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Digital Economy An interdisciplinary growth market

An analysis of investment opportunities in the digital economy.

Customer version | Swiss edition

Summary

The digital economy is experiencing explosive growth: the technology sector alone has surpassed annual growth in GDP by at least twice over the past 30 years. As a driver of economic prosperity, the digital economy affects almost all areas of life and the economy according to our analysis – from global trade, communication and health to research and development. It fosters transformation in a wide range of industries and should therefore also contribute to greater sustainability.

According to the Fraunhofer Institute for Industrial Engineering, artificial intelligence is not only able to make production processes more efficient, but also increase sustainability¹. Even in online retail, which is often described as unsustainable, CO₂ emissions are lower than expected. According to the German Öko-Institut, people who drive five kilometres to shop in a store have a poorer eco-balance than those who order online. Overall, we expect the digital economy to have a largely positive impact on society and the environment, even taking into account the energy consumption of servers. In our view, it can also contribute to several UN Sustainable Development Goals (SDGs).

We believe that the digital economy can also represent an exciting investment for investors. After all, it is a significant and steadily growing part of the global economy. Corporate IT spending alone is estimated by Gartner to be over USD 5 trillion in 2024². Cloud computing and software-as-a-service (SaaS) have revolutionised the availability of IT, enabling even small businesses to access sophisticated software. As a result, companies can improve their digital capabilities and reduce initial capital expenditure. This drives the development of new products outside of the core technology sectors and expands











the investable universe to include areas such as heavy infrastructure, smart health systems and banks. There are no standardised analyses on the market size of digital economy sectors. For this reason, we need to analyse each company individually to understand its opportunities. According to our estimates, the potential is likely to be considerable. However, investors must not lose sight of the possible risks. These result from factors such as technological obsolescence, the disruption of business models, market volatility or inflated valuations as a result of excessive enthusiasm for new technologies.

With the “Digital Economy” thematic fund, we want to offer investors an opportunity to participate in the growth of the digital economy. Our fund managers analyse companies that are likely to benefit from the expansion of the digital economy and invest in those candidates that seem most promising in this respect. Active selection focuses on companies that we consider innovative and high-quality players with sustainable business models. With this approach, we aim to achieve an above-average return for investors in a dynamic market.

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Asset Management by Zürcher Kantonalbank

Regions analysed: Global

Sectors: Technology, communication services, industry, utilities, finance, consumer goods

Sustainable Development Goals (SDGs):  Zero Hunger |  Good Health and Well-being |  Clean Water and Sanitation |  Affordable and Clean Energy |  Decent Work and Economic Growth |  Industry, Innovation and Infrastructure |  Sustainable Cities and Communities |  Responsible Consumption and Production |  Life below Water |  Life on Land.

Sources: All sources were last accessed in July 2024

Publication date: July 2024

¹ <https://www.iao.fraunhofer.de/de/presse-und-medien/aktuelles/mit-kuenstlicher-intelligenz-zu-mehr-nachhaltigkeit.html> (2.7.2024)

² <https://www.gartner.com/en/newsroom/press-releases/01-17-2024-gartner-forecasts-worldwide-it-spending-to-grow-six-point-eight-percent-in-2024> (2.7.2024)

1. Digital economy affects all sectors

The digital economy is based on the widespread use of information and communication technologies in all sectors. More and more economic activity is thus shifting to digital channels, resulting in radical changes. At the same time, automated and autonomous solutions are increasingly becoming part of our daily lives. Besides continuous innovations and technological developments, several factors are driving the expansion of the digital economy:

1. **Computing power:** Thanks to ever-increasing computing power, it is possible to handle complex tasks such as data analytics, compute artificial intelligence (AI) algorithms and create realistic graphics used in augmented reality (AR) and virtual reality (VR) experiences.
2. **Miniaturisation:** Smaller transistors and components enable more powerful devices in smaller formats. They provide the basis for a mobile and networked digital world.
3. **Network infrastructure:** Enhanced fibre optic networks, satellite communication, 5G (and in future 6G), Wi-Fi 6 and edge computing lay the foundation for faster, low-latency data transmission for real-time interactions. This is crucial for digital services such as autonomous vehicles, AR, robotics and drones.

1.1 The impact of the digital economy

These innovations have the potential to disrupt traditional business models, create new business opportunities and change the way products and services are offered across industries. Their effects can be seen on several levels:

Economy:

- **Growth:** New industries and business models are emerging that create jobs and stimulate economic growth, such as e-commerce and online services or the app economy.

- **Efficiency:** Digital technologies are streamlining processes, improving communication and facilitating remote work.
- **Innovation:** The digital economy is fostering a culture of innovation, with new technologies and solutions being constantly developed to meet changing needs.
- **Global marketplace:** Businesses are reaching a wider audience online and promoting international trade and global economic integration.

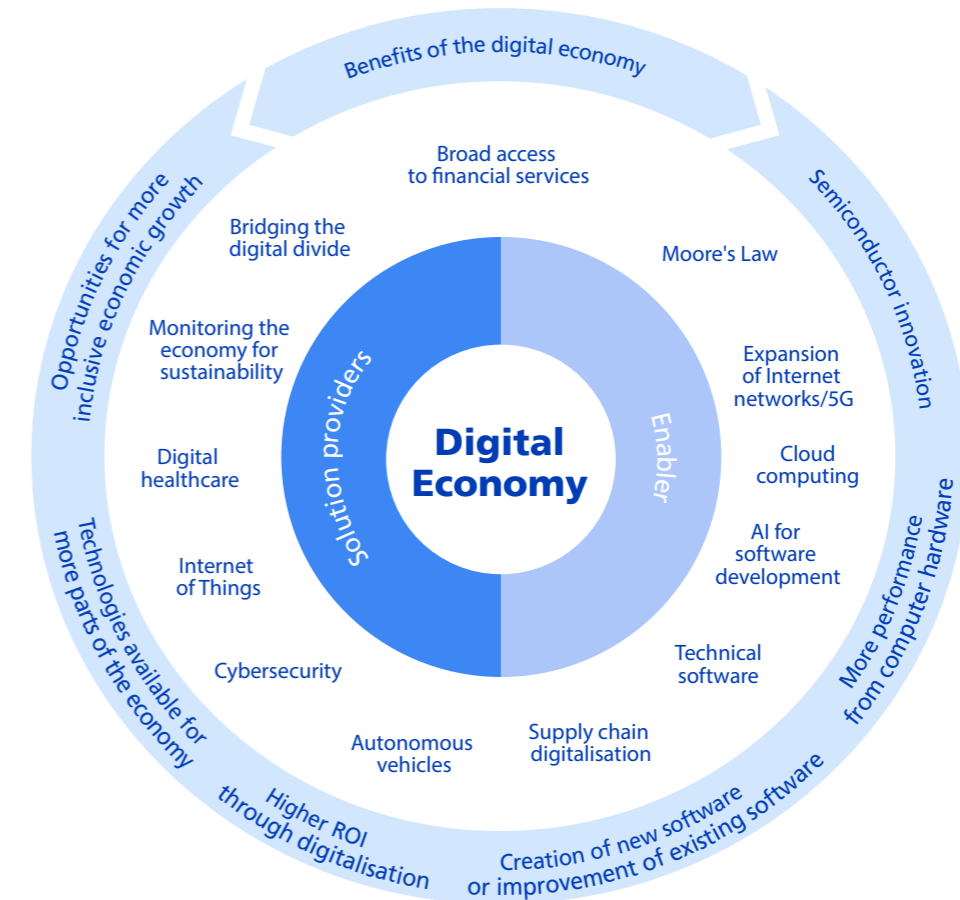
Society:

- **Access to information and work:** The digital revolution is simplifying access to knowledge and educational resources. It is also making it easier for people with health restrictions to participate in the labour market.
- **Communication and collaboration:** Digital tools have revolutionised communication and collaboration by bringing geographically dispersed teams together online. This became clear during the Covid-19 pandemic. The pandemic also sparked new e-commerce solutions for restaurant and food delivery services.
- **Financial integration:** Digital financial services are able to reach new population groups. This promotes financial integration and access to banking services – even in communities that are only accessible thanks to the spread of mobile phones.
- **New qualifications:** The digital economy is calling for new skills and creating opportunities for education and professional development in areas such as data analytics and digital marketing.

Environment:

- **Resource efficiency:** Digital tools are helping to optimise the use of resources across different industries, reducing waste and environmental footprint.
- **Sustainable solutions:** Technological advances are able to support the development of clean energy solutions and sustainable practices.

Figure 1: The focus areas of the digital economy



Source: Zürcher Kantonalbank

Reducing poverty and creating more demanding jobs depends on continued GDP growth. This will happen faster if more capital is available, the number of workers increases and both factors are used more productively. In many developed economies, capital is already being used efficiently and the number of workers is stable or declining. Productivity increases are therefore becoming increasingly important for economic growth.

We believe that the digital economy can play a crucial role in supporting economic growth and improving social prosperity. This is true even in areas unrelated to IT such

as the mining industry, which can offer safer and more productive jobs thanks to automation. However, some jobs are also at risk. Ultimately, the net impact on the economy is likely to be positive, but more actors need to be involved to mitigate the negative impact. We see great opportunities in improved access to modern information and communication technologies. A digital divide still persists in some places. This is measured on the basis of Internet connections per population unit or digital competence. The digital divide is unlikely to close by itself and it will require additional political support.

Business models with unique dynamics

Technological innovations, digitalisation and new business models will likely continue to act as catalysts for change – and not only transform the technology sector, but drive change across the entire economy. Traditional business models are expected to peter out and new ones emerge. The business models of the digital economy demonstrate unique dynamics:

Network effects: In the digital world, products and services become more valuable the more people use them. Network effects reinforce themselves and success compounds. This dynamic applies primarily to communication channels and platform economies such as social media, e-commerce marketplaces, digital entertainment services and app stores, proprietary hardware/software systems or razor-and-blade business models (e.g. printers and toners).

Tipping points: The spread of products and services by users – amplified by network effects – can lead to tipping points where their demand explodes and exponentially grows. This can happen when a critical mass is reached or a new feature is released that triggers increased user acceptance.

Long tail: The Internet makes it possible for a wide range of niche products and services to find at least a small audience. These are known as “long tail” products that could hardly be sold individually, but altogether make a significant contribution to a company's turnover. This applies to on-demand streaming services or e-books drawn from a huge library.

Scalability: Digital companies can often scale much faster and at lower cost than traditional ones. This allows them to reach a global audience with minimal additional resources.

Convergence: Digital products are standardised (written in binary code) and have low or minimal marginal costs. Unlike manufacturing physical products or provid-

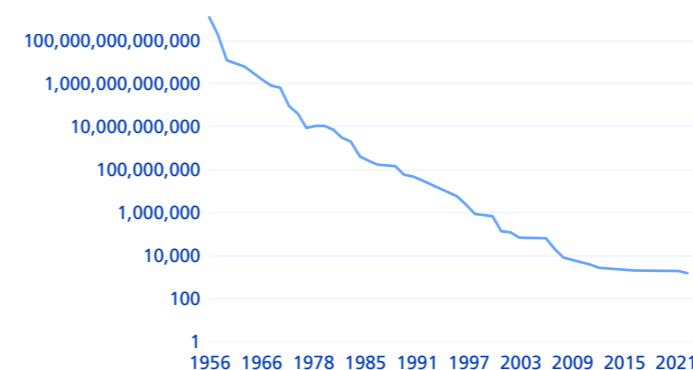
ing physical services, software or digital media content can be copied easily and at minimal cost, without loss of quality. Digitalisation and standardisation are also associated with minimal transaction costs. They also support interoperability at the device level: while a camera was once needed for photos, a Walkman for music or a book to read, a smartphone is enough for all these formats in the digital world. Organisational convergence is seen at the macro level, where different companies, industries or sectors are seamlessly integrated into one networked system. For example, self-driving cars bring together the historically separate automotive, software development, sensor and communications network industries.

Ever smaller, ever faster, ever cheaper

Cheaper and smaller processors with greater computing power are a catalyst for hardware and software innovations. The improvements have an impact on both the supply and demand side: developers can design new and more powerful software, which in turn can be deployed more cost-effectively (see chart). As a result, more and more niches can be digitised.

In the past, continuous innovation in the field of semiconductors has made it possible to double the number of transistors on a chip every two years. This has led to an increase in computing power, while at the same time reducing energy consumption and costs. The exponential growth of computing power based on Moore's law is now reaching its physical limits as miniaturisation approaches the atomic plane and raises precision problems such as Heisenberg's uncertainty principle. Nevertheless, there is still room for improvement. 3D stacking allows processors to be built with multiple transistor layers stacked on top of each other, effectively increasing processing power without shrinking components. New materials could also enable faster transistors or software optimisations, and new algorithms could improve the performance of existing hardware. Human ingenuity seems to know no bounds.

Figure 2: The cost of computer memory and storage in historical comparison (from trillions to single-digit amounts)



Source: <https://ourworldindata.org/grapher/historical-cost-of-computer-memory-and-storage>

The ever-increasing computing power can be seen in many applications that are not directly connected to IT. In healthcare, for example, the cost of sequencing the human genome has decreased by a thousandfold over the past 20 years thanks to groundbreaking advances in computing power and lower computing costs. This has enabled innovations in medicine that can extend people's lives and improve their quality of life. This is especially true for the Covid-19 vaccine, where the virus was sequenced within a matter of hours.

Another example of efficiency improvements are digital twins of physical structures in industry that enable more efficient and cost-effective prototyping or predictive maintenance. According to Bentley Systems, they now enable engineers to extract important information from a photo of a bridge regarding its span length and deformation or corrosion. Comparing the photo with the original digitised plans of the bridge allows for targeted maintenance rather than a comprehensive preventive measure. This saves time and money.

1.2 More sustainable processes

As far as sustainability is concerned, the digital economy makes many processes less carbon intensive and expands the possibilities for monitoring the positive and negative impact of economical processes on the environment. For example, a Google research team³ is helping airlines calculate flight paths with as few condensation trails as possible using AI-based analysis and maps. These trails are responsible for about one third of the negative impact of air transport on global warming. Thanks to AI and analytics, it should be possible to reduce airline emissions by over 50 percent⁴.

1.3 These Sustainable Development Goals (SDGs) can be supported by the digital economy

We believe that companies operating in the digital economy have the potential to support progress towards numerous SDGs, addressing the following SDGs directly. The list corresponds with the conventional numbering of the Sustainable Development Goals and sub-goals:



SDG 9: Industry, Innovation and Infrastructure

The effect of the digital economy comes into play, for example, in extending the safe lifespan of existing physical infrastructure such as bridges, roads or ports and, of course, in the continuous improvement of access to information and communication technology.

- **9.1 Sustainable and resilient infrastructure** requires more digital technologies – from cheap sensors to more complex management systems (e.g. for the power grid). For example, sophisticated train handling software can increase the capacity of train lines without additional investment in rail infrastructure.
- **9.3 Mobile networks** directly improve access to financial markets. More automated banking services are expanding banking to increasingly low-income niches in the global economy; in some cases, a sustainable business model for banks would not be possible without software and hardware.

³ <https://blog.google/intl/de-de/unternehmen/technologie/wie-goog-le-ai-emissionen-reduziert/> (2.7.2024)

⁴ <https://www.weforum.org/agenda/2023/11/3-ways-ai-can-revolutionize-sustainable-aviation/> (2.7.2024)

2. Digital economy promises high potential

– **9.4 Close monitoring of industries and infrastructure** helps improve sustainability. For example, carbon emissions from steel production or the degree of efficiency gains in heat generation provide a basis for measuring progress in sustainability. This would hardly be possible without digital solutions.

– **9.b Domestically, software can promote technological development and industrial diversification.** In countries with high labour costs, additional automation should also improve competitiveness.



SDG 8: Decent Work and Economic Growth

Thanks to the automation of high-risk manual work – for example in mining – and its contribution to innovation, the digital economy is a key component of GDP growth.

– **8.1 Sustainable economic growth** is achieved to a greater or lesser extent through technological innovation. GDP growth per capita is thus directly linked to innovative capacity.

– **8.2 Improving economic productivity** is also about innovation. Tasks with low value creation are automated, freeing up time for tasks with higher value creation.

Moreover, the digital economy promotes the following goals:



SDG 3: Good Health and Well-Being

Vehicle automation reduces the accident rate, for example. Early warning systems for global health risks are also directly dependent on the connectivity enabled by the Internet.



SDG 6: Clean Water and Sanitation

Digital economy solutions can improve the efficiency of existing infrastructure, whether it's reducing waste in a system or regularly monitoring water quality.



SDG 7: Affordable and Clean Energy

Increasing the share of renewable energy in power grids requires more detailed optimisation, which is only possible with connected sensors and powerful computers.



SDG 11: Sustainable Cities and Communities

Software improves the planning of new and the efficiency of existing transport infrastructure. For example, the London Underground can use more trains on the existing rail network thanks to modern signalling technology.

2.1 A multi-trillion-dollar market

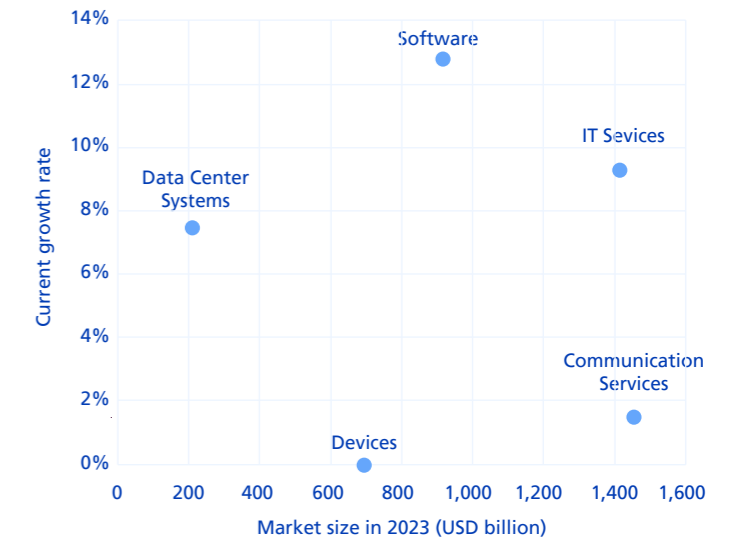
There are several estimates of the market size of the digital economy: Capgemini assessed the “eco digital economy” at USD 16.6 trillion or 15.8 percent of global GDP in 2023⁵. By 2028, the consulting firm forecasts an increase to USD 32.9 trillion, or 26.2 percent of GDP. These figures are in line with those of Satya Nadella, CEO of Microsoft, who already attributes 16 percent of global GDP to the digital economy today⁶. Over the past 15 years, the digital economy has grown more than twice as fast as GDP. Accordingly, it is expected to continue to grow at similar rates in the future. As the link between the physical and digital worlds, the Internet will likely drive the growth of the digital economy and capture more and more niche applications. The opportunities seem as diverse as the possible applications.

2.2 Extent of “pure” digital spending

Incremental innovations help to establish digital tools in areas of life that used to be purely analogue. Digitalisation requires significant investments in networks, infrastructure, semiconductors, sensors, hardware and software, i.e. in products and services offered by the digital economy.

The market research institutes Gartner and IDC have put forward calculations for these expenditures. Gartner estimates global IT spending at USD 4.7 trillion in 2023⁷. IDC forecasts USD 4.0 trillion by 2027⁸. IT spending has increased by 7 percent annually over the past 15 years. At a growth rate of 7 percent per year, this would increase by another trillion dollars in 3.5 years. This means that IT spending by companies is expected to reach the USD 6 trillion mark by 2028, or in just five years' time.

Figure 3: Global IT spending



Source: Zürcher Kantonalbank / Gartner

2.3 Degree of digitalisation outside core technology

Gartner's estimates refer to corporate IT spending only. This means, for example, the estimates include a bank's IT budget, but not the process of expanding a factory's robotic infrastructure. Finding a commonly accepted and accurate metric beyond corporate IT is difficult. We rely on the forecasts of individual companies on the topic. In agriculture, for example, improvements in production technology are referred to as “precision agriculture”. Major OEM John Deere expects this to create an additional addressable market of USD 150 billion⁹.

⁵ <https://www.consultancy.eu/news/9716/global-eco-digital-economy-to-double-in-next-five-years>

⁶ Forbes article, 26 January 2022

⁷ [https://www.gartner.com/en/newsroom/press-releases/01-17-2024-gartner-forecasts-worldwide-it-spending-to-grow-six-point-eight-percent-in-2024#:~:text=The%20overall%20IT%20spending%20growth,overall%20IT%20spending%20increasing%206.8%25.\(2.7.2024\)](https://www.gartner.com/en/newsroom/press-releases/01-17-2024-gartner-forecasts-worldwide-it-spending-to-grow-six-point-eight-percent-in-2024#:~:text=The%20overall%20IT%20spending%20growth,overall%20IT%20spending%20increasing%206.8%25.(2.7.2024))

⁸ <https://www.idc.com/getdoc.jsp?containerId=prUS52305724> (2.7.2024)

⁹ <https://citywire.com/pro-buyer/news/deere-bets-the-farm-on-150bn-precision-agriculture-opportunity/a2408316> (2.7.2024)

2.4 Brisk market development

Corporate IT spending has increased by 5 to 10 percent annually over the past decade, depending on the region and end market. Gartner and IDC expect comparable growth rates in the coming years. Moreover, modern technologies are promoting a system with low or zero marginal costs. At the same time, the markets are developing extremely briskly, as mentioned in section 1.2. There is a strong competitive dynamic and new business models are constantly being tested. This creative destruction offers new business models the opportunity to establish themselves. In general, they are surpassing the rate of GDP growth many times over, albeit from a smaller baseline.

2.5 Key applications of the digital economy

Connectivity

Communication networks are the backbone of the digital economy. They cover a wide range of solutions – from cables and fibre optics to satellite and mobile infrastructure (towers, devices, 5G networks and edge data centres). High-quality connections, on the other hand, are essential for modern digital applications such as streaming, support for cloud services, real-time data processing for autonomous vehicles and remote medical care. The list of ways in which improved networks enhance the flexibility and scalability of the digital economy is by no means exhaustive.

5G is currently the latest network innovation. It reduces data transmission time and increases network capacity to support multiple connected devices simultaneously. This is critical for the Internet of Things (IoT), where countless devices communicate with each other over the Internet. This creates a wide network of interconnected devices, from smart household appliances to industrial sensors, which in turn opens up new options:

- 5G network slicing enables the 5G network to be divided into several virtual networks. These virtual networks provide tailored connectivity for various services, for example in a factory hall where the networks should not be connected directly to the open Internet for security reasons.

- The improved bandwidth and lower latency of the networks is a big advantage for cloud computing, as it enables more complex calculations in the cloud and reduces dependence on local hardware.
- In smart cities, increased bandwidth facilitates the integration of a range of digital services and improves urban efficiency and sustainability.

Cloud computing and data centres

Cloud computing and the SaaS model based on it also make advanced software accessible to smaller companies. Hyper-scalers such as Amazon Web Services (AWS), Azure by Microsoft, Alphabet's Google Cloud Platform (GCP) or Oracle OCI are the pioneers in this field. They increase the ROI of digitalisation by increasing economies of scale and reducing costs. At the same time, they improve the capacity utilisation of an organisation and optimise efficient workload planning through virtualisation and flexible upscaling or downscaling of capacity. Offers on different service levels such as SaaS, PaaS (platform as a service) or IaaS (infrastructure as a service) enable customers to reduce their investment needs. Cloud computing services make it possible for large companies to increase their degree of digitalisation in a cost-effective manner, and smaller companies to become digital in the first place. Cloud computing lowers the initial costs as the services can be tailored precisely to the needs of a new application.

Due to the size of the hyper-scalers, even the smallest improvement of 1 bps results in enough savings with their millions of customers to fund additional innovations. As a result, hyper-scalers are becoming increasingly competitive in delivering computing power. They are also often the largest single buyer of data centre equipment. For example, Arista Networks, a leading provider of network equipment, generates 26 percent of its revenue from Meta, another 16 percent from Microsoft, 3 percent from Amazon and 2 percent from Google. In total, annual sales amount to USD 526 million.

The total investments of Microsoft, Amazon and Google in the past financial year amounted to USD 123 billion ac-

Table 1: The most important customers of Arista Networks

Customer name	Sector	Market capitalisation (m)	Total relative size (m)	Total relative size (%)	Customer costs (%)
Arista Networks Inc	Hardware	54,399.51	-	-	-
Meta Platforms Inc	Internet media and services	777,794.65	1,139.14	26.00%	3.62%
Microsoft Corp	Software	2,506,976.41	701.01	16.00%	2.83%
Alphabet Inc	Internet media and services	1,565,689.69	158.62	3.11%	0.52%
TD SYNEX Corp	Hardware	8,375.30	107.20	2.10%	0.19%
Amazon.com Inc	Online commerce	1,371,429.20	105.05	2.06%	0.16%

Source: Bloomberg / Zürcher Kantonalbank

ording to estimates from Zürcher Kantonalbank's research. Computer equipment and software accounted for more than half of these investments or USD 71 billion. This expenditure has increased by more than 10 percent per year in recent years.

On the other hand, it is important to note that the increased energy demand in data centres is a major challenge. This is particularly the case when additional computing power is required for AI solutions.

Security

The more the number of physical-digital interfaces increases, the greater the penetration of digitalisation into more sensitive areas. In recent years, for example, more and more critical infrastructure – such as nuclear power plants or oil pipelines – has been connected to the Internet. As technology becomes more powerful and a growing number of sensors are equipped with semiconductors, the risk of unauthorised access also increases. Cybersecurity is therefore an essential part of the digital economy. A major security breach would probably increase uncertainty substantially. As a result, official oversight would probably follow and this could endanger ongoing digitalisation.

Cybersecurity

According to our calculations, the revenues of listed, pure cybersecurity companies were estimated at USD 30 billion for the 2022 calendar year. There are also many other publicly traded technology companies that sell cybersecurity tools, such as Microsoft or Cisco, as well as a variety of private cybersecurity solution providers. McKinsey's Cyber Market Map estimates that the sales market alone

stood at USD 140 to 150 billion in 2021¹⁰. This corresponds to about one tenth of the total addressable market. This is plausible considering that many businesses still offer a low level of security. In our opinion, many smaller organisations that used to be disconnected from the Internet are not equipped with security tools at all.

As digitalisation progresses, more and more sensitive infrastructure and organisations are becoming vulnerable to cyberattacks. This risk is likely to drive growth in cybersecurity spending beyond that of the entire IT market. Global spending on security solutions and risk management is expected to increase by around 14 percent to a total of USD 214.9 billion in 2024, according to Gartner¹¹.

Data protection and privacy

Data protection is not only about ensuring the integrity of the systems used to store data; it is also about making efficient management possible for the owners of this data.

¹⁰ <https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-cybersecurity> (2.7.2024)

¹¹ <https://www.gartner.com/en/newsroom/press-releases/2023-09-28-gartner-forecasts-global-security-and-risk-management-spending-to-grow-14-percent-in-2024>

There is often a discrepancy between data subjects and those who manage the data. An example of this is meta-data collected about a person's shopping habits or video recordings of a person walking through a public space. The data subject is affected, but the data may be on the servers of an advertising company or a retailer.

The digital economy also involves finding practical solutions for implementing the individual's legal rights under data protection law. Although there is a constant debate in society about exactly what these rights should be, the digital economy is an important link in the implementation of these rights, especially as the costs of implementation can sometimes influence which rights are allocated.

Healthcare technology, digital healthcare and healthtech

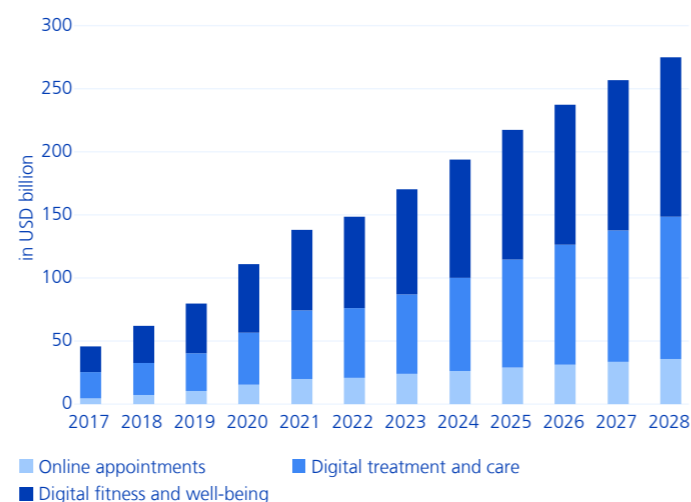
Digital healthcare encompasses a wide range of services, from wearables, connected implants and smart devices to remote consultations by doctors and digital diagnostic assistants as well as the possibility of remote surgeries by robotic surgeons. Digital solutions are also used by health insurers that leverage advanced data analytics to optimise their services.

Medium- to long-term trend: brain-computer interfaces (BCI)

In healthcare, the proliferation of automatic external defibrillators (AEDs) in public spaces shows that advanced, life-saving technology does not have to be a luxury, but can be ubiquitous. Accordingly, the potential for "brain-computer interfaces" is high. The example of AEDs already shows the importance of such technologies today. For every minute that someone is not successfully treated for cardiac arrest (by defibrillation), their chance of survival decreases by 7 percent per minute in the first three minutes, then by 10 percent per minute. AEDs can be used with minimal or even no training, bridging the vital time period between a heart attack and the arrival of emergency services. The cost of AEDs has steadily decreased in recent decades, at least partly due to the lower cost of microchips. In addition, with the improvement of their sensors and software, the devices are becoming ever more powerful and easier to use. More life-saving AEDs

can be used for the same budget or even less. The broad availability of life-saving technologies underlines the transformative social impact of the digital economy.

Figure 4: Digital health – worldwide



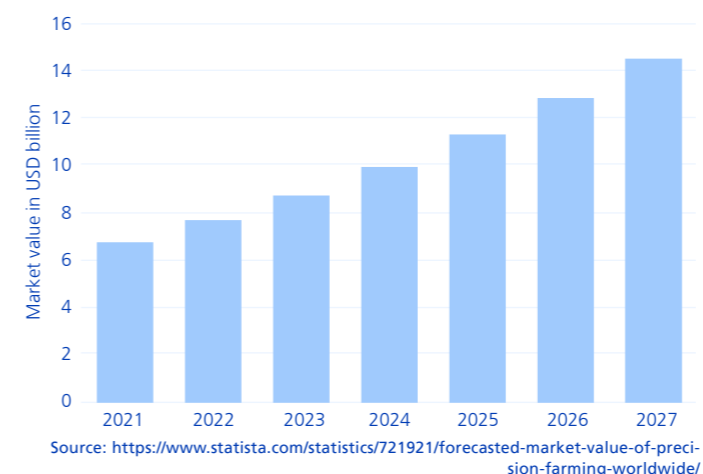
Source: <https://www.statista.com/outlook/hmo/digital-health/worldwide#revenue>

Precision agriculture

Precision agriculture uses the digital economy to increase efficiency and productivity. Digital solutions are designed to enable farmers to monitor and manage their fields with the highest accuracy by using data on soil conditions, weather patterns, plant health and pest infestation. A key component of precision agriculture from the digital economy is GPS technology, which is designed to enable farmers to accurately map their fields and control machines for tasks such as planting, fertilising and harvesting. Drones and satellite images also provide real-time insights into the condition of plants and they can detect problems that are not visible from the ground. Sensors installed in the field or on equipment collect data on parameters such as soil moisture and nutrient content, helping to optimise irrigation and fertilisation. This data-driven approach minimises waste, reduces costs and maximises yield.

John Deere, one of the leading agricultural OEMs, has invested considerable resources to adapt its product range and expand its software creation capabilities. The main competitor CNH Industrial pursues a similar strategy. John Deere's management team estimates that precision agriculture will create an additional addressable market of USD 150 billion¹². According to CNH, precision agriculture is expected to help increase yields by 5 to 10 percent, halve labour and reduce fertiliser use by 10 to 20 percent worldwide. The latter is of great importance considering that 20 percent of the world's arable land is expected to be lost by 2030, as CNH declared on Investors Day 2022. At the same time, a water gap of 50 percent is expected for irrigation by 2050. The use of pesticides is also likely to be increasingly regulated by then, for example through an EU mandate for a 50-percent reduction by 2030¹³. Precision agriculture thus contributes to broader social and environmental goals such as combating hunger, reducing pesticide use and saving water.

Figure 5: Precision agriculture: forecast of global market size in 2027



Source: <https://www.statista.com/statistics/721921/forecasted-market-value-of-precision-farming-worldwide/>

Improved public transport

Developers and operators of transport systems use the digital economy to make these systems more user-friendly, efficient and reliable. Transport authorities from Zurich to Singapore are using technologies to improve the flow of traffic and the running of public transport. GPS devices installed in buses provide real-time location data and allow central control centres to track the path of each vehicle. Sensors at bus stops and in buses collect data on passenger numbers.

In an advanced system, all this data can be used to dynamically optimise schedules based on real-time demand. This will reduce waiting times, avoid overcrowded vehicles and ultimately improve passenger comfort. Integrating data for mobile apps allows passengers to plan their journeys more effectively by receiving real-time updates and route suggestions. All these improvements should lead to increased use of public transport, which in turn should have a positive impact on society and the environment. These positive effects are directly dependent on the digital economy and its solutions.

Digitised financial services and fintech

Digitalisation has transformed finance in recent decades: branches have been replaced by online banking, neo-banks without physical locations have emerged and digital payment systems (e.g. credit card networks) span the entire globe. Payment systems, apps and terminals for retail are now also ubiquitous. Microloans via SMS in emerging markets, cryptocurrencies and units of assets in the form of tokens are also available. In turn, insurance companies are using complex big data analysis models to optimise risk management. The digital economy is a prerequisite for offering banking services to people who previously did not have access to the financial system.

¹⁰ <https://citywire.com/pro-buyer/news/deere-bets-the-farm-on-150bn-precision-agriculture-opportunity/a2408316> (2.7.2024)

¹¹ <https://ec.europa.eu/eip/agriculture/en/news/green-deal-halving-pesticide-use-2030.html#:~:text=As%20part%20of%20this%2C%20the,use%20pesticides%20in%20the%20EU.> (2.7.2024)

3. The investment concept of the digital economy

Thanks to lower operating costs, it is becoming increasingly possible to offer completely new banking services at low prices or to extend existing services to people who were previously left out. Many start-ups focusing on the financial sector have emerged with the fintechs over the past decade. They concentrate on areas such as microfinance, peer-to-peer lending and affordable insurance products. They fill gaps left by traditional financial institutions or compete in established markets. In emerging markets, the digital economy is transforming the banking and financial sector by addressing financial integration and gaps in infrastructure.

A prime example is Kenya's M-Pesa, a mobile phone-based money transfer service. This allows users to deposit, withdraw, transfer and pay for goods and services using their mobile phone. This service is particularly valued by the rural population, who previously had limited access to banking services. Another example is the Aadhaar system, a biometric database linked to individual bank accounts that enables secure and straightforward identification and transaction processing in India. In a country where many members of society are unable to produce official documents, the system has streamlined banking processes, reduced fraud and helped provide financial services to the population without bank accounts.

The example of international remittances when migrants transfer money to family members or other people in their home country shows how financial innovation can contribute economically to development. According to World Bank studies, global remittance flows to low- and middle-income countries amounted to USD 647 billion in

2022. In some countries, these incoming transfers account for a very large share of GDP, for example in Tajikistan (51 percent) or Lebanon (36 percent)¹⁴. World Bank studies based on recent budgetary surveys suggest that income from international remittances have helped reduce poverty (measured as the proportion of the population below the poverty line) by almost 11 percentage points in Uganda, 6 percentage points in Bangladesh and 5 percentage points in Ghana.

The cost of executing these transfers can be quite high, as banks and other financial institutions charge several percentage points for a transfer. At the end of 2022, the global average cost for transferring USD 200 was 6.2 percent. This cost was therefore more than twice as high as the SDG target of 3 percent. Wise (formerly Transferwise) was founded in 2011 with the aim of offering cheaper cross-border money transfers. The company uses Internet connectivity to bundle the daily transfers between two countries via its platform and ultimately only transfer the net difference at the end of the day. The fees charged by Wise are two to five times lower than those charged by established financial institutions, which typically charge a high upfront fee and a margin on the market exchange rate. Historical prices are so high that Wise can beat the banks and still make a profit.

¹⁰ <https://www.worldbank.org/en/news/press-release/2023/06/13/remittances-remain-resilient-likely-to-slow>
<https://www.imf.org/en/Publications/fandd/issues/Series/Back-to-Basics/Remittances>

Addressing the challenges associated with investments in the digital economy requires a strategic and diversified approach. At the heart of our approach are the solution providers, users and enablers:

Ubiquitous computing, where the material and digital merge, provides transformative solutions in areas such as healthcare, agriculture and public transport.

By using these solutions, the digital economy becomes not only an economic driver, but also a catalyst for sustainable, safe and inclusive digital development.

3.1 A theme with many advantages

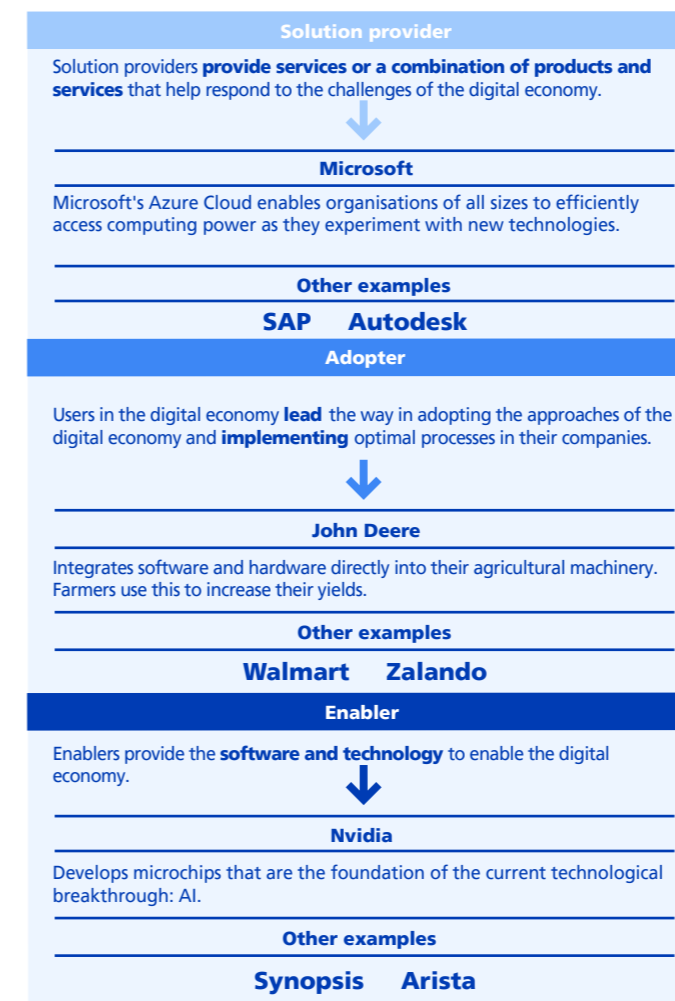
The digital economy is central to further economic growth and social development, with far-reaching effects on the environment, companies, consumers and society as a whole. The rapid spread of technologies such as the Internet, mobile technology and artificial intelligence has revolutionised business operations and social interactions, paving the way for new business models, increased productivity and broader access to information and services. This benefits many players in the economy and society:

Advantages for companies: Digital transformation creates opportunities to innovate, reduce costs and increase competitiveness. Digital tools optimise processes, support customer loyalty and create new products and services. They can help respond quickly to market changes and customer needs, boosting growth and profitability. Integrating digital solutions often leads to better compliance with environmental and social standards.

Advantages for consumers: The digital economy can help users gain better access to information, products and services. Digital platforms offer convenience, variety and competitive prices, which should increase consumer choice and satisfaction. Digital services such as e-commerce, telemedicine or online education can improve access – often at lower costs and greater convenience than traditional solutions.

Advantages for the environment: Digitalisation can help reduce environmental footprint. For example, smart technologies in energy systems lead to more efficient use of energy, which can reduce greenhouse gas emissions per economic unit. Digital logistics and supply chain management can optimise transport routes and thereby reduce fuel consumption. This also applies to innovative and sustainable server and/or cloud solutions that run exclusively on renewable energies. Data analytics and IoT enable better monitoring and management of natural resources.

Figure 6: Concept of the digital economy



Source: Company information

Cloud computing, as offered by industry leaders such as Microsoft Azure and Amazon AWS, is a fundamental solution as it reduces capital requirements and promotes accessibility. Robust cybersecurity measures, including data protection and privacy protocols, are essential for securing the growing number of digital-physical interfaces.

Advantages for society: Digitalisation can improve equal opportunities. The digital divide can be bridged when remote and underserved communities use the Internet to access information, education and healthcare. Digital platforms can boost citizen engagement and increase government transparency.

The digital economy is more than just a sector: in many industries, it is crucial for economic growth, innovation and sustainability.

3.2 A relevant investment theme

The digital economy is closely linked to digitalisation, a long-term investment theme. Although this theme has been around for quite some time, there are still considerable opportunities to increase the use of technology in the economy and society as a whole. The “digital economy” offers investors a wide range of investment opportunities. They can be found in core technology sectors as well as adjacent sectors such as telecommunications, media, cyclical consumer goods, healthcare, finance and industrials. This results in broad sector exposure and diversification. At the same time, there is an opportunity to benefit from the accelerated growth of the interconnecting theme of the digital economy. Sustainability aspects can also be addressed by innovative companies in the digital economy.

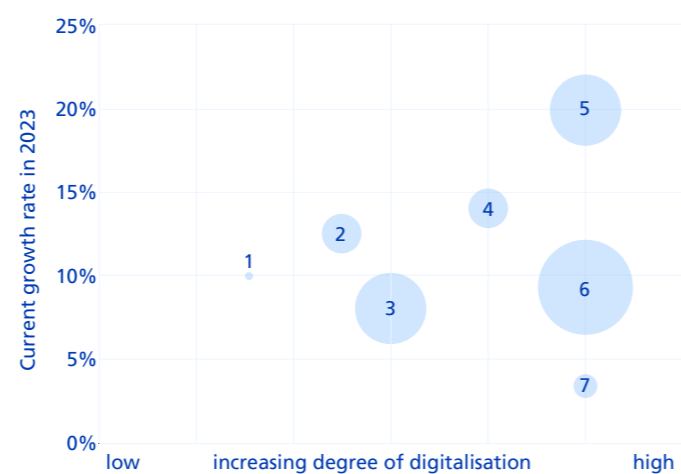
3.3 Risk

Rapid technological changes and obsolescence, disruptions to business models, regulatory uncertainties, cybersecurity risks, market volatility and potentially excessive valuations due to short-term hype around new technologies are challenges that may come with the digital economy. Investors need to deal with this complexity in order to benefit from the long-term benefits of this transformative theme.

3.4 Investment framework including the investment universe

Our strategic investment approach is geared towards capitalising on the growing opportunities of the digital economy, focusing on sustainable digital technology business models and related trends in other relevant global equity sectors. Our priority is investing in companies that are at the forefront of efficient and innovative digital operations and related services.

Figure 7: Growth rate and degree of digitalisation by sector
(The size of the circles corresponds to the market value in USD billion)



- | | |
|---------------------------------|--------------------|
| 1. Agricultural technology | 5. Cloud computing |
| 2. Healthcare and life sciences | 6. IT services |
| 3. E-banking | 7. 5G |
| 4. Cybersecurity | |

Source: Zürcher Kantonalbank



4. Summary – Digital economy: economic driver and potential sustainability catalyst

Driven by technological advances, the digital economy regularly outperforms traditional industries. Especially in areas such as cloud computing and SaaS, the growth rates in technology are significantly ahead of those of traditional sectors. The digital economy is extending this effect via the core technology sectors to areas such as heavy infrastructure, health and banks. As the digital economy accounts for almost 20 percent of global GDP, investors have the opportunity to secure a significant and growing piece of the economic cake. The ongoing trend towards digitalisation, fuelled by the proliferation of the Internet, underlines a steady growth path that makes the digital economy an attractive field for investment.

Despite its enormous potential, there are many challenges associated with investing in the digital economy:

- The human optimism and attraction of breakthrough technologies often lead to high valuations in the short term, resulting in unrealistic expectations that may not be met within the originally forecast timeframe.
- Finding the right ideas at an early stage can be challenging as timing and unforeseen technological challenges can lead to failure.
- External factors (e.g. regulatory changes due to data breaches) can trigger unpredictable dynamics.
- The market is also characterised by intense competition, which casts doubt on the profitability of companies.
- The lack of standardised estimates of market size in emerging segments of the digital economy further complicates risk assessment and requires a cautious and critical attitude on the part of investors.

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