

Digitalization: The “Fourth Industrial Revolution?”

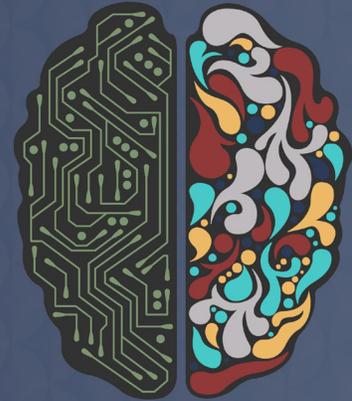
Technology trends merge the biological, analog and digital.

APRIL 30, 2020

INTRODUCTION

In 1993, American science fiction author, computer scientist and mathematics professor Vernor Vinge wrote, “The acceleration of technological progress has been the central feature of this century.” His paper, “The Coming Technological Singularity: How to Survive in the Post-Human Era,” is credited with popularizing the concept of a technological singularity—a theorized turning point at which the capabilities of technology, notably artificial intelligence, surpass those of humanity. “We are,” Vinge argued, “on the edge of change comparable to the rise of human life on Earth.”

The radical nature of Vinge’s prediction has produced its share of both skeptics and supporters. While vigorous debate can be expected to follow any prediction of such magnitude, what is undeniable is that the pace of digitalization over the past couple of decades has been



Key Considerations: Digitalization as a Broad Investment Theme

Digitalization is having a significant impact on the way humanity works and lives.

Information technology has consistently been an area of investment focus at Wasatch Global Investors.

The secular trend is global in scope and impacts essentially every business sector.

We are particularly excited about investment opportunities in disruptive software companies.

Some analysts have suggested the trend is impactful enough to constitute a “fourth industrial revolution.”

We believe the ongoing shift from “legacy” software to cloud-based solutions is one of the biggest areas of opportunity for investors.

so fast as to be difficult to track. If we define digitalization as "the electronic storage, retrieval and distribution of information, and the ability to communicate, collaborate and be productive with the help of electronic devices," the immense scope of the topic becomes more apparent.

The same year Vinge issued his prediction also marked the release of the first major web browser, Mosaic, which allowed early internet users to explore the 50 world-wide web servers estimated to have existed as of January 1993. A *New York Times* piece at the end of the same year, published just one month after the first webcam came online, enthusiastically described Mosaic as "a map to the buried treasures of the information age," foreseeing the tool as "the basis for a whole new system of electronic commerce, letting customers easily browse through on-line product catalogues."

In its own 1993 "year in review" feature, the *Los Angeles Times* summarized what it considered among the most exciting technological developments of the year: "Phone companies have achieved remarkable success in transmitting video pictures over regular copper lines."

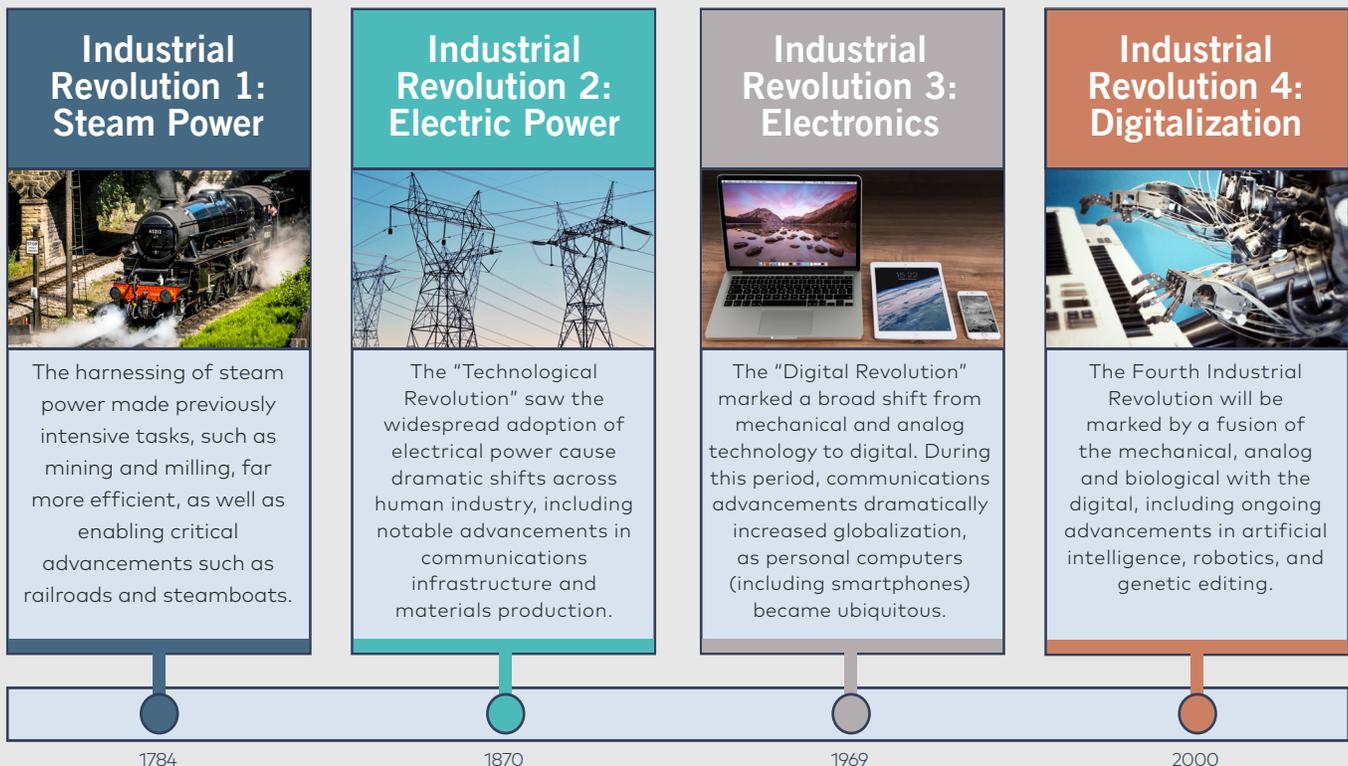
With the benefit of hindsight, such retrospectives feel almost quaint. The intervening years saw those then-nascent technological trends rapidly swell into sweeping waves of innovation. The decade and a half following its momentous release saw Mosaic give way to

browser wars between Netscape Navigator (the basis of modern Mozilla Firefox), Internet Explorer, Apple Safari and Google Chrome. Meanwhile, the advances in video delivery saw the rise of high-definition broadcasting (1998), digital video recorders (1999), and cable/broadband internet (2002), each of which caused its own subsequent ripples of innovation, leading to the current streaming model with which we are familiar.

In 2015, Intel's then-CEO Brian Krzanich summarized the incredible pace of advancement, using the well-known example of Moore's Law, which was created by Intel co-founder Gordon Moore. Moore famously predicted that the number of transistors in integrated circuits (and, by conjunction, computing power) would double roughly every year. The original prediction, penned in 1965, was intended as an outlook on the coming decade. When Moore revisited the prediction in 1975, he revised the projected pace of doubling to roughly every two years over the next 10 years. But instead of holding up for a decade, the revised figure has represented an impressively accurate predictor of technological innovation for more than half a century.

That the pace of innovation held at such a consistently high level over decades surprised even Moore and Krzanich. Despite their perches atop the wildly influential Intel, neither expected such innovation to be sustainable. As Krzanich later explained, if Moore's Law applied to a 1971

FIGURE 2: TIMELINE OF INDUSTRIAL REVOLUTIONS



Source: *The Fourth Industrial Revolution* by Klaus Schwab.

Volkswagen Beetle the way it did to 1971 computer-chip technology, then today, "you would be able to go with that car 300,000 miles per hour. You would get two million miles per gallon of gas, and all that for the mere cost of 4 cents!" The scenario seems absurd on its face, thus helping to contextualize the unbelievable pace of digitalization—a pace that has continued to stun even those most in-the-know.

In 2016, during the World Economic Forum, Klaus Schwab (who founded the event) suggested that humanity was experiencing a "fourth industrial revolution" by way of digitalization. According to Schwab and as illustrated in **Figure 1** on page 2, the first industrial revolution saw humanity master water and steam power, the second saw the adoption of electric power and the third corresponded with the widespread application of electronics and information technology.

Like the revolutions preceding it, the changes brought about by the present digitalization revolution have been rapid in their emergence, dramatic in their impact and broad in their scale. One need only think of the smartphone likely resting within an arm's reach while reading this. The device itself is a marvel—the end-result of a long chain of advances in semiconductors, communication infrastructure, data manipulation and even space travel. Turn the phone on to peruse its contents and one might find a mobile-banking app, a mobile-payments app, an app to order nearly any product, an app for updates on when the product is delivered to your doorstep and an app to call up high-definition video footage of the package's delivery.

At Wasatch, technology has been, and is likely to continue to be, an important part of our investing universe, in large part due to this nearly unprecedented growth. Precisely because the shift has been so dramatic (and the opportunity set has grown so large), taking a broad view of the investment opportunities can be difficult, much as one might struggle to outline the myriad ways other revolutions such as steam power or electricity changed the face of the globe. In this paper, we would like to highlight several themes under the broader digitalization umbrella that we believe will continue to develop over the coming years, and that represent potential opportunities for investors.

EVERYTHING-AS-A-SERVICE

As a bottom-up investment firm, we place heavy emphasis on companies with solid fundamentals, outstanding long-term growth prospects, capable management teams and innovative products and services, especially those benefiting from multi-year trends and well-positioned to disrupt their respective markets. To

this end, we have been particularly active in the software space, and have continued to find within the space many companies that meet our fundamental criteria.

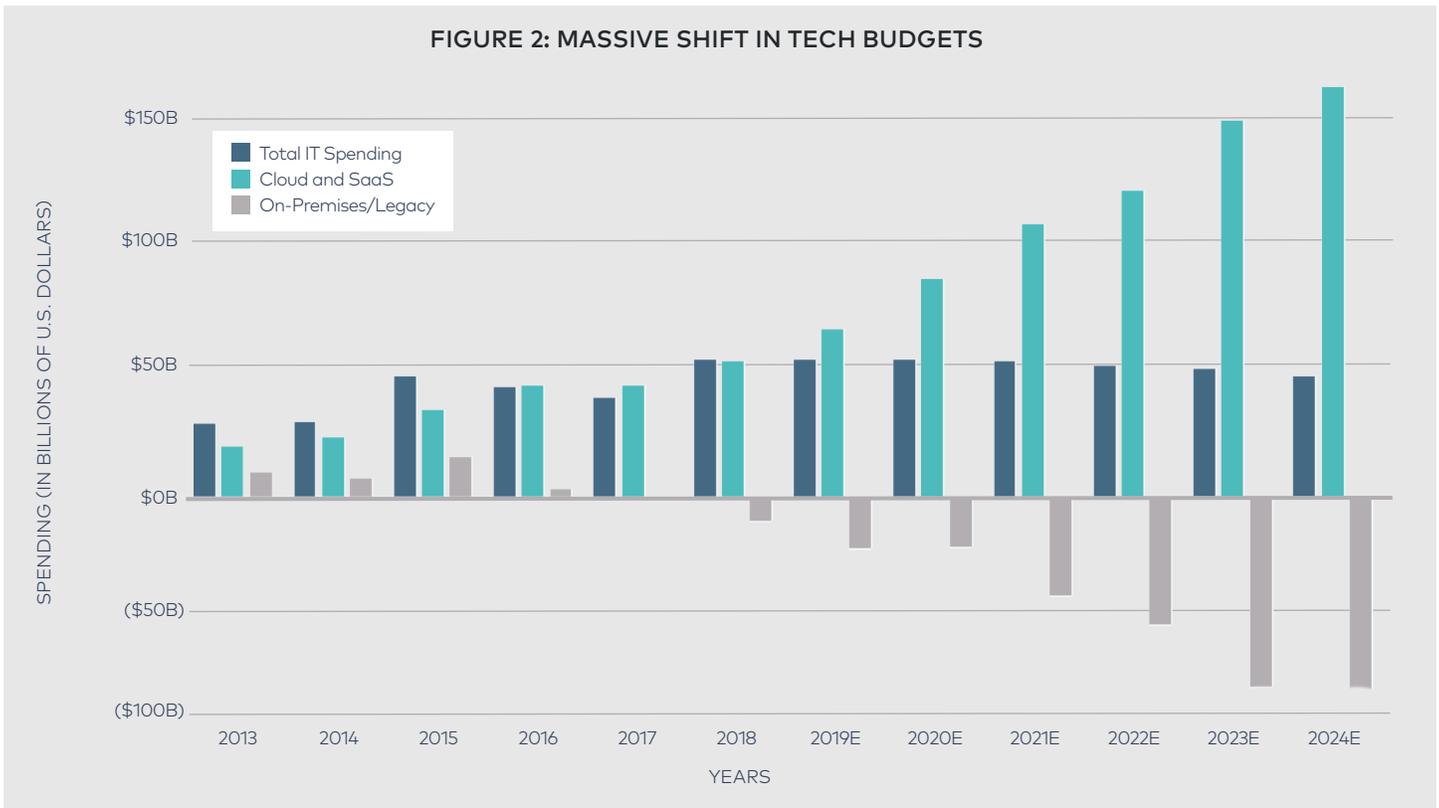
The transition to the cloud is well underway and, consistent with tech's breakneck pace, the shift is not happening slowly. One of the most fundamental technological shifts accompanying the cloud transition has been the wide-scale move from "legacy software" traditionally installed on-premises to cloud-based "as-a-service" models, the main categories of which are Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS).

All three "as-a-service" models involve centralized access to a digital software suite or tool, usually in exchange for a monthly subscription charge. The primary differences are the specific challenges addressed by each. While the focus and scope of the IaaS and PaaS segments differ slightly from SaaS, which has been an area of investment focus for us, the business models and potential benefits are broadly similar. IaaS offerings address organizations' ability to oversee their network components, data storage and other technical infrastructure, while PaaS offerings include access to platforms that support processes such as application programming, deployment and testing from within a centralized, uniform framework.

One helpful analogy compares legacy (on-premises) software to owning your own car and bearing all associated maintenance tasks and costs. SaaS is a bit like taking an established bus route—the application has a structured, specific path designed for efficiency and multiple, various passengers are along for the same ride. IaaS is compared to a car lease, as you are able to shop amongst options and use it freely, but you never fully own it. PaaS is comparable to taking a taxi or using ridesharing, as the focus is primarily on the destination, but less active engagement in the process is required of the customer.

In our estimation, the user benefits of the "as-a-service" model are many, among them the ability to access resources from any location, the ability to easily scale based upon need and a simplified (by virtue of being centralized) update process. Moreover, companies offering services under these subscription-based models may benefit from a steady flow of "annuity-like," recurring revenues. "As-a-service" platforms also offer providers the potential for a higher average lifetime customer value. Once established in using a particular system that capably fulfills a fundamental organizational purpose, customers are less likely to jump ship for a competitor. Thus, the SaaS, PaaS and IaaS models provide added predictability

FIGURE 2: MASSIVE SHIFT IN TECH BUDGETS



Source: IDC, Bernstein and Wasatch estimates.

for investors and can enable more-reliable projections of company growth.

Globally, spending on public cloud services and infrastructure is expected to nearly triple from \$53.6 billion in 2018 to an estimated \$148.8 billion by 2023. Still, there appears to be significant headroom for growth. Taken together, we currently view the broader SaaS/PaaS/IaaS transition as the biggest area of opportunity within the information-technology space.

The shift from on-premises to cloud-based software applications has disrupted a long-held view that hardware companies are the most attractive tech investments. We believe the spending gap between hardware and software will only continue to increase, and that the stable revenues and sustainable growth rates demonstrated to be attainable under the SaaS, PaaS and IaaS models will continue to produce companies with attractive long-term investment potential.

DIRECT-TO-CONSUMER

Whether one is banking, ordering health testing by mail, or scheduling an oil change, a haircut or a grocery delivery, sweeping digitalization has disrupted nearly every consumer-facing industry, including the \$25 trillion retail space, and has rapidly changed consumer expectations in the process.

While the broader retail space is currently dominated by the likes of Amazon and Alibaba, we believe the sheer size of the overall market continues to provide plenty of opportunities for new entrants, particularly those whose business models are highly specialized. But for as much attention as the idea has received, the changes in consumer-facing industries are not just about Amazon versus brick-and-mortar stores (or Amazon versus niche online retailers). While that new retail reality is certainly dramatic, it does not tell the whole story.

In short, “everyone has an app” and companies’ digital offerings have gone from a “nice, but inessential” function to something that can make or break a business. Increasingly, organizations are turning to mobile apps as critical sales tools and consumers expect the convenience of a digital offering. This secular trend has spread out across all sectors and industries. Those organizations that can creatively implement an app that adds value to the customer experience are likely to see those efforts rewarded.

Growth in this area is being led by the Asia-Pacific region. In 2019, six of the top 10 fastest-growing e-commerce markets were in the region, according to eMarketer. Indeed, while the U.S. is the leading market within the industries discussed previously (nine of the top 10 largest SaaS companies are U.S.-based), consumer-facing digital offerings have had their most outsized impact within

emerging markets, notably China and India, Earth's two most-populous nations.

Data from the World Bank's World Development Indicators shows that, in 1981, more than half of all Chinese and Indian citizens lived below the international poverty line of \$1.90 per day. As of 2011, that figure was closer to 22% in India and 8% in China. During the same time period, gross national income per capita rose nearly 750% in India and an incredible 4,300% in China, while India's gross domestic product (GDP) grew by nearly 1,500% and China's by more than 1,300%.

Today, among other economic achievements, China has already become the largest overall retail market in the world, the largest market for automobiles (including American automobiles) and is home to 119 of the 500 largest global companies, according to *Fortune*. Perhaps no example better highlights digitalization's potential as a force for good than its contribution to increased financial inclusion within emerging markets.

To be sure, the broad digitalization of financial services has also had an impact in developed markets. Michael Corbat, CEO of Citigroup, succinctly summed up the change when he said in 2014, "In many ways, we see ourselves as a technology company with a banking license." The sentiment was echoed in 2017 by Goldman Sachs CEO Lloyd Blankfein, who said, "We are a technology firm."

But whereas the seismic shift in developed markets brought about by the digitalization of financial services has primarily been one of changing business models, the same shift in emerging markets has assisted in pulling tens of millions of people out of poverty.

India's 2009 introduction of the Aadhaar program (a 12-digit unique identifier similar to a Social Security number in the U.S.) has led to astonishing increases in digital engagement and financial inclusion. The program has already registered about 90% of adult Indian citizens, thus enabling mass-scale, streamlined access to first-ever bank accounts, mobile-phone plans and other previously inaccessible modern amenities. As we noted previously in writing on India's incredible growth story, "To get a sense of the scope of the program, India enrolled more than one billion people in Aadhaar in about five years, which is approximately three years faster than it took Facebook to reach one billion users." By 2025, the value of India's financial technology segment alone is projected to reach \$170 billion—the current total value of all core digital industries within the country, according to a study by McKinsey Global Institute.

Similarly, China is now home to the world's largest bank, accounts for three-quarters of global online lending

activity and is on track to soon surpass the United States as the top global marketplace for digital payments. These superlatives were achieved despite a delayed start and even as only about 54% of the Chinese population has internet access, according to the World Bank.

These statistics highlight the impressive nature of these markets: the respective populations are so immense that the early stages of growth have been historic and dynamic. The populations are also so immense that the early, dynamic growth has not yet remotely exhausted these markets' potential to grow, in our view. Consider that between 2011 and 2017, India and China cumulatively saw more than 800 million people get their first bank accounts. Further consider that, despite these historic levels of progress, India and China still possess two of largest populations of unbanked citizens in the world.

The stories in India and China provide a glimpse of technology's potential as a tool for positive social change, as consumers turn to digital platforms for help in managing nearly every aspect of their lives, including their careers, finances, personal relationships and even health needs.

We believe demographic considerations may also become increasingly relevant in the health-care and medical-technology spaces. Across the globe, developed nations including Japan, the United States, South Korea, Germany and Spain, and emerging nations such as China, Argentina and Russia will be forced to confront aging populations. All told, the World Health Organization estimates that about two billion people across the globe will be over 60 years old by 2050.

We have already begun to see the fruits of technological innovation and accessibility. In 2001, the cost of DNA sequencing per genome was an eye-popping \$100 million. As of 2019, the cost had come down to just over \$1,000 per genome thanks to a combination of scientific breakthroughs and increased access to cutting-edge technologies. To this end, we like companies providing tools or addressing large opportunities with novel, first-to-market products.

Two specific areas that we have found appealing are consumables and medical tools in the life-sciences market. Currently, diagnostics only account for about 2% of health-care costs, despite informing well over 60% of health-care decisions, according to the National Institutes of Health.

Given global trends and an anticipated "silver tsunami," there will exist large (and expanding) addressable markets for those companies that can take advantage. These factors represent a promising growth prospect for a health-care sector that has seen digitalization transform

previously unthinkable ideas—such as direct-to-consumer diagnostic and genetic testing—into everyday realities in just over a decade.

ENTERTAINMENT AND ADVERTISING

Just as the proliferation of mobile devices has enabled increased financial inclusion and changed the way consumers interface with businesses, digitalization is also changing the way many people spend their free time. In many ways, the shifts in entertainment are a hybrid of the previous two concepts: one might think of the high-level changes as direct-to-consumer entertainment-as-a-service.

The rise of the "cord-cutting" mentality has seen broad shifts away from long-established "legacy" services—cable television, landline phones and brick-and-mortar movie rental and record stores, for example—and toward a model that offers consumers many of the same benefits the "as-a-service" model offers organizations: on-demand access to centrally stored content, convenient personalization and service updates that don't require manual intervention. Consumers have eagerly embraced the change.

In keeping with the theme of innovation and disruption, one of the biggest areas of growth in recent years has been a newcomer in an industry that is itself relatively young: digital gaming. As an entertainment form, video games have long struggled to gain the same kind of respect shown, for example, to Hollywood blockbusters. But while some may question the medium's artistic merits, gaming's revenue-generating potential can no longer be disputed. Consider that the top-grossing film of 2018 pulled in north of \$426 million in its opening week. In contrast, 2018's top-grossing video game made \$725 million in retail sales within its first three days of availability—nearly double the profit in less-than-half the time. And the top-selling video game of all-time, *Grand Theft Auto V*, has made an estimated \$6 billion and has been dubbed the "most financially successful media title of all time," across all formats.

Beyond the performance of record-setting individual titles, this trend proves broadly true. Video-game revenues are now more than twice those of films and more than seven times greater than those produced by the entire music industry. But even within this forward-thinking, inherently digital industry, digitalization has brought dramatic changes.

If "everyone has an app," then nearly "everyone has a game," too. As one *TechCrunch* article summarized it: "apps are the new prime time, and games have grabbed the lion's share." Mobile games currently account for one out of every

three app installs, and nearly three-fourths of all consumer spending on mobile. Despite only emerging around 2008, mobile gaming has risen meteorically. Within less than a decade, mobile gaming revenues were already greater than the combined revenues from both PC and console gaming, the long-entrenched "legacy" solutions of the gaming industry.

Like many of the most visible hallmarks of digitalization, streaming services and mobile gaming have thrived largely as a result of the relatively recent ubiquity of powerful, pocket-sized computers in the form of smartphones. And as with the emergence of any new communication channels in the past, new advertising venues were simultaneously formed in the shadows of these new platforms' creation and explosive growth.

The aforementioned *New York Times* 1993 year in review was prescient in foreseeing web browsers' commercial potential. In the same piece, one Sprint executive expressed conviction that "very quickly we'll have a new Madison Avenue kind of industry devoted to this style of advertising." In keeping with the prediction, the growth of online advertising has not only been lucrative enough to serve as the lifeblood for several of tech's biggest names, it has in many ways displaced traditional approaches to advertising.

The growth of this "new" Madison Avenue has required a fundamentally new approach for those firms still dotting the "old" Madison Avenue in the United States. In 2019, the United States and the Netherlands were the latest to join the ranks of China, Norway, Canada and the United Kingdom—countries in which online advertising has not only surpassed other formats, but has also accounted for more than half of all advertising spending.

One example that gives a sense of the remaining headroom for growth is the rise of connected TV (CTV). With most consumers now as likely to rent a movie from their smartphone (or HDMI streaming stick or video-game console) as they are to go to a theater or rent from a physical location, it is perhaps unsurprising that advertising within the space would produce its share of worthwhile investments. But while more than 70% of U.S. households make use of CTV, and even as digital advertising spending is at all-time highs, CTV advertising still only accounts for less than 3% of all media advertising spending, hinting at an immense and still-largely-untapped underlying market.

To borrow from one idiom of questionable authorship: if doing business without advertising is like winking at a lover in the dark ("you know what you are doing, but nobody else does"), then we can expect that those companies seeking to capitalize on growing markets must, at the very least, advertise their existence. Within this necessary business

function rests what we believe to be a great opportunity to catch secular headwinds driving entire industries forward.

SECURITY

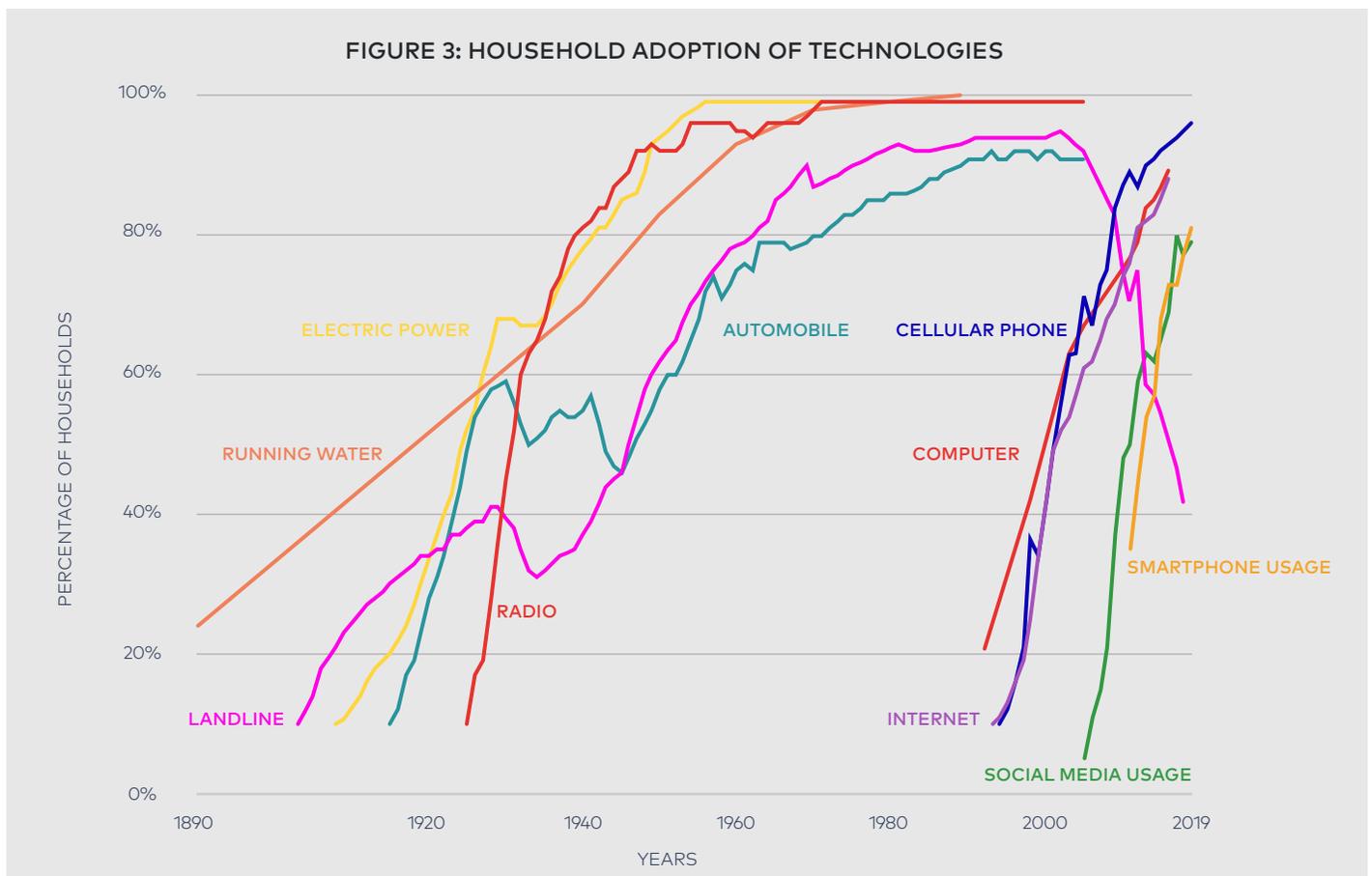
In the broadest terms, digitalization represents an increased reliance on digital tools in support of fundamental societal functions. But such a role change suggests a corresponding danger: the risks posed by any weakness in the foundation rise in direct proportion to the weightiness of the functions the foundation is tasked with supporting.

Security concerns are not merely a tangential subset of the software space. To the contrary, it appears that security concerns are both the primary driver behind decisions to transition to the cloud, as well as one of the top challenges organizations face once they have made the shift. In a 2019 Deloitte survey on data modernization and the cloud, 58% of respondents listed "security and data protection" as their primary reason for shifting to cloud-based software. As businesses delegate core functions to cloud-based providers, the complex challenge of securing an enterprise-scale system and its data is among the first logistical burdens management teams are looking to offload.

Even on the individual business level, the increased stakes are apparent. Within the first decade or more of the internet's rise, the notion of truly harming an organization by attacking its website would have been laughable in most instances. While websites were still considered an optional luxury for intrepid early adopters, such a cyberattack would have amounted to little more than an inconvenience for most impacted businesses. Today, such attacks are relatively commonplace and can be potentially catastrophic. In 2019, the average cost to organizations hit by data breaches was \$3.9 million and the average time to identify and contain the breach was nearly a year, to say nothing of broader risks, such as vulnerabilities in the digital frameworks supporting elections, infrastructure, financial operations and more.

As enterprise software transitions to the cloud, the old notion of perimeter or end-point security (the strengths of which are catered to on-premises setups) is being replaced by a new prioritization of point identity. Rather than primarily erecting digital barriers (e.g., a perfectly tuned network firewall), we expect that security solutions increasingly will be embedded in apps and will prioritize identity verification of the end-user.

Among the companies we have focused on are those specializing in "zero trust architecture," which hinges on a



Source: Our World in Data; Comin and Hobijn; Horace Dediu. As of July 19, 2019.

presumption that an organization will by default distrust any entities attempting to access its network resources, whether the attempted access originates inside or outside the network.

There no longer remains a question of whether the transition to the cloud will occur, nor even when it will occur (as it is currently ongoing), but what final form the changes will assume. That the trend toward cloud solutions appears to be a foregone conclusion suggests impressive headroom for growth for companies that can offer compelling security solutions, particularly as consumers and organizations increasingly transition sensitive data and essential operational functionality to the cloud.

CONCLUSION

The innovations brought about by digitalization have by now proliferated well beyond the traditional trails blazed by innovators in Silicon Valley, spilling into and often changing long-established ways of life. In elaborating on his perceived fourth industrial revolution and how it differs from the others, Klaus Schwab explains, "The speed of current breakthroughs has no historical precedent. When compared with previous industrial revolutions, the Fourth is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country." This rapid pace of adoption is clear in **Figure 3** on page 7, which shows the uptake speed of various paradigm-shifting technologies, and it is becoming increasingly evident that companies that choose a Luddite approach to this reality do so at their own peril.

Much like the revolutions that preceded it, this fourth industrial revolution carries with it a sense of inevitability (and of wondrous mystery). If the actual impact until now has been so large as to be difficult to quantify, the potential future impact is harder still to estimate.

If we once more step back to the heady days of the early internet, 1993, technologist Larry Landwehr summarized precisely this sense in an article in the now-defunct *Computer Underground Digest*, writing, "It's like trying to predict back in 1910 the impact of the automobile on society—the highway system, gasoline refineries, motels instead of hotels, new dating patterns, increased social mobility, commuting to work, the importance of the rubber industry, smog, drive-thru restaurants, mechanized warfare, and on and on. The net will bring more than quantitative changes, it will bring 'qualitative' changes. Things that were impossible will now become inevitable."

Even a single significant breakthrough on artificial intelligence or quantum computing, among other cutting-edge research trends, could be as broadly transformative as the internet or the web browser, if not more so. But while it is impossible, almost by definition, to fully anticipate the wholesale changes such innovations will likely bring about, the general forward trajectory seems indisputable, as does the breadth of the shift.

Whether Vernor Vinge's predicted "technological singularity" will occur remains to be seen. But whether or not the capabilities of computers surpass and replace human productivity, Vinge's underlying anticipation that technology (and specifically artificial intelligence) would be an upending force has already proven correct, as has his sense that human effort alone would steadily be outpaced by efforts aided by advanced technology.

"The fourth industrial revolution," as Klaus Schwab argued in his piece that coined the phrase, "will change not only what we do but also who we are."

Digitalization is decreasingly about fun gizmos that can provide a head start and is increasingly about keeping pace to avoid being left behind. Within that space between "where things are" and "where things likely will be" is where we believe the shrewd investor can thrive, and where companies with attractive, long-term growth prospects will continue to abound.

ABOUT THE INVESTMENT TEAM



JAGJIT SAHOTA

Portfolio Manager

20 / 5
Years of Experience / Years at Wasatch

Mr. Sahota is a Portfolio Manager on the U.S. small cap and international research teams. He joined Wasatch Global Investors in 2014 as a Senior Analyst. During his career, he has held several senior-level research positions, with a particular focus on technology companies.

Prior to joining Wasatch, Mr. Sahota was a partner and technology analyst for a long/short hedge fund. Earlier, he was a vice president and sector head for Crosslink Capital, which focused on investing in disruptive technologies, secular-growth opportunities and early-stage public companies. His other professional experience included positions at hedge-fund and equity-research organizations, as well as a corporate-development role at Agilent Technologies.

Mr. Sahota began his career as an analyst at Kensington Investment Group after earning a Bachelor of Science in Finance

from the Walter A. Haas School of Business at the University of California, Berkeley.

Jagjit grew up in the San Francisco Bay Area. He speaks fluent Hindi and Punjabi. He enjoys traveling and playing soccer.



KEN KORNGIEBEL, CFA

Portfolio Manager

24 / 4
Years of Experience / Years at Wasatch

Mr. Korngiebel is a Portfolio Manager on the U.S. micro/small cap and global research teams. He joined Wasatch Global Investors in 2015.

Mr. Korngiebel's investment career has spanned decades, during which he has covered small, mid and large cap growth stocks across all sectors.

Prior to joining Wasatch, Mr. Korngiebel was a founder, partner and lead portfolio manager at Montibus Capital Management—a business backed by Stifel Financial Corp. At Montibus, he led a team of five investment professionals from 2006 to 2015, managing the firm's long-only small and SMID cap growth portfolios totaling \$1 billion in assets. Earlier in his career, he was a senior managing director and lead portfolio manager at Columbia Management Company—where he rebuilt a six-person investment team, implemented a new philosophy and process, and managed small, SMID and mid cap growth portfolios totaling \$2.6 billion in assets. His tenure at Columbia Management was from 1996 to 2006.

Mr. Korngiebel holds a Master of Business Administration from the Wharton School of the University of Pennsylvania, and a Bachelor of Arts in Economics and Spanish from Stanford University. He is also a CFA charterholder.

Ken has lived in Venezuela, Spain and Switzerland. He speaks Spanish, and his French is passable. He is also an avid skier, wine collector and struggling golfer.



MIKE VALENTINE

Portfolio Manager

14 / 3
Years of Experience / Years at Wasatch

Mr. Valentine is a Portfolio Manager on the U.S. small cap and global research teams. He joined Wasatch Global Investors in 2016.

Since entering the asset-management business in 2005, Mr. Valentine has covered various sectors including health care, information technology and basic materials across all market capitalizations and geographies.

Prior to joining Wasatch, Mr. Valentine was a portfolio manager at Point72 in Boston where he led a team of analysts and managed

a long/short fund focused on the technology and telecom sectors. Before Point72, he worked from 2005 to 2012 as an analyst and a portfolio manager at Fidelity Investments in Boston where he developed a technology-sector strategy for a group of diversified funds in addition to managing long-only sector portfolios.

Mr. Valentine holds a Bachelor of Arts degree in Computer Science from Amherst College in Amherst, Massachusetts.

Mike grew up in New England and remains a fan of his beloved Patriots.

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ABOUT WASATCH GLOBAL INVESTORS

Wasatch Global Investors pursues a disciplined approach to investing, focused on bottom-up, fundamental analysis to develop a deep understanding of the investment potential of individual companies. In making investment decisions, the portfolio managers employ a uniquely collaborative process to leverage the knowledge and skill of the entire Wasatch research team.

Wasatch Global Investors is an employee-owned investment advisor founded in 1975 and headquartered in Salt Lake City, Utah. The firm had \$20.8 billion in assets under management as of December 31, 2019. Wasatch Global Investors is registered with the Securities and Exchange Commission under the Investment Advisers Act of 1940.

RISKS AND DISCLOSURES

Investing in small cap funds will be more volatile and loss of principal could be greater than investing in large cap or more diversified funds. Investing in foreign securities, especially in frontier and emerging markets, entails special risks, such as unstable currencies, highly volatile securities markets and political and social instability, which are described in more detail in the prospectus.

An investor should consider investment objectives, risks, charges, and expenses carefully before investing. To obtain a prospectus, containing this and other information, visit www.WasatchGlobal.com or call 800.551.1700. Please read the prospectus carefully before investing.

Information in this document regarding market or economic trends or the factors influencing historical or future performance reflects the opinions of management as of the date of this document. These statements should not be relied upon for any other purpose. Past performance is no guarantee of future results, and there is no guarantee that the market forecasts discussed will be realized.

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As of December 31, 2019, the percentage of Wasatch Global Investors' assets under management invested in Amazon.com, Inc. was less than 1%, Alibaba Group Holding Ltd. was 0.3%.

DEFINITIONS

The **"cloud"** is the internet. Cloud-computing is a model for delivering information-technology services in which resources are retrieved from the internet through web-based tools and applications, rather than from a direct connection to a server.

Gross domestic product (GDP) is a basic measure of a country's economic performance and is the market value of all final goods and services made within the borders of a country in a year.

Gross national income (GNI) is the total amount of money earned by a country's people and companies. It is used to measure and track a country's wealth from year to year. GNI includes the country's gross domestic product plus the income it receives from overseas sources. **GNI per capita** is gross national income divided by mid-year population.

The **international poverty line** is a monetary threshold under which an individual is considered to be living in poverty. When purchasing power parity (PPP) and all goods consumed are considered in the calculation of the line, it allows organizations to determine which populations are considered to be in absolute poverty. According to the World Bank, \$1.90 a day (in 2011 PPP \$) is the extreme poverty line and represents the poverty line typical of the world's poorest countries. Other poverty lines for developing nations usually represent a slightly higher standard of living. The \$1.90 a day poverty line can generally be used to measure poverty globally and to compare poverty across countries in less developed nations.

The **World Health Organization (WHO)** is a specialized agency of the United Nations that is concerned with world public health. It was established on April 7, 1948 and is headquartered in Geneva, Switzerland.

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