



**PRICE
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July 2018

In-depth analysis and insights
to inform your decision-making.



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Global Technology **TECHNOLOGY'S GOLDEN ERA IS ONLY IN EARLY STAGES**

KEY POINTS

- We are relatively early in a golden age for technology innovation, as the extraordinary power of the Internet has enabled unprecedented value creation by giant companies as well as nimble emerging leaders.
- E-commerce, online advertising, and cloud computing are still in the early innings and many newer trends, such as artificial intelligence and autonomous vehicles, offer huge growth potential.
- Leading firms have vast powers to disrupt many industries, so investors need to stay abreast of their strategies.
- Earnings for technology companies should remain healthy, but valuations are more of a concern in certain areas.

WHAT IS YOUR APPROACH TO INVESTING IN SCIENCE AND TECHNOLOGY?

We focus on innovation and key trends and how they are impacting industries and companies. And then we try to buy durable businesses at good prices.

Technology is so dynamic and the stocks can be so volatile that a fair amount of those opportunities arise. We particularly focus on owning companies whose prospects for generating cash over the medium and long term are most attractive relative to their prices.

To do this well, you need excellent analysts covering the gamut of industries, sectors, and companies, and we greatly benefit from the research capabilities and insights of our global technology research team. We have deep experience in assessing innovation and researching companies. We learn from each other in assessing not just the micro context for each of our companies but also

the macro context of the trends that they are operating within. That's a key competitive advantage.

To get to know the companies really well, we talk to customers, partners, management, and other industry participants. In discussing a particular trend with a CEO, we want to know if their capabilities make them well positioned to benefit from it, whether they are applying their assets in ways that are likely to be successful, and whether they are visionary enough to evolve and adapt. We also carefully assess the risk factors of the stocks we own, including their vulnerability to increased competition and economic and technology supply chain cycles.

We have the advantage of being able to take a longer-term view than many investors. Some great opportunities can surface when investors overreact to short-term setbacks for companies

that have durable businesses and considerable potential over the longer term. For instance, that has happened with Amazon.com and Google (Alphabet) countless times just in the nine years I've been managing the portfolio.

WHAT'S DRIVING THE RECENT WAVE OF INNOVATION?

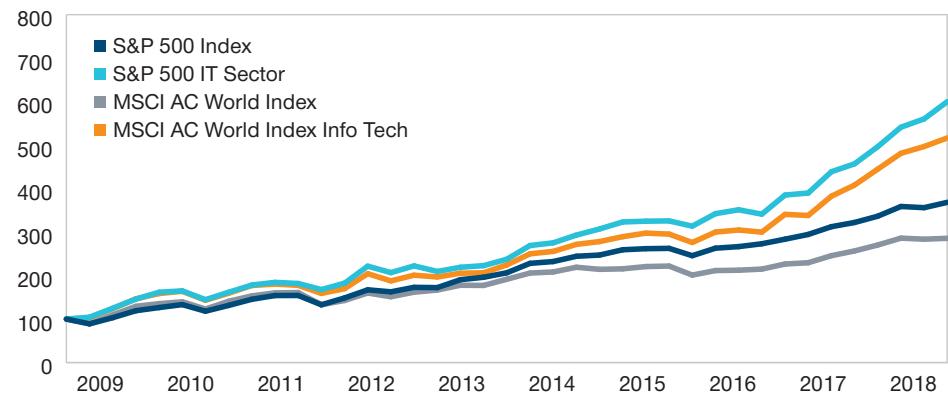
In many ways, we are in a "golden era" of innovation. Technology products and services are dramatically more central to our individual and work lives than just a few years ago and are key drivers of success or failure in all industries. Smartphones have become ubiquitous companions, providing continuous access to vast amounts of computing power, online services and apps, and things to purchase. Businesses have expanded their use of technology for improving individual productivity, collaboration, remote work, business insights, and customer service. Further, the increasing availability of artificial intelligence (AI) and machine learning will help accelerate this rapid pace of innovation.

These powerful trends have fueled the unprecedented rise of the technology titans—Apple, Google (Alphabet), Microsoft, Facebook, and Amazon, along with Tencent and Alibaba in China, which arguably have been as strong in China as their Western counterparts are in North America. These companies are pushing the boundaries of what's possible. Remarkably, they have become the seven most valuable companies in the world, driven by the extraordinary power of the Internet.

This group's investment in research and development and capital expenditures has skyrocketed over the past decade, pouring unprecedented amounts of money and resources into innovation. These companies have had a staggering increase in revenue recently and could potentially generate hundreds of billions of dollars more in the coming years from

FIGURE 1: Technology Leading Global Equity Market Performance

Total return indexed to 100 as of December 31, 2008, through June 30, 2018



Past performance cannot guarantee future results.

Source: FactSet Research Systems Inc. All rights reserved.

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FIGURE 2: Technology Has Produced Massive Performers

As of June 30 2018

Revenue in USD (billions)

Company	2009	Latest Fiscal Year
Apple	\$43	\$229
Amazon.com	\$25	\$178
Google (Alphabet)	\$24	\$111
Microsoft	\$58	\$90
Facebook	\$1	\$41

Source: T. Rowe Price calculations using data from FactSet Research Systems Inc. All rights reserved. For illustrative purposes only. This information is not intended to be a recommendation to take any particular investment action and is subject to change. No assumptions should be made that the securities identified and discussed above were or will be profitable.

gaining share of their core markets and continuing to innovate and expand.

WHAT ARE THE IMPLICATIONS FOR INVESTORS OF SUCH DOMINANCE?

I think investors in tech stocks and any other industry have to be very focused on what these seven companies are doing. Several of them should be able to create vastly more value for both customers and investors in the coming years. They also have vast disruptive potential, especially Amazon and Google (Alphabet). Their ambition and capabilities are unlike anything we have seen in the business world in modern times. Over the next decade,

they could begin to remake entire industries that historically have been relatively slow moving and have had little to do with technology.

Among these biggest tech stocks, there is likely to be meaningful dispersion in performance, so choosing the ones that are best positioned will be critical. We've recently favored Google (Alphabet), Alibaba, and Facebook, all of which were pressured, providing opportunity in recent months. It should also be noted that the biggest companies can't and aren't trying to do everything, so there will remain compelling opportunities in other tech leaders and emerging performers.

WHAT ARE SOME OF THE KEY THEMES YOU ARE FOCUSING ON?

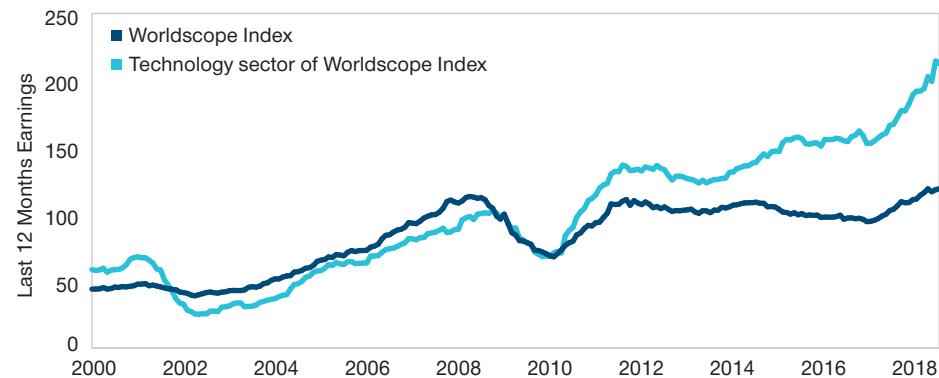
We continue to emphasize innovative and durable leaders in Internet-related companies, which account for about one-third of the portfolio. Broadly speaking, the Internet is still a business opportunity in the making. E-commerce is still less than 15% of the overall global retail industry. Online advertising accounts for less than 25% of the global market for advertising and related marketing. The leading companies such as Amazon, Facebook, and Google (Alphabet) are investing aggressively to expand and to avoid the disruption that has historically befallen many technology leaders from one era to the next. Because they are forgoing higher profits today, their valuations are even more predicated on longer-term cash flows than for a typical company. I'm finding opportunity in several non-U.S. markets where we expect significant long-term growth for regional leaders in e-commerce, online travel, and social advertising.

In many important instances, online leaders are bringing their hard-earned strengths and expanding competencies to the offline world, including in retail logistics and physical stores. Perhaps most notably, Alibaba and Amazon are applying their technology expertise and troves of valuable data to the offline world, bringing attributes that online customers value to physical stores. I think of this as tech-driven retail, and it is vastly expanding the opportunities of these leading companies. These large investments in assets and stores weigh heavily on companies' margins but offer potentially much higher earnings and cash flows over time.

Cloud computing is another key theme that, while not new, remains at a very early stage. The penetration of the public cloud, which comprises companies' with the data centers that store and help manage other companies IT workloads, is only about 5% of the overall market. We

FIGURE 3: Tech Earnings Outstripped Those of the Global Market

As of June 30, 2018. Based on latest 12 months earnings, indexed to 100 as of January 1, 2009.



Sources: Worldscope, Datastream, Goldman Sachs Global Investment Research. This chart is based on the Worldscope Index, a global equity market index published by Thomson Reuters, and the technology sector for that index.

have significant exposure to cloud computing services like Amazon Web Services, Microsoft's Azure, and Alibaba Cloud, each of which has massive scale that will be difficult for others to match. The opportunity is not only providing enterprise technology in the cloud, but also bringing innovative new technologies to on-premises data centers that will continue to house many important IT functions.

The other biggest part of cloud computing, software-as-a-service, offers considerable opportunity in many players beyond the public cloud giants such as Intuit, Salesforce.com, and Workday. We also are attracted to the long-term potential of autonomous vehicles. For instance, the Waymo division of Alphabet, which is a leader in the technology. We believe Tesla also has great potential in that area in addition to electric vehicles.

WHAT ABOUT ARTIFICIAL INTELLIGENCE?

The Internet and cloud giants, with their huge customer bases and leading capabilities in data management and software, are leading in the development of AI. They have invested billions of dollars in AI and machine learning for myriad business and consumer products and services.

The leaders are also competing to be the go-to platforms others tap in to for analytics, speech recognition, image recognition, and other key AI applications to make their products better. The result is a healthy competitive environment, where even the smallest start-ups can use the capabilities of the hyper-scale clouds. That, more than anything, will drive the permeation of AI and machine learning over the next few years.

WITH DATA PRIVACY CONCERN RISING, IS REGULATION BECOMING A GREATER RISK TO THE INDUSTRY'S GROWTH POTENTIAL?

Regulation and other possible oversight actions pose a risk for many of the largest tech companies. On the one hand, this reflects their competitive strength and business value; on the other, it could at some point make their further growth more challenging. Generally, I'm comfortable that the risk of regulation making any of the industry leaders significantly less valuable is relatively low. I believe their value to customers, technological innovation, and talent will enable them to navigate the evolving regulatory landscape.

THE TECHNOLOGY SECTOR HAS MASSIVELY OUTPERFORMED THE BROADER MARKET, DRIVEN BY STRONG EARNINGS AND RISING PROFIT MARGINS. HOW DO YOU VIEW THE FUNDAMENTAL OUTLOOK NOW?

Growth in spending for technology products and services by consumers and businesses has been extraordinarily positive. It probably can't accelerate from here, and it remains cyclical, so spending would most likely weaken in a faltering economy. And certainly geopolitics and global trade risks have the potential to undercut the otherwise promising outlook for technology earnings. But innovations are expanding the use and value of technology products and services more than ever. Leaders are taking massive chunks of market share in areas of the economy that are not traditionally associated with technology spending, such as retail and advertising. The pie has expanded so much for many of these companies, and the penetration in these areas is still so low, that several of the biggest players and many emerging leaders should have massive growth ahead of them.

I don't know if technology earnings, even if they remain robust, will be good enough for broad-based stock appreciation in light of elevated valuations in several areas. Nevertheless, valuations vary considerably, so there are still attractive opportunities in individual companies. With the fastest-growing companies trading at relatively high valuations, though, it's critical to identify those that could continue to gain share and expand their opportunities. Investors could lose a lot of money in companies that fail to do that. Losses could also be significant in companies with seemingly modest valuations if their businesses are disrupted.

We think a rigorous understanding of innovation and evolving industry dynamics is essential to investing in the potential technology leaders and avoiding the companies that fail to sustain a competitive advantage.

FIGURE 4: T. Rowe Price Science & Technology Fund Top 10 Holdings

As of June 30, 2018

Alphabet

Ctrip.com International

Qualcomm

Facebook

Altaba

Broadcom

Microsoft

Tencent Holdings

Amazon.com

Micron Technology

These holdings accounted for 45.1% of total net assets as of June 30, 2018.

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