centers to the cloud, penetration is still less than 50%. We believe this migration will accelerate due to recent advances in AI. In addition to major cloud providers like Amazon and Microsoft, pick and shovel companies like **Datadog, Inc.** are positioned to benefit from the growth in cloud computing.

SaaS and vertical software & services Software companies are a natural beneficiary of the increasing penetration of technology in every aspect of our lives. The key is to find the businesses best positioned for success in a crowded field. We like leading companies in niche markets, such as CoStar, which services the real estate industry, and **Guidewire Software, Inc.**, whose target market is the P&C insurance industry.

Artificial Intelligence We view GenAI as the next major secular tectonic shift, like mobile and cloud, and the most compelling force to power technology innovation and impact human life over the next decade. It will disrupt many industries, strengthening some businesses and weakening others. In addition to semiconductor companies like NVIDIA, we expect companies in systems software, autonomous driving, and business application software, along with investors in GenAI themselves, to benefit.

Cybersecurity The greater the amount of information digitized and/or stored in the cloud, the more critical cybersecurity becomes. While we see a long runway for growth, it is also a highly competitive space. We like market leaders with strong moats that specialize in cloud security like **CrowdStrike Holdings, Inc.** and **Cloudflare, Inc.**

E-commerce and electronic payments Digital wallets account for 29% of sales in 2022, and credit cards 24%, with those percentages rapidly growing. E-commerce has even more room to grow, accounting for about 19% of retail sales worldwide in 2022. We favor market leaders like Visa and Mastercard, which together processed 55% of total payment card transactions in 2022; Amazon, the undisputed leader in e-commerce; and **Shopify Inc.**, the leading e-commerce platform that offers end-to-end solutions for merchants, including e-commerce sites, payments, and marketing services.

Where E-Commerce Is Growing Fastest

E-commerce sales in selected countries/regions in 2020 and 2025* (in billions U.S. dollars)



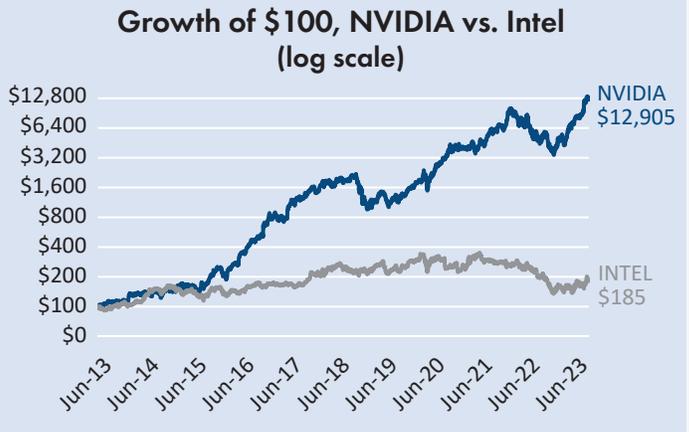
* projected
Source: Statista Digital Market Outlook

Digital advertising, media & entertainment Along with commerce and payments, advertising, media, and entertainment are increasingly shifting from traditional to digital channels. Meta is the leader in targeted social media advertising while Alphabet dominates digital search advertising through the Google search engine. Amazon is rapidly growing its ad business as no company possesses better e-commerce product and customer data than Amazon. Amazon Prime Video is also the second largest streaming media service in the world, behind only Netflix.

EVs/autonomous driving Growth in electric vehicles (EVs) continues to climb. EV sales are projected to reach 14 million in 2023 – a 34% jump from 2022 – and account for over 68% of all new car sales by 2035. Alongside the shift to EVs, we believe private vehicle ownership will be increasingly supplanted by driverless robotaxi fleets made possible by autonomous driving technology. We see many opportunities to invest in these secular trends, not just in EVs like Tesla, Inc. and Rivian Automotive, Inc. and advanced driver assistance system (ADAS) providers like **Mobileye Global Inc.**, but across the supply chain. For instance, **indie Semiconductor, Inc.** specializes in chips for ADAS and **AMG Critical Materials N.V.** produces lithium needed for EV batteries.

Genomics, genetic medicine, & modern surgery Technology is rapidly becoming an integral part of medical diagnostics and the development of new drugs and treatments. For instance,

Case Study in Semiconductors NVIDIA Corporation vs. Intel Corporation



Intel Corporation 20 years ago

Intel was the dominant force in semiconductors. Its CPU chips dominated personal computing and it generated impressive margins.

What it did wrong

Intel failed to embrace a major paradigm shift in personal computing – the rise of smartphones and mobile – instead clinging to its legacy architecture and core laptop and server markets. And instead of investing in R&D and innovation, Intel spent tens of billions of dollars to buy businesses that did not leverage or advance its core manufacturing advantages.

The result

Flat sales, shrinking EPS, and a relatively tepid 85% return over 10 years.

NVIDIA Corporation 20 years ago

NVIDIA specialized in GPUs, a chip primarily for video game graphics, which employed parallel processing to project millions of ever-changing pixels on TV and computer screens. Although relatively small, it had a near monopoly in its niche, with a moat built on its software and developer ecosystem.

What it did right

NVIDIA invested heavily in R&D and strategic acquisitions, leveraging its core advantage in parallel processing to pioneer AI chips and software, stack S-curves, and significantly expand its TAM. It now dominates the market for the accelerated computing chips used for AI and other advanced computing applications like machine learning and autonomous driving.

The result

A nearly 10-fold increase in sales, 44-fold increase in EPS, and almost 13,000% return over 10 years.

Intuitive Surgical makes the da Vinci robotic surgical system that allows surgeons to perform minimally invasive procedures with smaller incisions and shorter recovery times. **DexCom, Inc.** has developed a device for diabetic patients (and their caregivers) that allows people to check their blood glucose levels without fingersticks and at any time via their cellphone or smart watch.

How to Identify the Winners

- Durable competitive advantages
- Culture of innovation and driving technology change
- Capital deployment focused on long-term ROI
- Second and third acts and TAMs supporting “faster for longer” growth
- Strong management team

Within each major secular technology shift or trend we have identified, to find the companies most likely to benefit, we look for the five attributes listed above. This process involves extensive, proprietary research, including interviewing management, competitors, customers, former employees, and suppliers; analyzing company investments and incentive programs; visiting facilities; attending user conferences and analyst days; and identifying new markets, determining whether the new product/service will capture the opportunity, and determining compatibility with the company’s moat.

Perhaps the most important part of our process, and one that touches on our ability to gain insight into each of these attributes, is building a relationship with senior management. In fact, we try to speak or meet with the CEO and executive team members of each of our investments every quarter.

We then take all our research to build at least five-year financial models with analyses based on different scenarios and growth trajectories, margins, and multiples against current scaled businesses and historical industry trends. We update our models regularly.

Conclusion

We firmly believe that technology transcends the narrow definition GICS uses to categorize companies within the IT sector. As we have described, we find technology-driven businesses across virtually every sector and in a wide range of industry groups. We believe our broader approach to investing in technology can and does capture opportunities that a passive product tracking the IT sector will miss out on. We think this gap will only grow larger. As innovations like generative AI expand the scope of what technology can do, technology is destined to touch virtually every industry and aspect of our lives and work.

Disclosures

Investors should consider the investment objectives, risks, and charges and expenses of the investment carefully before investing. The prospectus and summary prospectuses contain this and other information about the Funds. You may obtain them from the Funds' distributor, Baron Capital, Inc., by calling 1-800-99-BARON or visiting baronfunds.com. Please read them carefully before investing.

Risks: Companies propelled by innovation, including technology advances and new business models, may present the risk of rapid change and product obsolescence, and their success may be difficult to predict for the long term. In addition to general market conditions, technology companies, including internet-related and information technology companies, as well as companies propelled by new technologies, may present the risk of rapid change and product obsolescence, and their successes may be difficult to predict for the long term. Technology companies may also be adversely affected by changes in governmental policies, competitive pressures and changing demand. Non-U.S. investments may involve additional risks to those inherent in U.S. investments, including exchange-rate fluctuations, political or economic instability, the imposition of exchange controls, expropriation, limited disclosure and illiquid markets. The **Baron Technology Fund**[®] is non-diversified, which means it may have a greater percentage of its assets in a single issuer than a diversified fund. Even though the **Baron Opportunity Fund**[®] is diversified, it may establish significant positions where the Adviser has the greatest conviction. This could increase volatility of the Fund's returns. Both funds invest in companies of all sizes, including small and medium sized companies whose securities may be thinly traded and more difficult to sell during market downturns.

The discussion of market trends is not intended as advice to any person regarding the advisability of investing in any particular security. The views expressed in this document reflect those of the respective writer. Some of our comments are based on management expectations and are considered "forward-looking statements." Actual future results, however, may prove to be different from our expectations. Our views are a reflection of our best judgment at the time and are subject to change at any time based on market and other conditions and Baron has no obligation to update them.

Non-mutual fund products are available to institutional investors only.

Portfolio holdings as a percentage of net assets as of December 31, 2023 for securities mentioned are as follows: Alphabet Inc. - Baron Technology Fund (0.9%); **Mastercard Incorporated** - Baron Opportunity Fund (2.3%), Baron Technology Fund (1.0%); **Visa Inc.** - Baron Technology Fund (1.0%); **Equinix, Inc.** - Baron Opportunity Fund (1.0%); **CoStar Group, Inc.** - Baron Technology Fund (1.6%); **Intuitive Surgical, Inc.** - Baron Opportunity Fund (1.6%); **The Trade Desk** - Baron Opportunity Fund (1.8%); **argenx SE** - Baron Opportunity Fund (2.2%); **Datadog, Inc.** - Baron Opportunity Fund (1.2%), Baron Technology Fund (1.1%); **Guidewire Software, Inc.** - Baron Opportunity Fund (1.7%); **Cloudflare, Inc.** - Baron Opportunity Fund (1.2%), Baron Technology Fund (1.0%); **Shopify Inc.** - Baron Opportunity Fund (1.4%), Baron Technology Fund (1.4%); **Mobileye Global Inc.** - Baron Opportunity Fund (0.7%); **indie Semiconductor, Inc.** - Baron Opportunity Fund (1.9%), Baron Technology Fund (2.0%).

As of December 31, 2023, Baron Opportunity Fund and Baron Technology Fund did not hold shares of PayPal Holdings Inc., Netflix, Inc., Intel Corporation, AMG Critical Materials N.V., and DexCom, Inc.

Baron Opportunity Fund

Top 10 Holdings as of December 31, 2023

Holding	% of Net Assets
Microsoft Corporation	14.2
NVIDIA Corporation	8.6
Amazon.com, Inc.	6.5
Tesla, Inc.	5.7
Meta Platforms, Inc.	3.8
Gartner, Inc.	3.1
CoStar Group, Inc.	2.9
Space Exploration Technologies Corp.	2.8
Visa Inc.	2.8
Alphabet Inc.	2.8
Total	53.1

Baron Technology Fund

Top 10 Holdings as of December 31, 2023

Holding	% of Net Assets
Microsoft Corporation	10.0
NVIDIA Corporation	9.3
Amazon.com, Inc.	7.9
Tesla, Inc.	4.9
Advanced Micro Devices, Inc.	4.4
Apple Inc.	4.3
Lam Research Corporation	3.0
Meta Platforms, Inc.	3.0
Intuit Inc.	3.0
The Trade Desk	2.8
Total	52.5

Portfolio holdings are subject to change. Current and future portfolio holdings are subject to risk.

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