DIGITIZING EUROPE
WHY NORTHERN EUROPEAN FRONTRUNNERS MUST DRIVE DIGITIZATION OF THE EU ECONOMY

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Google

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EXECUTIVE SUMMARY

Europe’s digital frontrunner countries must make faster and broader digitization a top priority and provide strong European leadership at the highest political levels to guide cooperation across nations to secure future growth and employment.

Digitization constitutes a transformative shift in technology across industry and society in general. While the positive impact of digitization is expected to benefit the entire continent, some EU nations stand to gain more than others and therefore should help pull Europe toward a more digitized economy for the benefit of all. These same nations also have more to lose from a lack of progress in European digitization.

The economies of the nations we define as frontrunners (the group consisting of Denmark, Belgium, the Netherlands, Sweden, Estonia, Ireland, Finland, Norway, and Luxembourg) are to a greater extent driven by economic activities related to the Internet and information and communications technology (ICT). They are characterized by having a relatively small population and being well-digitized, innovative, and export-dependent, making them more dependent on easy access to a large digital market. Digital frontrunners’ businesses are on average more digitized, and many are also more competitive than the businesses in less digitized countries. This, coupled with access to a much larger market, is a main reason these nations capture a larger share of the anticipated added economic value of an open and fully digitized Europe.

A European digital single market (DSM) would encompass more than 500 million consumers and is expected to add €415 billion in annual GDP to the EU. The more digitized frontrunner nations would see the largest benefits from a more digitized European economy, with their average GDP growth rate potentially increasing by 40 percent until 2020, double the increase in the growth rate of EU Big 5 countries for the same period.
If the frontrunner countries also were to fully capture and benefit from expected emerging high-technology markets at a rate proportional to the size of their economies, the combined net effect with DSM on GDP growth could be an increase in excess of 80 percent, up from a 2.2 percent expected annual growth to a 3.9 percent expected annual GDP growth until 2020, placing these economies among the fastest growing in the world, adding €264 billion in annual GDP by 2020.

Looking at the combined impact on the labor market of the two factors above, we estimate that the net effect (difference between jobs gained and jobs lost due to digitization) would be an additional 1.6 million to 2.3 million jobs between 2015 and 2020 in the frontrunner nations.

Unfortunately, there are signs that digital is neither accelerated nor ambitious enough to keep Europe and the frontrunners at the forefront of global competitiveness.

At the European level, the debate on digitization reflects widely differing opinions on the importance and value of digitization and an absence of a strong enough voice and thought leadership for truly seizing the digital opportunity. The EU’s DSM plan itself is broad, creating a risk of a lack of prioritization. As a result, progress on key areas of opportunity, such as the removal of obstacles to small businesses expanding into European markets, is unlikely to be fast enough. In addition, the DSM plan contains many proposals for new legislation and regulation, where the use of a wider set of policy tools, such as self regulation, might allow for more flexible and quicker solutions to be developed.

Globally, Europe’s competitors, notably Asian nations (Hong Kong, China, Taiwan, South Korea) are undergoing rapid digitization. At this rate, Europe will be surpassed by these more digitally inclined economies, leaving the Continent in a digital backwater on the global scene, with capital, talent, and growth focused elsewhere.

The EU in general and the frontrunners in particular stand to lose significantly. The price of inaction or of falling into a “complacency trap” is great. Europe is currently at a digital crossroads, with a unique chance to either capture an immense opportunity, or see the region fall behind other nations. We cannot afford to live on old merits in the digital world, the loss of potential growth and jobs would be too great. And the frontrunner countries are even more sensitive than the EU as a whole to a lost digital opportunity, since a larger share of their economies is digitized, and the majority of their future growth is digitally enabled.

The European digital frontrunners have a key role to play and a responsibility to act as Europe’s engine to avoid this scenario, and instead drive a more ambitious strategic dialogue at the highest political and policy levels to make the digital transition happen at a sufficiently fast pace for Europe to remain competitive in a rapidly digitizing world.
At the EU level, with the weight of their combined voices, digital frontrunners must use their ambitions, insights, and optimism, to bear to reshape Europe’s digital debate. A truly digitized single European market requires leaders willing to promote future-proof and innovation-friendly measures. They can bring a greater focus to the policy issues that are likely to have the biggest impact for businesses across the region.

At the global level, the digital frontrunners have the chance to shape the development of digital services and online commerce around the world. Immediate opportunities exist for mapping and drawing attention to the barriers to digital trade as well as developing and promoting reform and then systematically updating trade frameworks.

At a national level, the frontrunners should develop ambitious national digital agendas, aspiring to reach global leadership in leveraging digitization and new technology to drive economic growth and job creation. Taking a leadership role is necessary for them to retain the credibility to push Europe’s digitization. These agendas should cover areas such as the rapid digitization of business and government services, pushing national SME’s to become European in terms of market ambitions, and improving digital skills, and they should be nurtured in a smart policy environment in which innovative technologies and business models can be developed and grown.

This work requires clear, strong leadership at the highest political levels and solid cooperation across the range of policy issues. Prime ministers and ministers in charge of the economy of the digital frontrunners can lead Europe into an era of cooperation to define a clear overall vision, strategy, and set of priorities to achieve a higher degree of digitization.

By joining forces, the digital frontrunners can have a real impact on the digitization of Europe, keeping the continent continuously competitive in the digital era and beyond.
DIGITIZATION CONSTITUTES A TRANSFORMATIVE shift in technology across industries and society in general. It fundamentally changes the way people live, work, and communicate, and how they shop for and purchase goods and services. It changes the way companies are run, how customers are acquired, and how enterprises do business. The pace of change is rapid. Take the digital sharing economy: it was largely unheard of ten years ago, but in 2015, the combined market cap of privately held sharing-economy companies was rapidly approaching $150 billion, dominated by Airbnb, a platform for listing and renting lodgings, and Uber, a mobile app-based ride-request company.

Digitizing a society will involve most industries and sectors. Some of the technological shifts that are driving ongoing digitization are the Internet of Things (IoT), which enables connectivity of a vast array of objects, and remote monitoring and control through online platforms, as well as big data analytics, advanced robotics, and new forms of visualization through augmented and virtual reality (see Exhibit 1).

**EXHIBIT 1 | Digital Technology Reshaping Industries and Societies**

<table>
<thead>
<tr>
<th>Internet of Things &amp; Sensors</th>
<th>Big Data / Advanced Analytics</th>
<th>New Device Form Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent products with sensors and IP addresses to control the environment</td>
<td>Gain customer insights for personalized recommendations</td>
<td>Wearable, flexible, embedded, or implanted digital devices</td>
</tr>
<tr>
<td>Augmented Reality</td>
<td></td>
<td>Ubiquitous Connectivity</td>
</tr>
<tr>
<td>View of the real-world augmented with context-relevant information</td>
<td></td>
<td>Always-on, high-speed broadband and mobile connectivity across all devices</td>
</tr>
<tr>
<td>3D Printing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacture tailored products in smaller quantities, closer to the point-of-sale/use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced Robotics</td>
<td>Cognitive Computing</td>
<td>Simulation</td>
</tr>
<tr>
<td>Smart robots with the ability to react autonomously to unknown situations</td>
<td>System equipped with artificial intelligence to sense, predict, and infer independently</td>
<td>Powerful (3D) simulation software for education, product testing, and R&amp;D</td>
</tr>
<tr>
<td>Social, Local, Mobile</td>
<td>Cloud Computing</td>
<td>System Integration</td>
</tr>
<tr>
<td>Engage with customers in a relevant and continuous way</td>
<td>Scalable processing power combined with shared cloud storage to build SaaS solutions</td>
<td>Linking together individual computing systems and software applications</td>
</tr>
</tbody>
</table>

Source: BCG analysis
Value Created for People, Businesses, and Nations

Digitization creates value for individuals, corporations, and society alike (see Exhibit 2). On the corporate side, it can expand reachable markets for companies both domestically and internationally, increasing sales potential. Businesses also benefit from the productivity increase that comes with digitization of corporate processes, for instance in digitized supply chains, automated production lines, and digitized distribution systems for customer deliveries.

Existing business models in established industries are being challenged by models based on digitization, giving rise to new companies that can contribute to society through new jobs and increased tax revenue. Digital platforms, through the sharing economy, increase the efficient use of available resources and assets, for example for housing and transportation. This benefits both citizens and the environment.

Going digital can help governments increase their overall efficiency through productivity increases in tax collection and data management. E-government initiatives and big data tools open up the possibility of analyzing societal trends as well as combating fraud and misuse of public services. Increasing access to non-sensitive government data through e-government services may also boost innovation in the private sector by encouraging new uses of public data.

Citizens will benefit from the increased competition digitization will engender, giving them access to the best products and services at the lowest price. More competition would also push European companies to improve their products and service offerings, and consequently their competitiveness. Companies, citizens, and society as a whole gain from a more open job market with digitized recruitment, where supply and demand are more efficiently matched and trained and talented people fill the new positions.

These are just some of the ways in which digitization will be an important driver of GDP and job growth on a country and regional level.

Considering Both Sides of Increased Digitization

While the increased digitization of markets comes with many benefits, there are some areas of concern that should be noted. Frequently mentioned are privacy and data security, fear of industries and companies being exposed to strong global competition, and new technologies that might to some extent

| EXHIBIT 2 | How Digitization Drives Value for Countries, Companies, and Citizens Alike |
|-------------------------------------------------|
| **Values for nations** | **Values for companies** | **Values for citizens** |
| Digitization is a key driver for GDP growth | Access to bigger market — increasing sales | Increased competition — consumers can find the best products at the lowest price-point |
| Digitization has a positive net impact on job creation | Increased productivity potential through digitization of business processes and business models | Access to new types of products and services (e.g. sharing economy) |
| Increasing productivity in government operations such as tax collection and data management | Better access to talent thanks to better reach of digital channels | Better employment possibilities through facilitated access to available job positions |
| Potential to identify and reduce fraud and misuse of public services | Open access to government data can spur innovation and new uses of available data | Facilitated access to government services through e-government services |
| Identify and analyze societal trends with big data tools | More efficient communication with citizens and businesses |
| Source: BCG analysis | |

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replace jobs of today – such as artificial intelligence and robotics. Digitization brings about rapid shifts and potentially abrupt turns, giving rise to considerable uncertainty. This makes it difficult for governments and companies to plan for the long term and make the right decisions.

The path forward lies in looking for opportunities and addressing hurdles in an open and solution-oriented debate.

We believe there are ways to tackle these issues. First, acknowledge that new technologies and business models can present real challenges for governments, industry, and individuals. In many cases the technologies and services are at an early stage, so it’s difficult to judge what their impact will be. Early acknowledgement of the challenges gives time to adjust. Policy solutions are often not clear, but governments should engage in an open, proactive, and solution-oriented debate with stakeholders.

Wherever possible, we think governments should support new technology trials in order to play a positive role in shaping the technology and industry environment. A certain degree of risk-taking will be needed when making decisions in uncertain situations, but the risk should be shared, where possible. Assessing and trying different options continuously and being open-minded makes for more nimble organizations with more informed and skilled workers, and facilitates a change of course for governments – and indeed companies–when it is needed. This will allow a nation or region to have a chance to stay competitive from a digital perspective, to help develop local skills needed for the future, and to lay the foundation for more informed policy-making.
DIFFERENT COUNTRIES AND COMPANIES are embracing the switch to digital and reaping its benefits at varying rates. Although digitization creates value for the EU as a whole, some European countries stand to gain even more from increased digital market openness than others. These countries are well positioned to lead the digitization of Europe, but they are also have more at stake from a Europe failing to cope with the rapidly digitizing global economy.

If we assess how European countries perform in a number of digitization and market-openness parameters, a group of high-performing nations emerges (see Exhibit 3). We refer to these countries as European digital frontrunners. The group as we define it consists of Belgium, Denmark, Estonia, Finland, Ireland, Luxembourg, the Netherlands, Norway, and Sweden. These countries are characterized by being small in terms of population size, dependent on ICT exports, and highly digitized and innovative.

We have included Belgium and Ireland—both of which show performance below frontrunner peers in terms of digitization—as they still outperform the remainder of European nations as shown in the 2016 DESI index by the European Commission which tracks the digital competitiveness of EU countries (Belgium is ranked fifth and Ireland eighth out of EU’s 28 member states). They also fit the definition of the frontrunner group as small and export-dependent countries, and are showing some signs of positive development. Belgium, for example, has an appointed deputy prime minister in charge of the country’s digital agenda—a best practice worth highlighting. We have chosen to consider the UK as an EU Big 5 country as it shares many characteristics with its large EU peers, albeit with a relatively high degree of digitization.

The average ICT goods and services exports as share of GDP for the digital frontrunners is 7.5 percent, compared with 1.9 percent for EU Big 5.

Because the digital frontrunner countries are geographically small, they have a limited domestic market compared with bigger European countries, here represented by the EU Big 5 (Germany, France, the UK, Spain, and Italy). This in turn means that the digital frontrunners can benefit considerably from easier access to the vast European market. As noted above, the UK is a borderline case and could qualify as one of the digital frontrunners as well, given the country’s strong performance on multiple ICT-related factors.
The average ICT goods and services exports as a share of GDP for the digital frontrunners is 7.5 percent, compared with 1.9 percent for EU Big 5, indicating that their economies are indeed more dependent on exports than their bigger neighbors. Reversing the perspective, we also see that the digital frontrunners are more vulnerable should the EU Digital Single Market not be realized to its full potential, with a great risk of slower growth and job losses as a likely consequence of a less digitized EU.

Another characteristic of the digital frontrunners is that they are more digitized than their European peers (the UK excluded), as illustrated by their higher scores in the BCG e-Intensity index which measures to what extent a country has embraced the Internet (IT infrastructure and Internet access, e-commerce, and the engagement of businesses, consumers, and government in Internet-related activities).

In terms of innovation, on average the digital frontrunners outperform EU Big 5 countries by 7 percent in the Global Innovation Index co-published yearly by Cornell University, INSEAD, and WIPO (World Intellectual Property Organization). The index rank world economies’ innovation capabilities and results. The measure of innovation is a key driver in creating and improving products and services that can be exported and better compete in an open, competitive marketplace.

The digital frontrunners have, on average, double the VC investment share of GDP of the EU Big 5.

Being highly digitized and innovative, the digital frontrunners are in a good position to benefit from efforts to remove regulatory and administrative barriers in the EU and globally, as that would result in a more open and accessible market and healthy competition. A high degree of digitization and innovation increases a country’s readiness and ability to access and offer competitive products and services in an open digital market. In other words, the companies in such a country are more competitive than less digitally developed players who will find it harder to com-
pete in the common digital marketplace. The more a country relies on exports, the more important these factors become.

The Internet economy of digital frontrunners made up 8% of GDP in 2014 – 57% more than EU Big 5.

The amount of venture capital invested in the countries as a share of GDP is seen as an indicator of how much financial support there is for new and innovative companies. At 0.4 percent, the digital frontrunners average double the VC investment share of GDP of the EU Big 5, whose average amounts to 0.2 percent. The story is similar when it comes to English proficiency, which can be assumed to make the workforce better suited for an international market. The digital frontrunners score on average 18 percent higher than EU Big 5 countries (excluding the UK) at English proficiency, further increasing their competitiveness in an open digital market.

Digitization as an Economy Driver

If we look at the European digital frontrunners as an aggregated economy, we see that the Internet sector – a theoretical “Internet economy” or e-GDP – made up 8 percent of GDP in 2014. This is considerably more than for the EU Big 5 countries, whose aggregated e-GDP share of GDP was 5.1 percent in the same year – a difference of 57 percent. It is important to note that these e-GDP shares form integral parts of the economies, in other words, digital does not constitute an isolated economic sector. The e-GDP share of GDP can theoretically approach 100 percent as more economic activities are conducted online. Big 5 countries are driven to a great extent by the UK, which is a leader in e-Commerce – considerably boosting its own and the Big 5’s aggregate e-GDP. Moreover, looking at individual countries, the digital frontrunners consistently outperform the Big 5 countries in terms of e-GDP share of GDP. This means that the digital frontrunners’ economies are driven to a greater extent by economic activities related to the Internet and ICT. To understand the reasons behind the differences between groups, we need to dig deeper into the components of the e-GDP figures.
We note that e-GDP is essentially consumption-driven both for digital frontrunners and EU Big 5 countries (Exhibit 5). An important difference, when you consider the digital frontrunners and the EU Big 5 group as aggregates, is that, whereas net ICT exports are positive for digital frontrunners, they are negative for the EU Big 5. Positive net exports mean that the digital frontrunners export more ICT goods and services than they import. The trade with ICT goods and services thus contributes to the countries’ GDP figures (and consequently their e-GDP figures). The opposite can be said for EU Big 5 countries, where the ICT trade deficit reduces the overall GDP and e-GDP figures. However, the Big 5 countries are showing an increase of ICT exports – reducing the ICT net export deficit from 1 percent in 2010 to 0.6 percent in 2014, with an expected continuing decline that will drive the deficit down to 0.3 percent by 2020.

When it comes to private sector ICT investments in the digital frontrunner economies, they show relatively slow growth at 2 percent per year in absolute monetary terms. But given that the forecasted GDP growth is higher, at 3.7 percent in nominal terms for the digital frontrunner cluster, the net effect is a decreasing investment share of GDP over time. The situation is very similar in the EU Big 5 countries.

If private ICT investments are somewhat lagging behind, the situation is even worse for government ICT investments. They actually show average negative growth in absolute terms both for the digital frontrunner countries and the EU Big 5 countries. This means that government ICT investments would not even keep up if the economy as a whole were at a standstill. This is not consistent with an ambition to embrace and promote the development of the e-economy. A government should instead lead by example to drive the development of digitization. Given the current figures, there is clearly room to increase ICT investments for governments and the private sector alike.

When discussing e-GDP figures, keep in mind what the digital frontrunners’ combined 8
percent e-GDP share of GDP really means. To put it into perspective, the Internet economy is larger than the non-digital portions of the construction, transportation, education, and real estate sectors. It does constitute a considerable part of the whole economy, however, given that the e-economy does not take share away from the other sectors of the economy, but rather becomes an integrated part of them, there is obviously significant room for further e-economy growth, both in absolute terms and as a share of GDP.

In other words, even in the more advanced frontrunner nations, the process of digitizing the economy is at an early stage; there is potential to increase the scale of digitization tenfold without reaching a fully digitized economy.
WE DEFINE DIGITIZATION IN this report as the broad adoption of digital technology in homes, businesses, and the society as a whole.

In order for a country to take advantage of emerging technologies and the GDP growth and jobs they bring, it must be highly digitized. The benefits of digitization include new jobs in emerging technology-intensive businesses and a higher standard of living/GDP per capita. This is due to jobs moving toward more productive sectors, a private sector that is shifting toward services and technology-intensive businesses that have a higher growth rate boosting the growth of the entire economy, and an increased productivity in traditional businesses, especially for SMEs.

Furthermore, a highly digitized country will be ready and able to compete in the new and redefined markets emerging from technological development. To be ready for the future, business leaders and governments must continually invest in digital technologies so that their companies and countries are ready to digitize swiftly and intelligently.

Digital represents one of few achievable pockets of growth for Europe in the near and midterm future, but the window of opportunity could close quickly should the Continent fail to digitize at sufficient speed or in a fragmented manner, leaving Europe vulnerable to increasing competition from Asia and the U.S. Digitizing is no longer a choice, it is an imperative.

Toward a Digitized European Market

The European single market was built over several decades as EU member states sought to harmonize legislation, policies, and regulations in their countries. Through this work, Europe has become a highly developed and competitive region where people, goods, and services can move freely across the continent.

As European markets have grown increasingly digital, certain obstacles to trade in the digital marketplace have become more prominent. Because the Internet enables businesses and consumers to transcend geographical distance, distribution costs and varied and complex regulations for example for payments or taxes such as VAT can become obstacles. The net result is that the vast majority of European digital commerce is still domestic – only 15 percent of European consumers shop online from EU countries other than their own.

The environment of small domestic markets in the digital frontrunner countries limits new businesses that are trying to grow quickly. The frontrunner nations have an average
population of only 6.8 million, compared with an average of 63.6 million people for the EU Big 5 nations. Businesses in these smaller nations tend to encounter the difficulties of an international expansion early on.

DSM, or Digital Single Market, is a strategy put forth by the European Commission in 2015 (see Exhibit 7). It aims to strengthen the European economy by removing obstacles to commerce within the EU in order to create a large overarching digital market where businesses can act across all European nations without having to adapt to too many different sets of individual country rules. This is in many ways a natural evolution of the original plan for the European single market that has been an integral part of the EU project.

Removing the obstacles to a true digital single market in Europe has the potential to increase economic activity and productivity significantly. This, in turn, can lead to an increase in employment and prosperity in Europe. Economic activity increases because it is easier for consumers and businesses to find one another in a larger and more transparent market. Increased competition puts pressure on prices and promotes specialization. This drives productivity, one of the most important factors in sustainable growth. The larger market will also serve as a fertile ground for digital innovation.

Valuing the Digital Opportunity
When assessing the potential value of digitization for nations, we consider two main contributors to GDP growth and new jobs. First, we consider the impact of a digitized single market in the EU and, second, we study the value for nations of further digitization if they have managed to capture a number of emerging digital markets, including the Internet of Things, advanced robotics, and big data analytics.

For the purposes of our analysis of the opportunity at the Europe level, we use the economic impact of the implementation of the DSM plan as a form of proxy for the digitization of the European economy. We note that the economic impact of full digitization across Europe is likely to be far greater than what would be delivered by implementation of the DSM itself.

The potential impact from a fully implemented DSM has been estimated by Cambridge Econometrics – using the E3ME model – to be worth €415 billion in annual GDP for the EU nations. This would be driven by higher

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**EXHIBIT 7 | The Digital Single Market Strategy**

<table>
<thead>
<tr>
<th>ACCESS</th>
<th>ENVIRONMENT</th>
<th>ECONOMY AND SOCIETY</th>
</tr>
</thead>
</table>
| - Create rules to make cross-border e-commerce easier  
- Enforce consumer rules  
- Make delivery more efficient and affordable  
- End unjustified geo-blocking  
- Launch an antitrust inquiry into e-commerce  
- Create a modern, more European copyright framework  
- Review the Satellite and Cable Directive  
- Reduce VAT burdens | - Propose a European ‘free flow of data’ initiative  
- Define priorities for standards and interoperability  
- Support an inclusive digital society | - Overhaul telecom rules  
- Review audiovisual media framework for 21st century  
- Comprehensively analyze the role of online platforms  
- Reinforce trust and security in digital services  
- Propose a partnership with industry on cyber security |

One vision

“A European strategy aimed at creating a single European digital market, enabling companies to act freely on a large market without obstacles and creating a more attractive startup landscape by providing a larger initial market...”

(European Commission)

Supported by three pillars

Made up of 16 initiatives

Source: European Commission
economic activity and increased productivity. A significant part of this GDP increase is likely to happen in the digital frontrunner nations for two reasons. First, these nations are already highly export-focused, thus increased trade will have a positive effect on exporting businesses. Secondly, the frontrunner nations have a relatively strong digital footprint, making them better prepared to benefit from digital cross-border commerce.

A fully implemented DSM combined with further digitization efforts could boost the frontrunner nations’ GDP growth rate by 80 percent until 2020, placing these countries among the fastest-growing economies in the world.

Our analysis suggests that a fully implemented DSM could boost the frontrunner nations’ growth by nearly 40 percent until 2020. This would be double the increase in the growth rate of EU Big 5 countries which is less than 20 percent for the same period (see Exhibit 8). These numbers show the importance of getting the DSM in place, a feat which requires the digital frontrunners to cooperate with each other. Worth noting is that the nearly 40 percent increase in growth rate is achievable without significant investments by the public sector. The increases will be driven by market forces.

Apart from a digital single market, significant value could also be created from emerging new industries which are driving digitization. Big data analytics, the Internet of Things, advanced robotics, and virtual/augmented reality are some examples (see Exhibit 9). As these are expected to constitute

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**EXHIBIT 8 | The Digital Single Market Shows Large Potential for Growth**

- **EU Big 5**
  - 2020 GDP: €129 billion
  - +18% yoy growth, from 1.9 to 2.25% p.a.
  - 2020 GDP: €129 billion

- **Digital frontrunners**
  - 2020 GDP: €2,400 billion
  - +38% yoy growth, from 2.25 to 3.1% p.a.
  - 2020 GDP: €2,400 billion

*Source: BCG analysis, Eurostat, OECD, World Bank*

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**EXHIBIT 9 | Emerging Global Technology Markets**

1. *Estimates based on several sources, IDC, Gartner, Markets & Markets, IBM*

*Source: BCG analysis, World Bank, Eurostat, IDC, Gartner, Markets & Markets, IBM*
The main drivers of value, we restrict ourselves to them in this analysis, while acknowledging that other areas (see Exhibit 1) will add still further value. Aggregated, the four considered technologies alone have an estimated global market value in excess of €2 trillion by 2020.

On a national level, the contribution to GDP from such upcoming digitization-dependent high-tech markets could be important if the frontrunners are able to take a share of these markets equal to their share of the gross world product. We have found that by increasing the rate of digitization and creating an attractive environment for entrepreneurs, the frontrunner nations have the opportunity to boost their growth rate by another 40 percent (see Exhibit 10).

If done right, these two efforts combined could potentially put the digital frontrunners among the fastest growing economies in the world. For the digital frontrunners it would add approximately €260 billion to their combined GDP in 2020. For the period from the present to 2020, the total GDP addition would be around €700 billion.

Impact on jobs
These two effects – or two cumulative waves of digitization – on GDP will potentially provide an increase in employment levels. To fully realize this potential, the digitization efforts must help match the skills of the workforce to the skills required by the jobs that will emerge from new technologies. If this is not done properly, or if it is overlooked, a country’s workforce may be left behind and become unable to provide the labor and competence that a digitized economy demands.

The net effect on jobs of the DSM and world-class level of digitization in the frontrunner nations could reach 2.3 million jobs.

The digitization of markets and societies is a significant systemic change to economies around the world. New jobs and businesses will appear and some existing ones will disappear over time. This is a familiar mechanism in all major periods of change.

We estimate that the net effect of rapid digitization, or the difference between jobs gained from digitization and jobs lost from increased productivity, in the digital frontrunner nations can be as much as 1.6 million to 2.3 million (see Exhibit 11) or between 5.3 percent and 7.7 percent of the total workforce.

Many of these jobs will likely emerge in small and innovative businesses, but as long as more traditional companies keep up in their digitization efforts they will likely see growth as well. The net creation of jobs from a digital...
single market and the emerging digital industries such as IoT and advanced robotics is going to be affected by how this transition is handled by governments and societies. Either governments look ahead and make efforts to prepare their workforces for the future, or they try to stop the changes from happening to avoid falling far behind others who are embracing the trends.
GLOBAL MARKETS ARE BECOMING digital at a fast pace. In the race for competitiveness, the consequences of not adapting to change can be harsh. European companies risk falling behind competitors from outside Europe both in global and home markets. This, in turn, will mean lower GDP growth and lost jobs in Europe when innovation, capital, talent, and companies are concentrated elsewhere. How the EU and its member states choose to address the digitization challenge in a globalizing world will decide how their economies develop in the long term.

Three scenarios that describe possible paths a nation can take in the near future are shown here (see Exhibit 12). These scenarios provide vivid and concrete reasons to take action and start preparing a nation’s economy for the digital era. The difference between an ambitious digital agenda – the “bright future” scenario – and a “business as usual” scenario, or worse still, the “the complacency trap” are significant in terms of GDP growth and job creation. The “bright future” or “tag along” scenarios will not be achieved by default, but require varying degrees of ambition and effort. With its current level of effort, Europe is clearly not heading toward the bright future and the window of opportunity is closing fast.

To be successful in the long run in an increasingly digital and global environment, traditional industries have to embrace digitization. Successful companies also must be prepared to scale up to meet the demand of the larger, more open, market on the horizon. Governments need to embrace digital in a similar fashion. To successfully meet the future we need leaders with a clear mandate. This is not the case in most European countries today. In order to succeed in transforming nations, there must be a functioning ecosystem where all concerned stakeholders can collaborate. This includes the government with institutions such as health care and education as well as the private sector with both multinational companies and SMEs. European countries are doing this to varying degrees, but there is room for improvement across the board.

Member states should not wait for EU-level policies to be fully in place, but rather make digitization a national priority and work together with other countries with similar goals. Such initiatives can function as engines for change on a regional level.

Today, for the frontrunner countries, the picture at the national level is mixed. The 2016 BCG e-Intensity index reveals that each of the countries has areas of relative strength, and that they all lack a comprehensive strategic framework and strength across all key measures. For instance, the Netherlands is ranked as number one when it comes to engagement (in other words, to what degree businesses, consumers, and governments are embracing
the Internet) but is positioned near the bottom of frontrunners in enablement (covering Internet infrastructure and access). Denmark, on the other hand, ranks reasonably well in enablement, but last among frontrunners in engagement. Norway is an example of a country that fares reasonably well across metrics, with the exception of government engagement where it falls behind many other countries. The other frontrunners show varying performance across the e-Intensity metrics cementing the impression of a group of countries that could learn from one another.

Along with governments, successful companies need to make digital an integral part of their entire value chains and something that drives their competitive advantage. In this way, they can actually spur national digitization. European companies in general should work to become known for and associated with efficient operations enabled by digitization. It is not enough to invest in IT equipment, there must be results.

Should any of the components in a nation’s ecosystem fail to adapt to a rapidly digitizing world, the entire nation risks falling behind global leaders, resulting in slow economic growth and a fewer new jobs. Many companies have disappeared in the past as a result of failure to adapt to an evolving world. Although countries are more diverse and generally more resilient than individual companies, they still cannot afford to ignore the major shifts in the environment in which they operate.

**Need to Re-Focus Europe’s Digital Agenda**

Europe’s digital agenda forms a vital part of the policy framework underpinning trade for the frontrunner countries. There are indeed many concrete obstacles to digitization and export-fueled growth that could be best addressed by action at the EU level. It’s in this context that the frontrunners need to focus on the EU’s digital agenda and ensure that Europe’s markets are opened rapidly.

On a positive note, the EU Commission ranks the DSM as one of its top priorities. The DSM plan itself is, however, very broad, covering a wide scope of regulatory measures, and will take many years to implement.

It has also been observed that some governments and stakeholders take a more pessimistic view of the impact of digital in Europe. This dynamic creates a real opportunity for the frontrunners to bring their insights and experience, as well as optimism, to Europe’s digital debate.

In addition to changing the mood in Europe around the digital opportunity, the frontrunners should focus the implementation of the DSM plan in areas that are likely to make the

**EXHIBIT 12 | Three Scenarios Describing the Potential Outcome of Adequate or Inadequate Action**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Level of digital success</th>
<th>Labor market flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;The bright future&quot;</td>
<td>• Countries drive DSM and act as Front-runners</td>
<td>• Top-of-the-line education keeps workforce skilled and able to thrive in the digital era</td>
</tr>
<tr>
<td>(3-6% Growth)</td>
<td>• Each country maximizes its own digitization processes</td>
<td>• Successful job-matching and enabling of national/international transfer</td>
</tr>
<tr>
<td></td>
<td>• World-class digitization allow for maximum benefit from European single market</td>
<td></td>
</tr>
<tr>
<td>&quot;We tag along&quot;</td>
<td>• Implementation of a DSM ongoing, but implementation takes time due to political complexity and lack of effort</td>
<td>• Education not quite keeping up, leaving some people behind</td>
</tr>
<tr>
<td>(1-3% Growth)</td>
<td>• Continued digitization drives growth, but other countries develop faster</td>
<td>• Job-matching and transfer sub-par</td>
</tr>
<tr>
<td>&quot;The complacency trap&quot;</td>
<td>• Digitization slows down, causing relative productivity losses</td>
<td>• Labor regulations and unions not aligned with national IT strategy</td>
</tr>
<tr>
<td>(0-1% Growth)</td>
<td>• Export-dependent countries losing, increasingly unable to compete on price</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ultimately resulting in sub-par growth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rise in unemployment due to inflexibility in labor regulation, poor education, and lack of mobility</td>
<td></td>
</tr>
</tbody>
</table>

Source: BCG analysis
biggest difference for their own economic prospects such as:

- Removing practical obstacles to exports within the EU, particularly for small and medium-sized businesses (simplifying VAT rules, making parcel delivery work better, making cross-border payments easier)

- Creating an environment for the development, launch, and growth of innovative new technologies and business models, supported by a smart policy framework

In seeking to shape the EU agenda, the frontrunners could also build a wider coalition beyond the core countries identified in this report.

The Rapid Rise of Asian Digital Tiger Economies

Competition in the digital era is becoming more global as technology enables companies to do business across countries to an increasing extent. For long-term competitiveness in this emerging digital landscape, it is not sufficient for European companies to compete on a Europe level – they need to compete globally, not only to gain global market share, but also to retain market share in their home markets which are being entered by multinationals from all over the world.

Widening the perspective beyond Europe raises some concerns for the digital frontrunners. The evolution of the Internet’s contribution to the economy of the digital frontrunners and EU Big 5 compared with China and the U.S., introduces the question of whether digital frontrunners will maintain their lead over time (see Exhibit 13). The e-GDP figures for 2014 are 4.7 percent and 6.3 percent for China and the U.S. respectively. This is well below the digital frontrunners. However, if we follow the current trajectory and look a few years ahead, the gap with China will be nearly eradicated by 2020. In fact, China is projected to overtake several of the individual digital frontrunners by then. China’s rapid growth shows that the business-as-usual scenario clearly will not be enough to maintain a leading position over time. This will put pressure on European companies because as they face more competitive companies from outside Europe they will likely lose a portion of their business, ultimately putting European growth and jobs at risk.

By 2025, all frontrunners will have been overtaken by China and Taiwan. This could lead to investments, talent, and innovation moving east.

The growth of China’s Internet economy is driven by a rapid expansion of e-commerce as seen in the recent BCG report The New China Playbook from 2015. E-commerce as a share of private consumption has grown from 3 percent in 2010 to 15 percent in 2015. Despite a slowing Chinese economy, it is predicted to grow to 24 percent by 2020. Another interesting finding is that consumers in China will buy more from other countries in the future – by 2020, 15 percent of Chinese e-Commerce will be cross-border. This can be seen as an opportunity to reach the Chinese consumer for competitive firms outside China.

This sense of urgency for action is underlined by the non-economic factors covered by the BCG e-Intensity index. (See exhibit 14). When looking at how countries outside Europe are performing and how they are projected to be ranked by 2020, we see Asian countries such as China, Taiwan, and Singapore climbing quickly and overtaking the digital frontrunners one after the other – following its current growth trajectory, China will even be in the lead by 2020. In fact, there are currently two Asian countries in the e-Intensity top ten, by 2025, that number is likely to grow to five or six. By then, all of the European digital frontrunners will be behind China, South Korea, Singapore, and Taiwan. This is a strong trend and the digital frontrunners, and indeed European countries in general, cannot afford to ignore it. The rise of digitized nations in Asia could in time lead to investments, talent, and innovation moving east, hurting European competitiveness, growth, and job markets.
The development we see in rapidly advancing Asian countries is not happening by chance. Asian countries are putting considerable effort into stimulating innovation and translating this into tangible results. Many best-practice examples can be found in Asian countries.

For instance, Singapore drives digitization in private and public sectors through a single board which is run like a business with yearly reports and business plans. Another example is South Korea betting on 5G to become core of its future growth through public-private partnering, along with government funding and special support for startups and SMEs with the goal of increasing SME participation in 5G research by 40 percent.

For the digital frontrunners, future projections show that this is not the time to relax. Instead, they should do everything they can to capitalize on their advantageous starting position going forward. With prompt and determined action, current detrimental trends can be altered. Countries should not be afraid to learn from best practices from all around the world.

### Threats to Digitally Powered Trade

The rise of Asian countries as digital leaders can shift the center of gravity of the digital world to the south and east. The recently concluded Trans-Pacific Partnership trade agreement that includes the U.S., Japan, Singapore, and Australia is likely to accelerate this process, drawing increasing investment and production to the Asian region, and over time, affecting the competitiveness and productivity of European companies on the global stage.

Securing favorable access to Asian and other global markets is imperative for the health of the European economy. A robust framework of trade agreements capitalizing on the strengths of European industry presents an opportunity. For the frontrunner countries, facilitating flows of data and supporting digitally enabled business models needs to be a key element of such trade deals.

The reality today is that the regulatory and trade framework globally, and in Asia in particular, underpinning such business models is not robust. Regulatory requirements covering
hosting data locally, which is an example of a commonly applied approach, can significantly increase costs for overseas business.

A good example of the importance of digital trade is the EU-U.S. trade relationship. As it is very connected to the free flow of data, the entire industry of Digitally Deliverable Services, such as ICT consulting, financial services, and engineering and design, is almost entirely dependent on this relationship, which represents a value of more than €100 billion. Globally 25 percent of the total EU exports consist of digitally deliverable services, equal to 5 percent of the EU GDP, or €600 billion.

This is however still a gross understatement of the importance of the free flow of data. In addition, Digitally Deliverable Services are often involved in the production of other services or goods, which in turn, may be exported. In today’s markets, value chains are increasingly complex and the inputs to the production of services have bounced back and forth across borders several times before becoming a final service product. These services could truly be said to be global.

The fact remains that we are only talking about services that are digitally deliverable. If all the trade that is underpinned by digital communications and data transfers were to be included, the numbers would be larger still. It is also important to remember that for the countries we are focusing on in this report, the digital frontrunners, the value of free data flows is greater than the EU average due to their higher dependency on exports, including DDS.

These two things result in significant values at stake should the free flow of data be disrupted. One possible example of a disruption in this data flow would be the failure of the Safe Harbor system, which could potentially be replaced by the Privacy Shield which is currently being discussed in the EU. The implementation of a working data transfer agreement is crucial for EU-U.S. trade and should be considered a top priority for EU member states which are dependent on trade for their prosperity. An agreement needs to become solid and comprehensive enough to withstand scrutiny by the European courts in order to achieve stability for the companies trading across the Atlantic.
If the EU and the U.S. fail to get a functioning framework in place, the current period of uncertainty will be cemented, negatively affecting transatlantic trade.

The impact of a full disruption of the former Safe Harbor system has been described at a high level in Exhibit 16. The potential impact of disruptions is significant – the EU risks seeing its GDP lowered by 1 percent and losing 2.4 million jobs, with exporting businesses likely to be the hardest hit.

For the digital frontrunner nations, which are small and dependent on exports and trade, the effect of a theoretical collapse of transatlantic data transfers is greater still. A hit to the GDP in excess of 1 percent, approximately €23 billion, and a loss of over 380,000 jobs would be likely to occur with even a relatively minor disturbance.

The global trade framework provides an opportunity for frontrunner countries to shape the development of digital services and on-
line commerce around the world. Moving quickly will allow the frontrunners and Europe as a whole to work from a position of strength. Immediate opportunities exist in mapping and drawing attention to the barriers to digital trade around the world, developing and promoting principles to underpin reform of trade frameworks, and systematically updating the global trade framework to match the realities of the digital marketplace.
WHAT NEEDS TO BE DONE

The European digital frontrunners have a key role to play and a responsibility to act as Europe’s engine to drive a more ambitious strategic dialogue at the highest political and policy levels to make the digital transition happen at a sufficiently fast pace for Europe to remain competitive in a rapidly digitizing world.

**Frontrunner actions at the EU level.** Digital frontrunners must bring their insights and experience, as well as optimism, to bear to reshape Europe’s digital debate. They can bring a much greater focus to the policy issues that are likely to have the greatest impact for businesses across the region, such as removing practical obstacles to cross-border commerce within the EU, particularly for SMEs.

**Frontrunner actions at the global level.** Digital frontrunners have the chance to shape the development of digital services and online commerce around the world. Immediate opportunities exist for mapping and drawing attention to the barriers to digital trade as well as developing and promoting reform and then systematically updating trade frameworks by supporting cross-border information and opposing data localization requirements.

This will protect online services and products from discrimination to allow flexibility within the scope of trade agreements.

**Frontrunners acting together.** Alone, each of the frontrunners will have limited influence in promoting the pioneering initiatives necessary to achieve a digitized EU economy. But by joining together, they may have a pivotal impact and keep the continent competitive in the digital era now and in the future. This cooperation must work at both political and policy levels – prime ministers must take the lead and kick off a new era of cooperation. Their participation is essential for achieving the broad and deep changes required for true digitization success and to communicate their strong commitment to the execution of the digital agenda.

At stake for the digital frontrunners are 1.6 million to 2.3 million jobs, net, and an 80 percent increase of yearly GDP growth rate. They will only be able to reap the rewards of increases in demand and competition if they form a true digitized single market where they can make the most of the competitive edge that they have today.

For inspiration, there are many relevant models to consider of how this cooperation works in practice. Similar steps were taken, for example by the Digital-5, founded by Estonia, Israel, New Zealand, South Korea, and the UK with the ambition of increasing in-house digital skills and working more closely with SME suppliers. In Europe, the Northern Future Forum brings together prime ministers from
several countries across the region for a high-level debate about emerging technology, business, and policy issues. Another example is the Visegrad Group, an alliance among the Czech Republic, Hungary, Poland, and Slovakia with the goal of increasing the countries’ European integration. The scope of the Visegrad Group is broad, but it is relevant in the context of digitization, as success in digital touches policy issues far beyond technology, including taxation, education, labor market policy, and trade.

The frontrunners’ credibility and ability to serve as drivers of European digitization is based on them maintaining their position as leaders in digital, which requires ambitious national digital agendas that demonstrate global leadership in leveraging digitization and new technology to drive economic growth and job creation. These national agendas should cover rapid digitization of business and government services and improving digital skills, and be backed by a smart policy environment in which innovative technologies and business models can be developed and grown (See Appendix: A National Digital Agenda Framework for a more comprehensive view on national digitization priorities).

We hope this report can contribute to, and encourage, the public conversation about Europe’s digital development with senior politicians and business leaders as well as on the roles and responsibilities of the digital frontrunner countries. The pace of development we are currently seeing in Europe is not enough to ensure a global top position over time when it comes to digital economies. The digital frontrunners have the ability to lead the way to a fully digitized continent, creating millions of jobs and ensuring some European nations a place among the fastest growing economies in the world. The time to act is now, before the window of opportunity closes.
APPENDIX: A NATIONAL DIGITAL AGENDA FRAMEWORK

To become a world-leading country for leveraging digitization and technology to drive economic growth and job creation, you need a holistic, nationwide digital agenda, an ecosystem involving the government, its institutions – such as health care and education – and the private sector, including both big multinational companies and SMEs.

This national agenda should comprise a wide set of highly prioritized political policy initiatives and investments to build a digital economy of the future (see Exhibit 17). Five important levers for success are:

- Enable digital and technology innovation
- Stimulate entrepreneurship
- Improve access to capital
- Regulate for the future
- Build the skills and talent of tomorrow

Such an agenda would be the basis for an ambitious plan for world-class digitization and ultimately lead the nations toward a society-wide digital ecosystem in which the full potential of digital technologies can be unlocked.

Enable digital and technology innovation. European nations should better support the development of innovation clusters by providing a world-class digital infrastructure, connecting startups to leading national companies and universities, and attracting leading technology multinational corporations to establish national operations through tax subsidies. The nations also have to guide and incentivize their already-established SMEs and large enterprises to fully transition into digital and mobile-first businesses. It is not enough for businesses to invest in ICT equipment, they must transform and develop the entire businesses end to end. Furthermore, there is a need to fully digitize government processes and services, and to increase usage of such services. This will boost efficiency and improve the quality of the public sectors. Making public data more easily available via e-government could encourage innovation among SMEs.

Stimulate entrepreneurship. To stimulate entrepreneurship, the frontrunners should lower taxes on stock options to better incentivize entrepreneurship, direct public tenders and procurement toward SMEs to stimulate demand and growth, and work to strengthen the link between universities and startup communities to provide startups with talent. It is important to continue to foster a culture in which entrepreneurship is seen as a viable career option for top talent.

Improve access to capital. Despite a handful of government efforts, startups and SMEs are often still struggling to raise capital for
institutions. Although public funding is available, systems are complex and funds are sometimes misdirected. To address this problem, public-funding structures can be simplified, and public funding should be used for matching private investments, rather than being distributed through publicly run investment companies. A portion of pension fund investments should also be shifted toward established venture capital funds. Moreover, tax breaks on angel investments should be introduced to give startups access to early stage capital, while letting individual investors make lower-risk investments by allowing losses to be offset by income or capital gains. Furthermore, the nations should set out to attract the world’s leading venture capital funds to establish a presence in the region.

Create smart policies for the future. To uphold competitiveness in a world in which continuous change and progress is central, there must be a forward-looking and proactive approach to creating smart policies, rather than regulation. Removing regulatory obstacles to change includes increasing labor market flexibility, simplifying legal conditions for SMEs, and promoting the sharing economy, as well as driving the discussion around current legislation on intellectual property and data protection to ensure that the country and region are promoting innovation and transparency to the fullest extent possible.

Build the skills and talent of tomorrow. To make a country’s human capital adept at facing technological development, nations should rethink the educational system. For primary and secondary school, the countries must modernize the curriculum and promote equality and integration across schools and students. Some measures have already been initiated, for instance Estonia introducing coding in the national curriculum, but much more is left to be done. Countries must differentiate and specialize tertiary education and introduce cross-disciplinary programs. Furthermore, there should be nationwide planning for the digital workforce, looking at future demand both in the private and public sectors. The frontrunners should look at their peers – Ireland, the Netherlands, and Denmark, and launch dedicated talent-visa programs to better attract top international talent and reduce relocation barriers.
Many of these topics could be implemented on a cross-national basis, either as agreed upon best practices or with one nation taking inspiration from another. The proposed cooperation of the frontrunners would serve as a forum for discussion of, and agreement on, these topics. Relevant topics would, for example, promote SMEs as exporters, promote cross-border visas for tech entrepreneurs, establish regional innovation clusters to try new technologies in multiple countries, and share best practices for developing new skills.
APPENDIX: METHODOLOGY

The methods and assumptions used throughout the report are outlined in this chapter.

**e-GDP**

E-GDP is a measure that quantifies the monetary value of the Internet on a country level. Comparing e-GDP with the GDP of a country yields the economic share of Internet-related activities in the country.

There are numerous ways to calculate GDP. The figures in this report have been calculated using the expenditure method. This method measures total spending on finished goods and services in an economy. The underlying principle is that finished goods and services are bought by someone and that, consequently, the value of production (what GDP is a measure of) equals total expenditure.

Our decision to use the expenditure method is based on two things. First, expenditure data is more readily available and makes cross-country comparisons easier. Secondly, the expenditure method makes it possible to distinguish among what is spent by households, companies, and the government, in order to gain deeper insight.

In the expenditure method, e-GDP is computed as the sum of four components:

1. **Consumption**: goods and services bought online by households in a country. It also includes consumer spending on Internet access and the relevant cost of devices used to access the Internet.

2. **Investment**: capital investment by telecom companies and Internet-related private investment in information and communications technology (ICT).

3. **Government spending**: public spending on ICT infrastructure and software along with supporting services.

4. **Net exports**: the difference between exports and imports of ICT equipment and services.

When computing these components, trusted sources available for a majority of countries have been used to allow for cross-country comparability. Such sources include Gartner, Ovum, IDC, Euromonitor, WTO, UN, OECD, and the World Bank. In addition to these sources, country-specific sources – mainly statistics services such as Statistics Sweden, Statistics Denmark, and Statistics Netherlands – have been used for greater granularity in consumption and import and export data. When computing aggregated figures for groups of countries, the included countries have been considered as a single economy.

As most global sources are presented in U.S.
dollars, this currency has been used as currency of reference throughout. In order to reduce the influence of exchange rate fluctuations over time influencing some countries more than others, an average exchange rate for 2010-2015 has been used for currency conversions over the entire studied period (2010-2020).

To put the e-GDP figures in perspective, we have compared e-GDP size to traditional sectors of the economy. These have been obtained by studying GVA (Gross Value Added) of different sectors in the economies of individual countries. GVA is a measure closely linked to GDP as they both measure national output (GVA does not take into account taxes and subsidies on products).

**BCG e-Intensity index**

The BCG e-Intensity index is a measure of how strongly a country has embraced the Internet. It is an index which is updated on a yearly basis to measure performance relative to other countries over time. The e-Intensity score is computed based on a weighted average of three sub-indices:

1. **Enablement**: Measures presence of Internet infrastructure and how available Internet access is

2. **Expenditure**: Measures how great a share of consumer spending is online and how big the online share of advertising is

3. **Engagement**: Measures the extent to which consumers, businesses, and governments embrace the Internet

The weights of individual metrics can be seen in Exhibit 18, below.

When it comes to the future projections of e-GDP scores, extrapolation of historic data has been used. The results have been adjusted for outliers.

**Impact of digitization and DSM on GDP and jobs**

When projecting GDP impact from policy shifts, new markets, and other sorts of changes, one needs to handle a large number of unknown factors. The best and most reliable way of doing this is to use a computer model that uses as many relevant input variables as possible. The E3ME model that is maintained by Cambridge Econometrics is such a model. It is often used to simulate outcomes of changes to societies and economies.

In our analysis for this report we have used the output from the E3ME model simulation

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**Exhibit 18 | BCG E-Intensity Index Composition**

Source: BCG analysis, Magna Global, UN, WEF, ComScore, ITU, Euromonitor, Ovum
of the DSM. This output has then been allocated to the EU member states based on a set of assumptions.

- Economies that are more dependent on exports will see larger shifts in GDP from regulatory changes that affect trade.

- Nations with economies that are more digital will see larger effects from changes that affect digital trade and standards.

- A country will see an effect on its GDP that is in proportion to the comparable size of that country’s GDP size.

These assumptions have been built into a model and then been equally weighted. This has in turn rendered our presented results.

When modeling the potential impact of an increased level of digitization, we have adopted a market-driven approach. A few emerging high-value markets were identified. Estimates for these markets were then established by multiple means.

The impact on the different countries was then calculated based on an assumption that a world-class level of digitization would enable a country to obtain a share of these markets proportionate to its fraction of the gross world product.

The net impact on jobs is calculated by using a productivity metric called gross value-added per hour worked. We have assumed that an increased level of digitization will increase labor productivity and thus require fewer employees to produce the same amount of value. When using this new level of productivity, we can calculate an approximate number of new jobs that will be needed to create a specific level of GDP impact. While future job creation is hard to predict, this approach gives a good approximation of what the magnitude of the benefits of digitization will be.

Overall we have used trusted sources for general data on GDP, exports, and workforce statistics. These sources include: the World Bank, OECD, Eurostat, CIA World Fact Book, IDC, and Gartner.
NOTE TO THE READER

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