

# DIGITIZING DENMARK

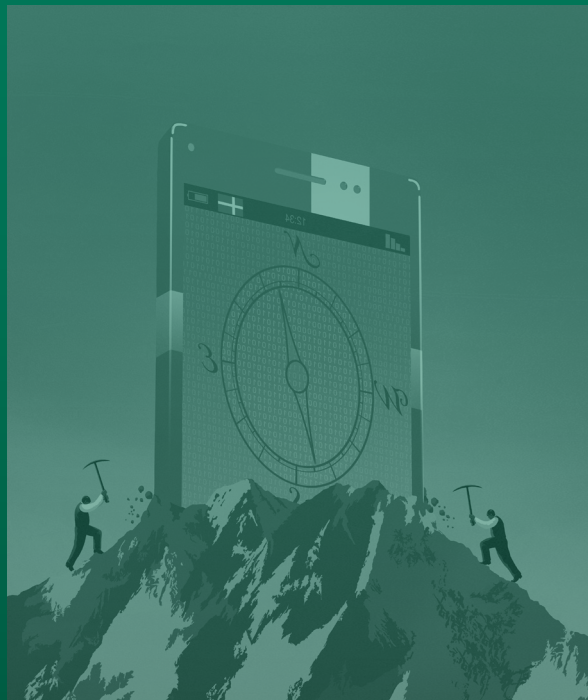
HOW DENMARK CAN DRIVE AND BENEFIT FROM AN ACCELERATED DIGITIZED ECONOMY IN EUROPE



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ACCELERATED DIGITIZED ECONOMY IN EUROPE

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# EXECUTIVE SUMMARY

**DENMARK MUST MAKE FASTER and broader digitization a national top priority. It is essential for the country in order to secure future GDP growth and create new jobs, as well as to stay competitive in a global and increasingly digital world.**

By many measures, Denmark is well on its way to digitization. In the 2016 BCG e-Intensity index, which measures to what extent a country embraces the Internet, Denmark ranked number 4 out of 85 countries. Denmark's employment regulations are regarded as among the most flexible in the world, a flexibility that is essential to encourage new businesses. Language skills are also an important factor in international business, and Danes are among the best non-native English speakers in Europe.

Being in a good position today does not mean Denmark can relax its efforts. Denmark's strong ranking is driven mainly by infrastructure enablement, expenditure, and consumer use of digital services, but on other measures – such as digital engagement by small business, growth of innovative businesses, and tech skills – Denmark's performance is relatively weak.

For instance, Denmark has a very large and growing deficit in cross-border e-commerce, as Danish businesses fail to keep up with the buying habits of Danish consumers, with tens of thousands of jobs at risk if current trends are not reversed. Although most Danish businesses have websites, only a quarter of SMEs in Denmark are using their websites for selling, leaving a vast untapped potential for Danish companies.

Despite Denmark's good digital infrastructure and generally high adoption of digital services, there is a lack of unicorns (private start-ups which have reached a valuation exceeding \$1 billion). Comparable countries such as Sweden and Finland have historically fared, and are currently faring, better in allowing tech companies to grow large and go global.

Digitizing European markets offers the largest and most easily attainable opportunity for export-led growth in Denmark. The European Union's initiative for a Digital Single Market (DSM) is a first step, but it may not deliver the real changes that Danish businesses need. The EU DSM plan is broad, which risks 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.

Looking outside of Europe, several Asian countries (Hong Kong, China, Taiwan, Singapore, and South Korea) are highly digitized and/or are undergoing rapid digitization. There is a risk of Denmark being rapidly surpassed by these more digitally proactive economies, leaving the nation in a digital backwater on the global scene, with capital, talent, and growth being focused elsewhere.

**The value at stake for Denmark of a full Danish embrace of emerging digital industries and a fully working DSM translates into a potential 150,000 net full-time equivalent (FTE) positions and more than 200 billion DKK added to the GDP by 2020, an 83% increase in the GDP growth rate.**

National digital efforts allowing Denmark to eventually fully embrace a set of emerging high-value digital industries often related to Industry 4.0, comprising big data analytics, the Internet of Things, advanced robotics, and augmented reality, could increase Denmark's GDP growth rate by around 41% through 2020. Moreover, a working DSM could increase the Danish GDP growth rate by another 42% through 2020 on top of the already embraced high-value digital industries presented.

An increased level of digitization combined with a working DSM could thus amount to an 83% increase in GDP growth for Denmark. This is equal to an approximately €27 billion increase in GDP by 2020 over the current trajectory, and would place Denmark among the fastest growing economies in Europe.

Translating these figures into job opportunities, we find that the total value at stake for Denmark would exceed 150,000 FTE positions by 2020, or about 2.7% of the current total population. Combined, this is an opportunity Denmark cannot afford to miss.

**The Danish government has declared that it will put forward a digital growth plan and announced a new panel that will advise the government on issues related to Industry 4.0. To begin with, the Prime Minister also said that he will announce a 2025 economic plan with a focus on digitization. These are positive steps in the right direction. There's a clear need to prioritize digitization within the government as well as to take action on key policy areas, at national and international levels. To begin with, the Prime Minister should take the lead on developing an ambitious national vision and strategy for digitization across the economy, including:**

- Appointing a senior minister to lead the digitization process across the government with a seat on the key economy and coordination committees
- Updating primary and secondary educational curricula, introducing of new education technology, and introducing national workforce planning to deliver the skills needed for the jobs of tomorrow, including introducing coding for all students and applying new digitally enabled educational themes such as adaptive and blended learning, individualized learning paths, increased use of educational platforms, and flipped classrooms.
- Making a targeted effort to digitize businesses more quickly, in particular SMEs for export success, and help them to grow. This should be delivered through both direct government action – in partnership with industry, and generally by improving access to capital
- Promoting the development and growth of new technologies and innovative business models, such as the Internet of Things and the sharing economy, through creating smart policy frameworks
- Engaging in an international collaboration with like-minded peers to push the development of an open and digitized economy in Europe and globally

# IMPACT OF DIGITIZATION

**D**IGITIZATION 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.

**Values created for citizens, businesses, and nations.** Digitization creates value for individuals, corporations, and society alike. On the corporate side, it can expand reachable markets for companies both domestically and internationally, thus increasing the 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.

Going digital can help governments increase their overall efficiency, for example 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.

**What this means for the Danish government and companies.** Digitization brings about rapid shifts that can cause abrupt turns in its



path, giving rise to considerable uncertainty. In many cases, the technologies and services are at an early stage, so it's difficult to foresee their impact. This complicates planning for the long term and making informed decisions, but this is not a reason to remain indecisive or passive.

Although policy solutions are often not clear, there is no shortage of options to consider. The Danish government should therefore engage in an open, proactive, and solution-oriented debate with stakeholders. The same goes for companies when it comes to decisions related to their digitization journeys. The earlier this takes place, the more time there is to adjust.

In cases of uncertainty, a degree of risk will be involved in making decisions, but risk should be spread out where possible. Assessing and then trying different options continuously and with an open mind makes for more nimble organizations with more informed and skilled workers, facilitating a change of course for governments and companies when (not if) it is needed. This will allow Denmark 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.

# THE BURNING PLATFORM

## WHY DENMARK NEEDS TO DIGITIZE FASTER

**D**IGITIZATION IS AN INTEGRATED part of the economy as a whole. Not only is digitization transforming existing industries, but it also gives rise to new ones. It presents a great opportunity to boost the Danish economy through new jobs and overall GDP growth – if the country plays its cards right.

Should Denmark fail to adapt to the rapidly evolving digital world, however, the consequences could be harsh. In combination with globalization, increased digitization gives rise to a race for competitiveness. If existing and new innovative Danish companies cannot be globally competitive, Danish GDP growth and jobs are at stake in the long term.

**Caveats to the success story.** In a number of measurable ways, Denmark is performing well in terms of digitization and innovation, and has done so in the past. For instance, in the 2016 BCG e-Intensity index, which measures to what extent a country embraces the Internet, Denmark ranked fourth overall out of 85 countries. In the Global Innovation Index, where the world economies are ranked in terms of innovation capabilities and results, Denmark ranked tenth out of 141 countries. This may not be world-class, but is still a respectable score. Venture capital investments as a share of GDP in Denmark are actually the highest in Europe at close to 0.08%. This can be seen as an indicator of how much financial support or access to

capital is available to startups. In addition, Danes generally speak English well, (as seen in the EF English proficiency index where they ranked third in 2015), a measure of the country's readiness for globalization.

Thus, at first glance, Denmark appears to be doing very well. However, digging deeper into the results raises a few concerns for the future. The e-Intensity score, for instance, is made up of three components: enablement, expenditure, and engagement. Denmark's score is driven by particularly strong performance in expenditure, covering online retail and advertising spend, and high ranking in enablement, relating to the Internet infrastructure. When considering the engagement sub-scores which measure to what degree businesses, consumers, and governments are embracing the Internet, a different picture emerges.

Denmark's business engagement rank for 2016 was 29th and its rank for government engagement 28th. This means that Denmark is underperforming in engagement, given its leading position in expenditure and relatively high ranking in enablement. Business engagement is based on business-to-business Internet use coupled with the business-to-consumer Internet use, estimated by World Economic Forum surveys. The low score in engagement indicates that Danish businesses are not utilizing the Internet in

their services and operations as much as peers in several other nations, despite having relatively good digital infrastructure in place.

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There are currently no Danish unicorns and only a few big Danish tech companies.

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In fact, although the vast majority of Danish SMEs have websites, only around 25% of them sell directly through those sites, according to a report by the European Commission, and only 10% of Danish SMEs sell online to customers in other countries. One contributing factor for Danish SMEs' low rate of online sales is likely a lack of necessary skills and know-how when it comes to successfully utilizing new channels to drive a digitized business model.

In contrast, research indicates that a third of Danish e-commerce purchases in 2015 were made from a foreign company – an amount equaling approximately 27 billion DKK. With e-commerce exports of approximately 5 billion DKK, the resulting deficit for 2015 was approximately 22 billion DKK in total.

The fact that Danish businesses do not use their websites to their full potential may contribute to this e-commerce deficit, as Danish online shoppers take their business to companies with an online presence regardless of where the companies are physically located. This is an indication that Danish companies already face strong online competition. If this trend is not reversed, Danish jobs and growth are at stake.

The story is similar when it comes to Denmark's ability to produce successful tech companies. Venture capital is available in Denmark, the innovation capacity is high, and Internet infrastructure is generally of high quality. Despite this, there are currently no Danish companies qualifying as unicorns according to Fortune's listing, indicating a lack of entrepreneurial success. Other Nordic countries, notably Sweden and Finland, have a comparatively strong track record in en-

abling and encouraging tech companies to grow big.

Also, when it comes to more established businesses, there are not many large, global tech companies in Denmark. In fact, out of the 11 Danish companies on the Forbes' Global 2000 list, the most tech-related are the biotech company Novozymes (ranked 1519) and the telecom company TDC (ranked 1775).

Aside from creating jobs and contributing to tax revenue, local big tech companies can play a role in acquiring promising startups and enabling them to remain in the country. The current route for many innovative and growing startups is to leave Denmark before they become profitable and begin contributing to the country through jobs and tax revenues. This has been the case for successful Danish enterprises such as Unity, Zendesk, and JustEat which have located their headquarters outside Denmark. It is important for Denmark to not only provide a supportive environment for founding companies, but also for allowing them to grow big. Educating ICT talent and attracting it from abroad is an area where Denmark must do more.

According to *DANSK INDUSTRI*, Denmark will have a deficit of at least 6,000 IT specialists by 2020. Half of the demand will come from ICT companies and the other half from digitizing companies in other industries. By 2030, this number could be 19,000. The share of ICT specialists in the Danish workforce is only 3.9% (2014 data), translating to a rank of 14 among EU countries, according to the European Commission's DESI index. Moreover, this seems to be trending down, which raises concerns for future access to digitally skilled workers in the country. According to Statistics Denmark, more than a third of companies with more than ten employees consider lack of IT skills among employees to be a barrier to the use of IT in the company.

Many companies in Denmark have not yet realized the importance of the digitization trend. In a company survey by *DANSK INDUSTRI*, only 24% of respondents fully agreed that their company's top management has a vision for the company's digital transformation.

**Rising tiger economies.** Denmark is a small country and cannot rely on its internal market for growth. This means that for Danish companies to grow big, they will inevitably need access to markets outside Denmark to reach a scale where they can be globally competitive. Therefore, Denmark must embrace open market initiatives to make sure its companies can be competitive and ensure long-term growth and Danish jobs.

Fully embracing the emerging high-tech digital industries could increase Danish growth by 41%.

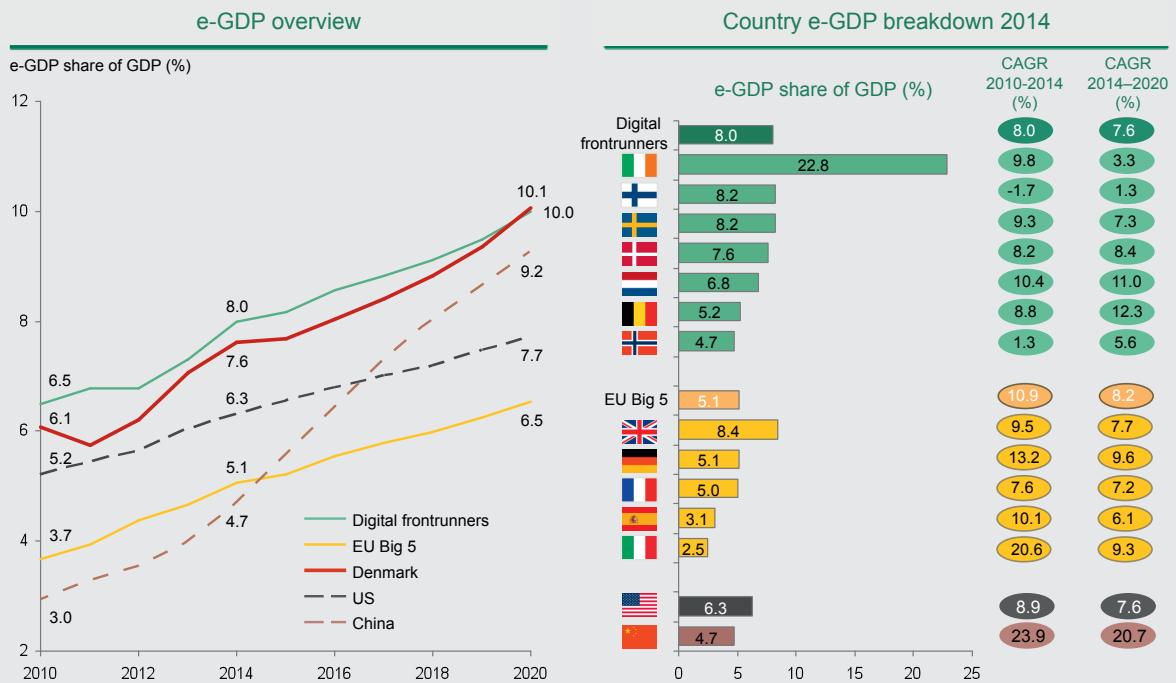
The risk to Danish companies of losing in global competitiveness is twofold. Not only will they fail to increase market share outside Denmark, they also may be overtaken in their

home market. Therefore Denmark needs to not only drive an agenda to open up the European and global markets, but also adapt its national policies to accelerate digitization of its companies and society. The former may be impeded by forces that see initiatives to increase the pace of digitization as a threat to existing business models and structures. Denmark should do all it can to work against such forces as there is great value at risk.

From 2014 to 2020, the gap between Denmark and China in the Internet's contribution to GDP will have shrunk by almost 70%.

Looking outside Europe, we note that other countries are catching up with Denmark in terms of the Internet's contribution to GDP. In 2014, the gap between Denmark and China was a considerable 2.9 percentage points (see Exhibit 1). Or put another way, the Internet's contribution to the economy was 62% greater in Denmark than in China. By 2020, that gap is projected to shrink by 69% to 0.9 percentage points. Following the same trajec-

### EXHIBIT 1 | e-GDP, China Is Catching Up



**Note:** \*Ireland's ICT exports are contributing to the country's high e-GDP share and these exports have been adjusted downward to account for this. Irish ICT services exports have been adjusted downward. In the estimates, average exchange rate for period 2010-2015 has been used to avoid distortions affecting countries to varying degrees. CAGR, i.e. yearly growth figures are based on absolute market size.  
**Source:** BCG Analysis, Gartner, Ovum, EIU, Euromonitor, UN, IDC, WTO

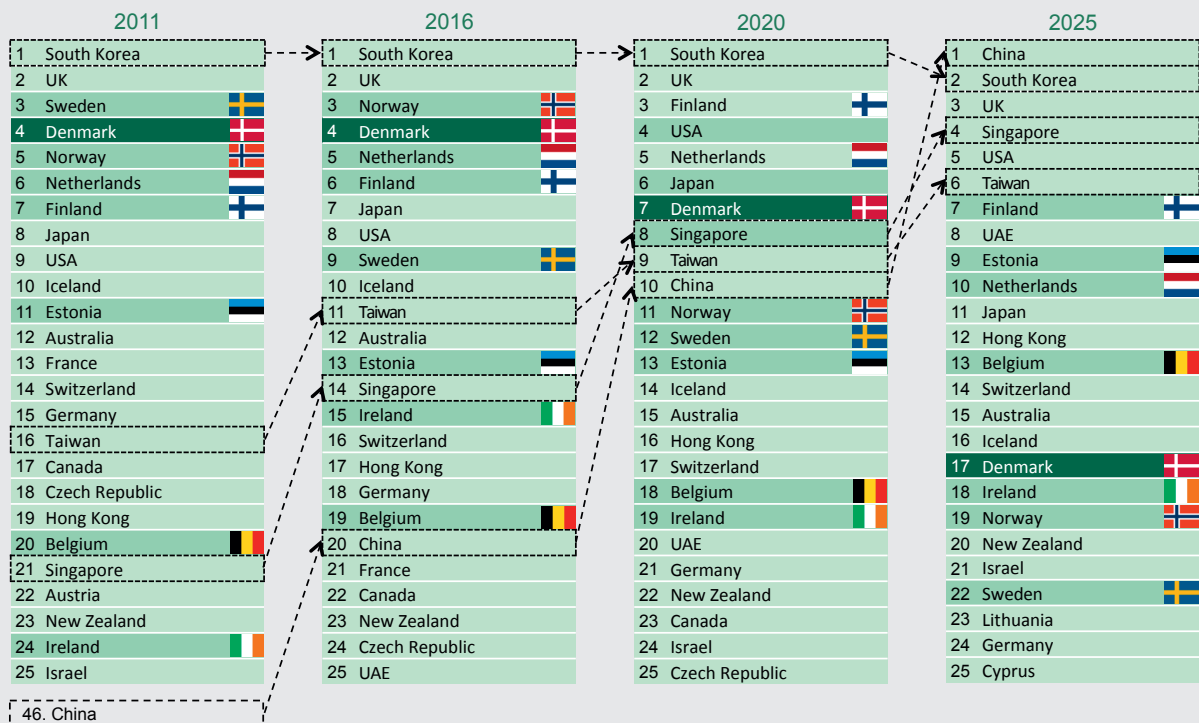
tory, China’s digitized economy may well become larger than Denmark’s beyond 2020. China’s rapid growth shows that a business as usual way forward is not enough to maintain a leading position and competitiveness over time.

This picture holds true also when we consider the non-economic factors covered by the BCG e-Intensity index. When looking at how countries outside Europe are performing and how they are projected to be ranked by 2020 (if the current trajectories are maintained), we see that Asian countries such as China, Taiwan, and Singapore are climbing fast. By 2020, China will actually have passed Denmark – and Singapore and Taiwan will be neck and neck with the country. Stretching the time horizon beyond 2020, Denmark will continue its relative decline in the ranking tables and be overtaken by several countries in Asia and also Europe by 2025. The performance of countries in Asia is remarkable: in 2016 only two of the top ten countries are Asian. By 2025, that number is projected to

grow to five (following current trends). This is not by chance. These countries are putting considerable effort into stimulating innovation and translating it into tangible results. Günther Oettinger, European Commissioner for Digital Economy and Society, recently stressed this threat, stating, “Action is needed if we want to catch up with Japan, the U.S.A., and South Korea,” in his comments on the European Commission’s latest digital economy and society index report (see Exhibit 2).

The consequences of failing to adapt to the combined effects of digitization and globalization could be harsh for Denmark. Reacting too slowly or too late will put Denmark behind leading countries. This could mean lower GDP growth and lost jobs when innovation, capital, talent, and companies are concentrated elsewhere. Given Denmark’s good starting position, it is easier to shape up now, rather than trying to catch up later. This is why Denmark needs to make digitization a national priority.

### EXHIBIT 2 | Asian Countries Climbing in E-Intensity Rankings – On Track to Overtake Denmark by 2025



Note: 2020 and 2025 rankings are based on extrapolating 2011-2016 data. Luxembourg is not included in BCG e-Intensity Index. Source: BCG analysis, BCG e-intensity index

**The large values at stake.** Digitization will be a main driver for innovation and economic growth for the near- and midterm future. This is why Denmark must maximize its efforts on enabling digitization. If Denmark successfully constructs a regulatory environment domestically – and pushes for one on the EU level – that promotes fast digitization and innovation, large economic and societal benefits await.

In order to understand the value of an open DSM and increased digitization for Denmark, we also need to understand the value on a European level. On the EU level, the DSM strategy was presented by the EU Commission in 2015. It is aimed at reducing obstacles to commerce in Europe, especially for the digital commerce of goods and services. This is in many ways an extension of the original EU single market concept. In today's digital market space, a single market is not worth much if it is not able to function with modern businesses and business models. The DSM strategy is therefore an important part of the evolution to a European single market in the digital era. It is, however, important to note that the DSM strategy is in no way a complete and readymade structure that will achieve a fully functioning European single market. Günther Oettinger stressed this as well when

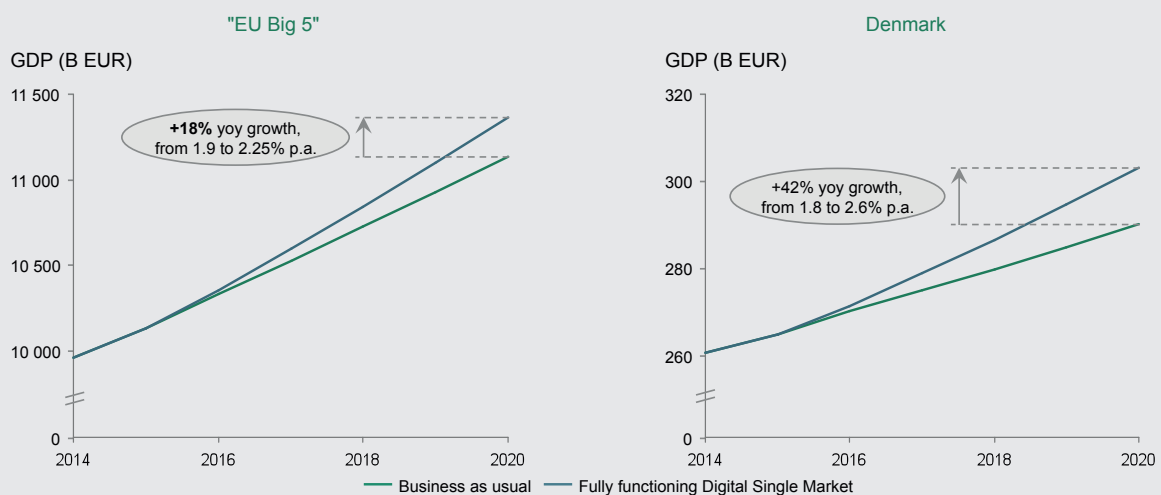
he said, “The EU makes progress, but too slowly. There is no room for complacency.” The DSM is a first step toward this goal.

A working European DSM would bring benefits such as increases in productivity derived from increased competition and a larger initial market for small businesses and startups. It would also enable European consumers to more easily find the right product or service at a lower price point.

The value of a fully implemented DSM has been estimated by Cambridge econometrics to be €415 billion in incremental GDP for the EU member states by 2020. Based on our belief that smaller, more digitized and export-dependent countries will be able to benefit to a greater extent from a functioning DSM, we have found that the Danish economy would see a Substantial boost in growth. A working DSM would increase the Danish GDP growth rate by around 42% in the period until 2020 (see Exhibit 3).

The benefits of digital markets and technology are by no means limited to the EU DSM strategy. There are several high-value industries on the rise that can bring significant economic value to those ready to take part (see

### EXHIBIT 3 | A Digital Single Market could significantly increase growth



The EU Big 5 nations see an **~18% increase** in growth rate on average which amounts to a **0.35 pp.** higher growth rate.

Denmark sees an **~42% increase** in growth rate which amounts to a **0.8 pp.** higher growth rate on average.

Source: BCG analysis, Eurostat, OECD, World bank

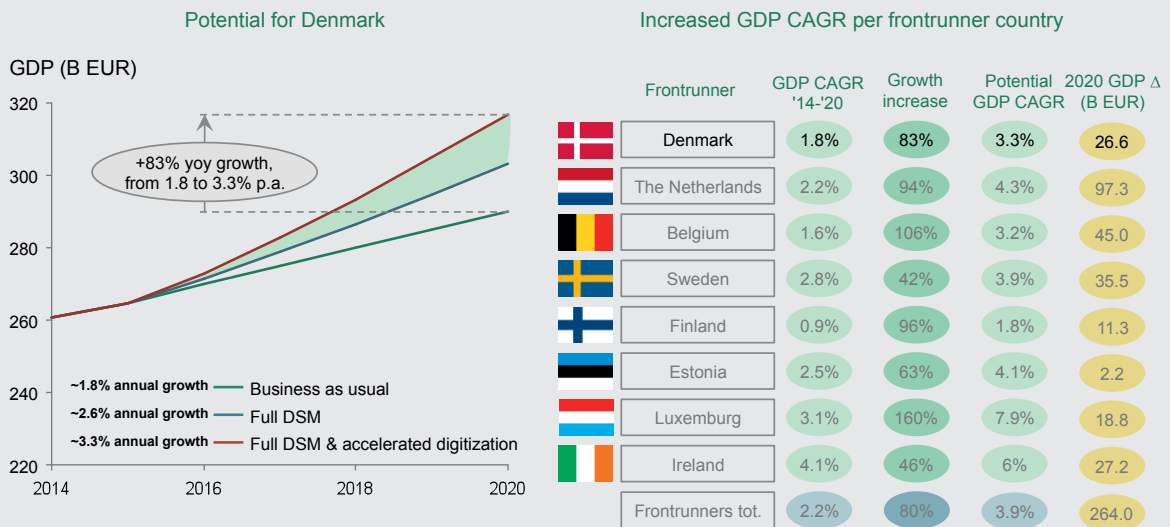


## EXHIBIT 4 | Emerging Global Technology Markets



<sup>1</sup> Estimates based on several sources, IDC, Gartner, Markets & Markets, IBM  
Source: BCG analysis, World bank, Eurostat, IDC, Gartner, Markets & Markets, IBM

## EXHIBIT 5 | Digital single market and world-class digitization, further potential for increased economic growth



Note: CAGR = Compound annual growth rate  
Source: BCG analysis, World Bank, Eurostat, OECD

Exhibit 4). Notable examples include technologies often related to Industry 4.0, comprising big data analytics, the Internet of Things, advanced robotics, and augmented reality. Among other things, these are helping drone technology to advance, something that recently has been in focus in Denmark. Being able to compete in these industries requires innovative businesses that are highly digitized and that are acting in an innovation-friendly regulatory environment.

When modeling the impact of a full Danish embrace of these high-value emerging digital industries in terms of increased GDP growth and changes to employment, we find that, on top of the benefits of a working DSM, Den-

mark's growth rate can increase by another 41% or so. This means that a working DSM combined with an increased level of digitization would amount to an 83% increase in GDP growth rate for Denmark (see Exhibit 5). This is equal to an increase in GDP of more than €26 billion by 2020, and would place Denmark among the fastest growing economies in Europe.

Translating these figures into job opportunities, we find that the total value at stake for Denmark could exceed 150,000 FTE by 2025, or 2.7% of the current total workforce. Combined, this is an opportunity Denmark cannot afford to miss.

# SHAPING DANISH POLICY FOR THE DIGITAL ERA

**W**E BELIEVE IT IS necessary for Denmark to aspire to become the best country in the world when it comes to leveraging digitization and technology, thus stimulating economic growth and job creation. In this chapter, we suggest a blueprint for world-class digitization and measure Denmark's current initiatives and status against it. We then point to a couple of areas where we think there is potential to fill gaps in the blueprint, and work toward a more digitized Denmark.

Denmark's actions, such as introducing the Danish Agency for Digitisation, and other initiatives supporting digitization, are a step in the right direction, and something that can be built upon. However, we see a need for such structures to also take initiatives for the private sector into account, not just the public sector. There are several indications that the government intends to take the necessary steps. The government proclaimed that it will launch a digital growth plan, it announced a new panel that will advise the government on Industry 4.0, and the Prime Minister publicly announced that he will put forward an 2025 economic plan with a focus on digitization. It is time to translate these intentions into specific ambitions and actions that will make a difference in the big picture.

## Blueprint for national digital agendas.

Denmark should strive to become a global leader for leveraging digitization and technol-

ogy. We believe that nations ultimately must adopt comprehensive nationwide digital agendas to adapt to fast-moving developments in digital. Such an agenda should be made up of a wide-ranging set of highly prioritized political policy initiatives and investments for a digitized economy of the future. To make sure a digital agenda can be successfully implemented, the agenda must also be underpinned by an efficient structure and clear leadership.

There are five areas that should be prioritized for a world-class digitized nation. These are:

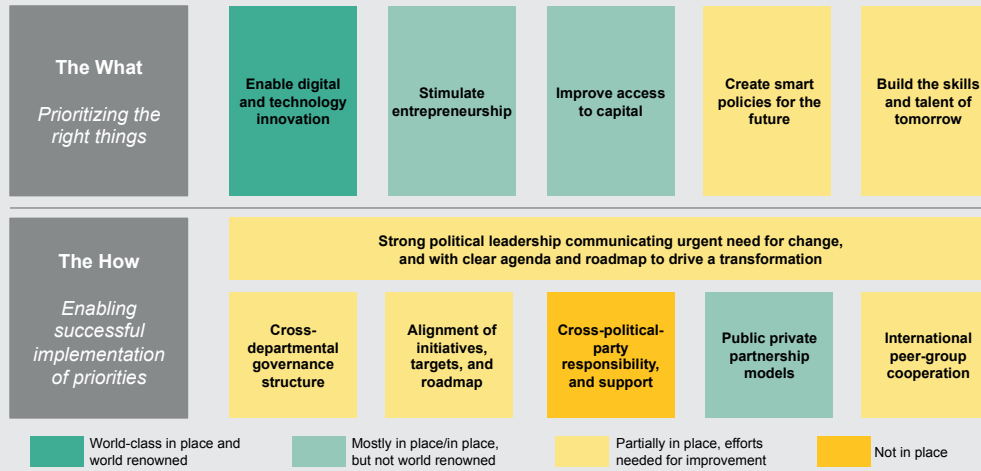
- Enable digital and technological innovation
- Stimulate entrepreneurship
- Improve access to capital for young businesses
- Develop smart regulation for the future
- Build the skills and talent of tomorrow

Successful implementation can be facilitated with these six main building blocks in place:

- Strong political leadership communicating urgent need for change
- Cross-departmental government structure



**EXHIBIT 6 | Assessment against blueprint for digitization: Denmark is showing strength in digital enablement, but several areas for improvement identified**



Source: BCG analysis

- Alignment of initiatives, targets, and roadmap
- Cross-political-party responsibility and support
- Public-private partnership models
- International peer group cooperation

The priorities and implementation building blocks together form what we see as a blueprint for an ambitious agenda for world-class digitization of a country. We describe these two parts as the “what” and “how” of the agenda (see Exhibit 6).

**The What – Prioritizing the Right Things**

*Enable digital and technology innovation.* To enable digital and technology innovation, there must be strong support in several areas. This includes supporting 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. We must also steer and incentivize established SMEs to move into digital and mobile-first businesses. Government processes and services should be

fully digitized, and very importantly – these services should be fully utilized to boost actual efficiency. Moreover, investments are needed in high impact maturing technologies such as the Internet of Things (IoT) and big data. Denmark should also push for – and be part of – the establishment of international standards for these new technologies. Finally, it’s time to look into setting a date for a transition to electronic money.

*Stimulate entrepreneurship.* Stimulating entrepreneurship is about incentivizing and removing barriers. Taxes on stocks and stock options should be lowered, public tenders and procurement should be directed toward SMEs to stimulate demand and growth, and initiatives should be established to strengthen the link between universities and startup communities to ensure startups have access to talent. Furthermore, it’s important to encourage a culture in which entrepreneurship is seen as a viable career option for top talent, in order to address societal and cultural barriers to entrepreneurship.

*Improve access to capital.* Despite available public funding, systems are often complex and funds might be partially misdirected. We see that there are several complementary initiatives to be leveraged to enable a startup’s access to capital. First, public funding structures can be made simpler and the funding

should primarily be used for matching private investments, rather than being distributed through publicly run investment firms. Pension fund investments should also be steered toward established venture capital funds. Second, introduction of tax breaks on angel investments would give startups access to early-stage capital, incentivizing investors to invest by allowing potential losses to be offset against income or capital gains. Third, a nation should aim to attract worldwide leading venture capital funds to the region.

*Smart regulation for the future.* There must be a pragmatic and proactive approach to regulation if Denmark is to maintain competitiveness in a changing world. Regulation can't be allowed to hinder or slow down economic and societal development. Removing regulatory barriers includes increasing labor market flexibility, simplifying legal conditions for SMEs, and promoting the sharing economy – for example when it comes to car or ride sharing, accommodations, and music and video streaming. It also includes revitalizing current legislation on intellectual property and data protection to ensure the fullest possible promotion of innovation and transparency.

*Build the skills and talent of tomorrow.* A central factor for managing unemployment and driving economic growth will be a nation's ability to transform human capital in the face of fast technological development and build skills and talent for the future. To be able to successfully manage the next wave of structural transformation, the educational system should be rethought. Primary and secondary schools must modernize their curricula and promote equity and integration across schools and students, as well as encourage the Danish interest in STEM subjects. Also, there is often a need to differentiate and specialize in tertiary education, and introduce cross-disciplinary programs. Nationwide planning for the digital workforce is needed – looking at future demand both in the private and public sectors. To attract international talent, dedicated and functioning talent-visa programs should be in place. Finally, “relocation packages” can be introduced to minimize existing barriers to relocation. These could, for example, include access to affordable housing.

## The How – Enabling Successful Implementation of Priorities

*Strong political leadership communicating urgent need for change and driving a transformation with a clear agenda and roadmap.* Placing digital among top political priorities promoted by senior ministers is crucial for achieving world-class nationwide digitization. It is also important to make sure there is a clear agenda and implementation plan that is easily tracked by, and communicated to, all stakeholders.

*Cross-departmental governance structure.* To ensure a successful implementation of the new digital agenda, we need a strong cross-departmental governance structure. This implies establishing a supervising governing body with the mandate to make central decisions with regard to the implementation of the digital agenda, for example, a digital ministry with a mandate to make central decisions and with a seat on the economic and coordination committees. The governing body should ultimately be led by a digital minister – an appointed senior minister whose main responsibility is to drive and execute the digital agenda.

*Alignment of initiatives, targets, and roadmap.* A well-developed digital agenda needs to be supported by concise and detailed initiatives, including specific targets and implementation plans. Linked to the strategic priorities above, an overall implementation roadmap is needed for the digital agenda. The initiatives, targets, and plan must be communicated to and easily available for all stakeholders, to educate them on the digital priorities, available support, and new opportunities that might arise. Critical to the success of corporations that undergo transformations and large-scale change efforts is the establishment of a program management office (PMO). The PMO is set up to track and support change efforts, and eliminate any bottlenecks. A comprehensive digital transformation roadmap would benefit from a similar approach.

*Cross-political-party responsibility and support.* This would allow for continued execution and progress over election cycles, with limited distortion, and allow for long-term support.

*Public-private partnership models.* Public-private partnership models will act as a catalyst and support the move toward digital in the private sector. Denmark should create structures for joint investments in tech industries, as well as digital advisory boards, which can assist businesses in the digitization effort.

*International peer group cooperation.* To benefit from the experiences of the best countries around the world, a nation should be sure to benchmark the progress of digital agendas. To get an outside-in perspective on the strategic priorities, experts from countries leveraging digitization to drive economic and societal development could be invited to give their input. The gathered input should then be translated into an actionable business plan for each country, with solutions tailored to the individual nation's situation and needs.

*Inspirational global best practices.* To give some flavor to different parts of our proposed blueprint, we have gathered a few initiatives and policies for promoting digitization from around the world to serve as inspiration for Denmark when looking at varying parts of a comprehensive blueprint. These should be viewed as inspiration, rather than an exhaustive list of fully implemented world-class initiatives.

- *Digital enablement: e-citizenship in Estonia.* Led by Estonia's Chief Information Officer and tech-savvy government, e-citizenship has been introduced to boost Estonia's economy by encouraging foreign entrepreneurs to remotely start businesses in the country. An e-residency does not automatically entitle a person to physical residency in Estonia, but it allows him to manage an online business and to base its online financials in Estonia. In 2015, the Estonian government took e-citizenship to the next level by partnering with Bitnation, a decentralized governance project offering e-world citizenship IDs and DIY governance. The e-citizens of Estonia will, via Bitnation, be offered the services of a notary public. This will allow them to notarize contracts, certificates, and marriages using blockchain technology. The notarization provides a legally binding proof under the jurisdiction of the blockchain, rather than in Estonia.

- *Build the skills and talent of tomorrow: Programming in school curricula, UK.* The UK was the first country in Europe to introduce coding and computational logic into school curricula for all children. In order to make more children interested in digital tools, it is important to expose them early to the inner workings of digital technology.
- *Smart regulation for the future: Decision to allow large-scale testing of self-driving cars in the Netherlands.* In 2015, the Dutch government passed legislation that permits companies to test self-driving cars in traffic. This is a good way to bring tech development to the Netherlands and also to attract tech talent.
- *Cross-departmental governance structure: Digital minister with digital governing body in Belgium.* Belgium launched "Digital Belgium" in 2015, an initiative to put Belgium on the map when it comes to digital development. The initiative covers a concrete national digital action plan. The plan followed the establishment of an advisory board – Digital Minds – on digital for Belgium in the same year. The board consists of the nation's top ICT experts heading the digital agenda. Alexander De Croo, founder of the advisory board as well as deputy prime minister and minister of Development Cooperation, Telecom, and Postal Services, is ultimately responsible for the agenda. He was also appointed minister for the Digital Agenda.
- *Alignment of initiatives, targets, and roadmap: Digitization in the private and public sector run by an authority with yearly annual reports and business plans in Singapore.* Singapore, often mentioned as one of the more highly digitized nations, is driving digitization in private and public sectors through one board, the Infocomm Development Authority, which allows for comprehensive and clear planning and tracking. The authority is tasked with driving ICT development in the private sector, as well as driving e-government initiatives through the nation's Government Chief Information Office Wing. In the private ICT sector, it is formulating

policies, related guidelines, and codes of practice. This is described in Singapore's iN2015 strategy put forth in 2005.

- *Enabling digital and technology innovation via public-private partnership models: 5G investments in South Korea.* South Korea is positioning 5G to become a core driver of its future growth by public-private partnering and SME involvement. The government has pledged to invest \$1.5 billion – jointly with the private sector – in R&D, bandwidth, and a business ecosystem. Unlike their earlier investments in 4G, this time the government will specifically increase support for startups and SMEs, hoping to increase SME participation in 5G research by 40%.

**Assessment of current ambitions and policies.** Using the previously described blueprint consisting of the elements making up “what” and “how,” we have analyzed how current political initiatives in Denmark compare. Looking at each component in the 11 elements, we determined how well Denmark stands globally in terms of facilitating digitization. The blueprint summarizes our views on what the aspiration of a world-class digitized nation should be; and our analysis shows that Denmark is doing well in certain areas, but can indeed do more in others, especially in terms of enabling a successful implementation of a digital agenda.

Denmark is often listed as a leading nation when it comes to enabling technology and innovation, especially digitized government processes, digital infrastructure, and cluster support. Not only are general government processes consistently available and used in digital format, but Denmark has also been investing in digitizing the health care system, resulting in its having a leading position in digital health care. For example, doctor's visits can be made online via video, aided by simple at-home medical devices. Past focus on ICT investments has contributed to a world-class digital infrastructure. To keep up with ongoing development though, additional investments should be made and new technologies embraced. Wide use of big data and data analytics would be a next step for the health care sector. Estonia with its openness

to Blockchain technology when it comes to e-government is one example of this, and further investments in nationwide IoT enablement is another.

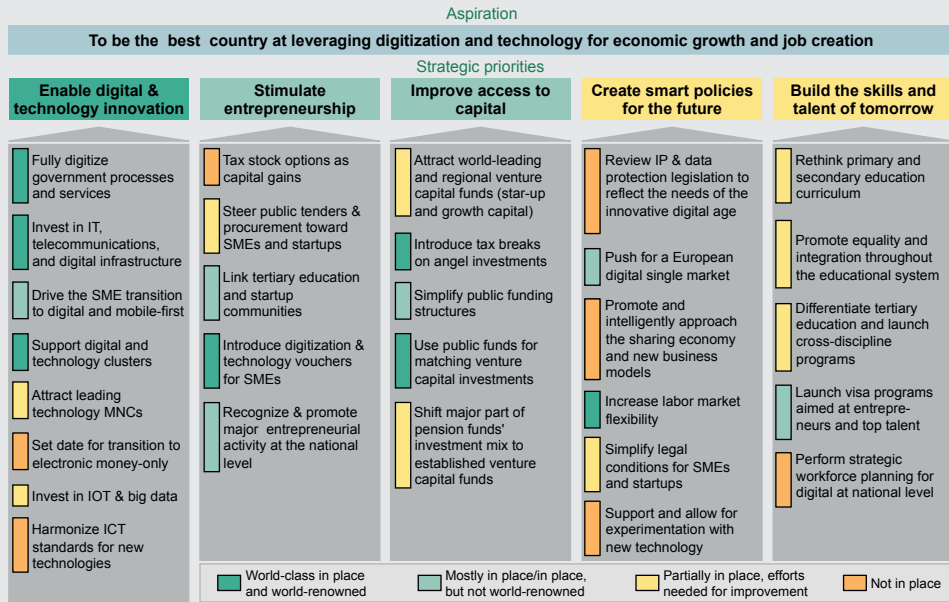
Denmark does stand out when it comes to labor market flexibility – Denmark's employment regulation is regarded as one of the most flexible in the world because of its “flexicurity” model coupled with active labor market policy. There have also been initiatives put in place to improve access to capital. For example, Denmark has worked on matching venture capital investments via the public fund Vaekstfonden. The fund offers co-financing in collaboration with private investors, as well as loan solutions via partnerships with financial institutions. Moreover, Denmark is – via the Innovation Fund Denmark – offering innovation vouchers for SMEs seeking to collaborate with universities. It has reformed and simplified Denmark's system for research and innovation, according to Euraxcess.

But there are areas where Denmark could increase its efforts. One of these is regulation, where Denmark would benefit from modernization, especially in IP and data protection, as well as specialized frameworks for a sharing economy. Looking at the UK's recent modernization of IP legislation would be a good place for Denmark to begin. We also believe that Denmark would benefit from looking into smart policies adapted to the digital era and which encourage digital innovation. Digital innovation increases the potential for a nation to grow unicorns and attract foreign investments. Actively supporting and allowing for experimentation with new technology could also be a way to support such innovation.

Furthermore, there is a need to skill up the workforce as the nation is already facing a future labor-force shortage in ICT skills. Taiwan's efforts in growing the semiconductor industry can serve as inspiration when it comes to linking education to research in specific industries, thus encouraging adoption of adequate skills and attracting talent to these industries.

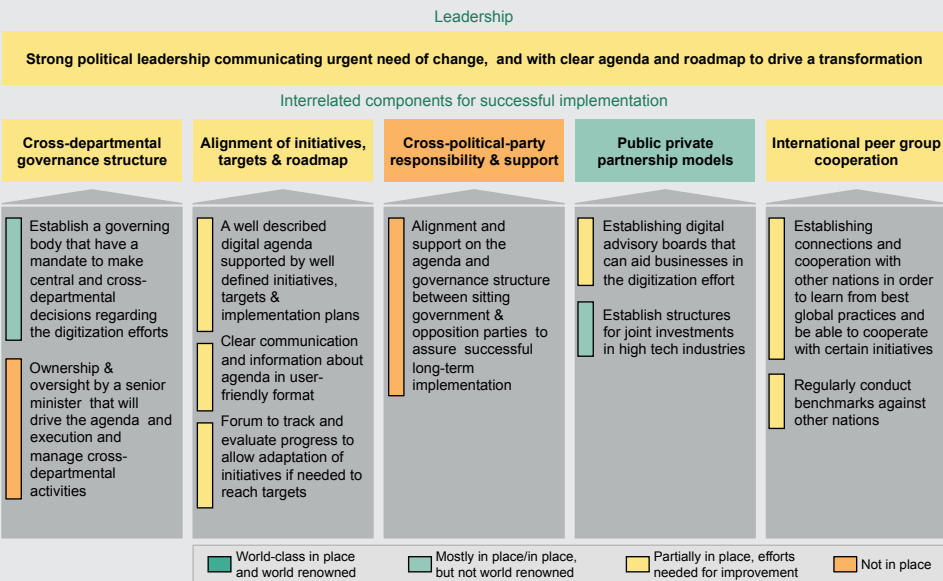
Other areas not scoring as high relative our suggested blueprint are: strong and clear

## EXHIBIT 7 | The What: Prioritizing the right things – Denmark assessment against blueprint



Note: SME = small & midsize enterprise. MNC = multinational corporation. IP = Intellectual property.  
Source: BCG analysis

## EXHIBIT 8 | The How: Enabling successful implementation of priorities – Denmark assessment against blueprint



Source: BCG analysis

leadership; having clear targets linked to initiatives for digital; communication around initiatives, targets, and roadmap; and relevant benchmarking. Denmark also must improve its efforts on stabilizing cross-political-party

responsibility and support, as well as having an appointed digital minister. Here both Belgium and Singapore serve as examples of how to improve efforts (see Exhibits 7 and 8).



# PRIORITIZED DOMESTIC INITIATIVES TO SPEED UP DIGITIZATION

**B**ASED ON DENMARK'S STARTING point on the assessment of the nation's initiatives for digitization, we suggest several areas we think should be prioritized in the nearest term for a more digitized country.

- *Updating primary and secondary educational curricula and introducing national workforce planning.* Denmark is already expecting a deficit in skilled labor for future jobs in a digitized world. This urgently needs to be addressed, and the workforce must be given the skills to meet the needs of the future. We suggest setting up a nationwide workforce plan in which expected needs are broken down in detail and expected necessary skills forecast. In Denmark, the public debate indicates an increasing need to focus on STEM subjects and encourage interest in such majors. The primary and secondary educational curriculum should be adapted to ensure a future supply of needed skills and talents – more significant and comprehensive than just adding coding to the curriculum. Such initiatives could include new digitally enabled educational themes such as adaptive and blended learning, performance based individualized learning paths supported by AI, increased use of global educational platforms, and flipped classrooms, leveraging the use of digital to enhance student performance and increase learning. Reviewing and introducing modern and flexible options for when and where students can study is also something to look into. Further, Denmark should look into how ICT and advanced technologies such as virtual reality and big data can help students learn the right things more efficiently. A Swedish study showed that technology-enhanced collaboration improved student achievement in literacy and mathematics and leads to a lower gender gap in performance. With online learning tools, interested students could potentially complement traditional learning between semesters, thereby increasing productivity. Workforce planning should address not only future supply, but also current supply. Initiatives to address this skills gap should involve the business community to ensure a thorough understanding of key gaps and their roots, and how the community itself could be leveraged to bridge them.
- *Making a targeted effort to simplify conditions, increase business engagement, and encourage exports for SMEs.* To be able to capture economic value from export-led growth in Denmark, it is necessary to support SMEs as they go digital and address a larger market. Business engagement is an area where Denmark lags behind peers, and there is a shortage of know-how and skills especially among SMEs. We see measures that can be taken

both at a European and a domestic level. On the European level, non-synchronized regulation across nations, for example regarding freight and payment terms and the degree of liberalization of labor laws for e-commerce, often hinders expansion of small businesses compared with larger players. Large players can afford to attract people with necessary skills to efficiently stay on top of the different regulatory regimes, as well as invest in necessary digital resources to scale up and successfully drive a business online. This is also made possible by incentives to provide capital to startups in need of capital, for example through tax breaks on shares. By making EU online commerce more open and conditions more synchronized across borders, SMEs can be empowered to compete with larger established international players. On the domestic side, Denmark should make a targeted effort to digitize business more quickly, in particular SMEs for export success, and help them to grow. This should be encouraged through both direct government action, in partnership with industry and by incentivizing the nation's SMEs and startups to invest in needed digital resources and skills. For example, a pull effect toward online can be made by encouraging fully online tax declarations, as well as tax breaks for SMEs and startups for investing in digital resources.

- *Creating smart policies for the sharing economy and new business models.* New business models and revolutionary concepts, such as the sharing economy, are growing rapidly and bringing innovation along with them. Not only do they often depend on functioning digital platforms, but also on smart policies that ensure transparent, encouraging, and safe growth of this part of the economy. Smart policy solutions and principles must be adopted to promote the growth of such innovative models, and the competitive products and services they bring. There are different ways to approach and encourage these emerging business models. Some are experimental – for example in the Netherlands, where the government is supporting experimenta-

tion with self-driving vehicles. Other measures could include approaching new business models on a case-by-case basis for any necessary regulation, or allowing for deregulation, or market self-regulation.

- *The Prime Minister taking the lead on developing an ambitious national vision and strategy for digitization across the economy. Appointing a senior minister to lead the digitization process, with a seat on the key economy and coordinating committees.* To be able to ensure a streamlined and highly prioritized digital strategy for both the private and public sectors, the new digital minister must be responsible for the execution of the strategy and must have a seat on the key economy and coordination committees, including the Committee of Economic Affairs and the Coordination Committee.
- *Engaging in an international collaboration with like-minded peers to push toward the development of a single digital economy in Europe.* Digitizing European markets offers the largest and most easily attainable opportunity for export-led growth in Denmark. As a single country, Denmark has limited power to drive such a development, but backed by like-minded nations, an international collaboration could better speed up the digitization of the European economy, a development from which Denmark as a small export-driven and digitally competitive nation would significantly benefit. We describe a potential such setup in more detail in the following chapter.

Digitization of the economy is a major growth opportunity, and one of the clearest in Denmark. A growing overall economy will eventually create new jobs, which in turn will increase the total tax revenue of the nation, helping to pay back investments. The required national efforts in the area of skills is a long-term investment for Denmark, while making a targeted effort for SMEs is shorter-term. Introduction of smart policies, a cross-departmental governance structure, and international collaboration should be relatively less resource intensive.

# THE NATIONAL DIGITAL AGENDA IN A EUROPEAN CONTEXT

**A**S IMPORTANT AS DENMARK'S national digital agenda may be, not everything can be achieved in isolation. Denmark must work together with other countries with similar goals.

**International collaboration.** Digitization will benefit all European countries, but not to an equal degree. This leads to diverging priorities among countries. Denmark, being a small country, must find partners with whom it can drive an ambitious digitization and DSM agenda on the EU level.

By assessing how European countries perform in a number of digitization and market openness parameters, a group of high-performing nations similar to Denmark emerges (see [Exhibit 9](#)). We refer to these countries as European digital frontrunners. The group as we define it consists of **Denmark, Belgium, the Netherlands, Sweden, Estonia, Ireland, Finland, Norway, and Luxembourg.**

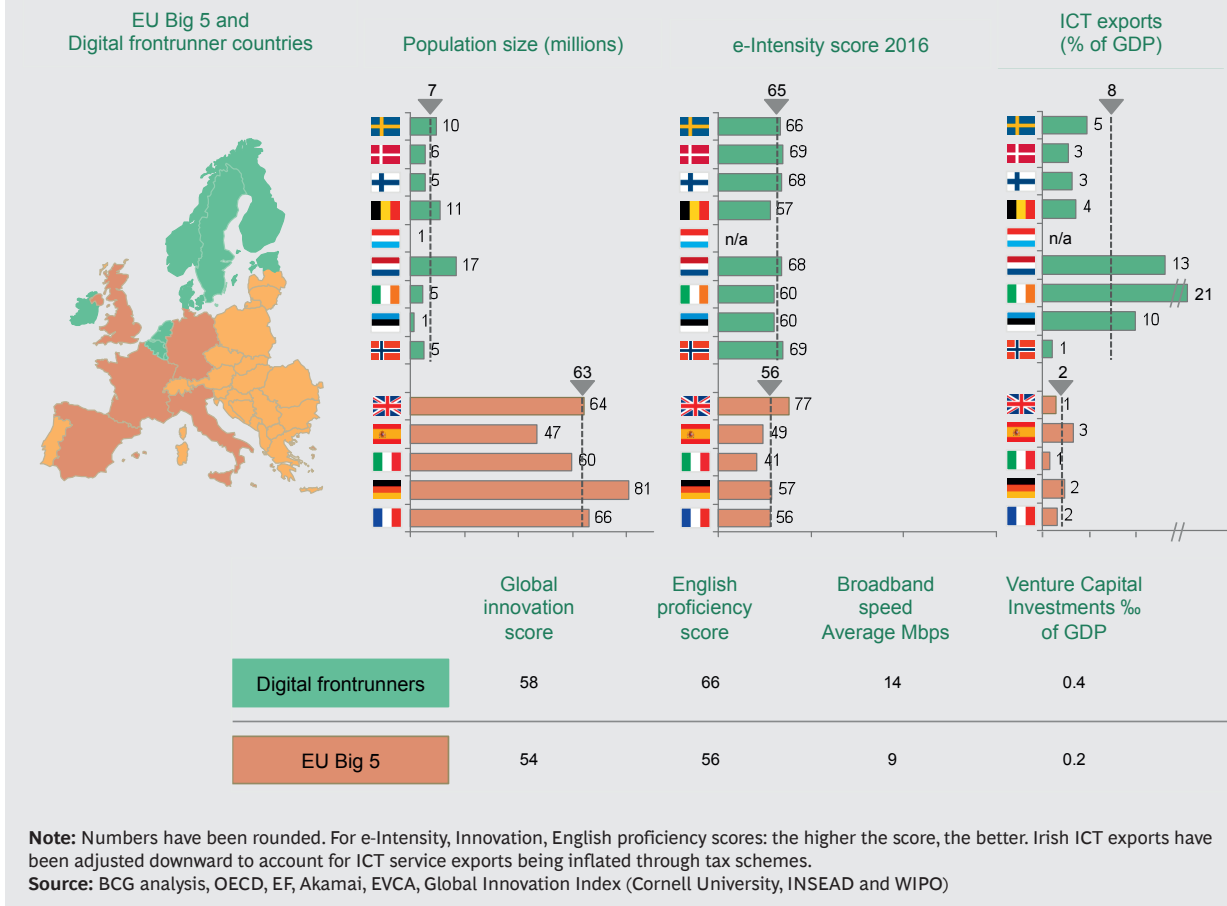
These countries are characterized by being small in terms of population, dependent on ICT exports, and highly digitized and innovative. Denmark should also open its doors **as well** to other countries that want to collaborate and don't happen to fit the criteria of a digital frontrunner. However, the digital frontrunner group constitutes a likely set of partners for a successful digital push in the EU.

The fact that the digital frontrunner countries are small means that they have a limited domestic market compared with bigger European countries such as the EU Big 5 (Germany, France, the UK, Spain, and Italy). This in turn means the digital frontrunners, as is the case with Denmark, can benefit considerably from easier access to the vast European market. The average ICT goods and services exports as a share of GDP for the digital frontrunners is 8%, compared with 2% for the EU Big 5, indicating that their economies are indeed more dependent on exports than their bigger neighbors'. Denmark's ICT exports as a share of GDP may not be the highest in the group at 3%, but are still higher than the EU Big 5 average. Reversing the perspective, we also note that the digital frontrunners are more vulnerable should the digitization of the European economy 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.

Being highly digitized and innovative, Denmark is in a good position to benefit from EU digitization and other efforts to remove regulatory and administrative barriers. Such initiatives would introduce a more accessible market with healthy competition, where countries with competitive companies would thrive. And given that a high degree of digitization and innovation increases a country's readiness and ability to access and offer competi-



## EXHIBIT 9 | The Digital Frontrunners and EU Big 5



tive products and services in an open digital market, Denmark would have an advantage.

Denmark should engage with other digital frontrunners to drive their digital agenda in the EU and share best practices.

**Turning the digital tide in Europe.** To further boost the nation’s development toward digital, Denmark should engage in an international collaboration forum with the European digital frontrunners. This collaboration would aim to speed up the digitized economy of the European Union, to the benefit of Denmark as a small export-driven and digitally competitive nation.

Ministers responsible for digital in each frontrunner nation should engage with each other and work together in close cooperation, as well as ensure close collaboration with permanent representatives in Brussels. This would be a forum to agree on common points to drive in the European Union, and work with the European Commission and the council to drive the digitization of the EU.

Furthermore, this is an opportunity to understand common concerns about and plans for national policy solutions that will ease the implementation of the DSM and encourage digitization. The frontrunners have different strengths and skills to bring to the table and other member states would also benefit from their insights.

This would be a chance to be a global trendsetter and idea generator when it comes to digitization. A good example of how this cooperation could work is the International En-

ergy Agency. A broad cooperative effort on digital might include inviting international scholars, business leaders, and politicians from other countries which are leveraging digitization to drive economic and societal development, in order to encourage a nuanced discussion.

This is also an opportunity to conduct – and learn from – benchmarking of digitization. Yearly benchmarks could be set up, in which not only are European nations compared with each other, but insights and best practices from global world-class initiatives are incorporated. The international perspective would serve as an inspiration for updates in Denmark’s digital agenda, thus helping to keep up a global competitiveness.

**Concluding words.** In closing, we hope this report will contribute to the public debate on the digitization of Denmark – and Denmark’s

role in Europe’s digital development – with senior politicians and business leaders. Denmark, as well as the entire European Union, could see many benefits from digitization and a single market in Europe when it comes to digital.

Given the speed of digitization in nations outside of Europe, the pace of development we are seeing is not enough if we are to ensure a global top position when it comes to digital for Denmark.

Denmark must look into adopting a comprehensive national digital agenda with well-targeted initiatives. To facilitate growth of domestic businesses and promote competitive strength, Denmark must also engage in an urgent push for a true single digital market in Europe, via its digital minister, together with the European frontrunners.

# 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

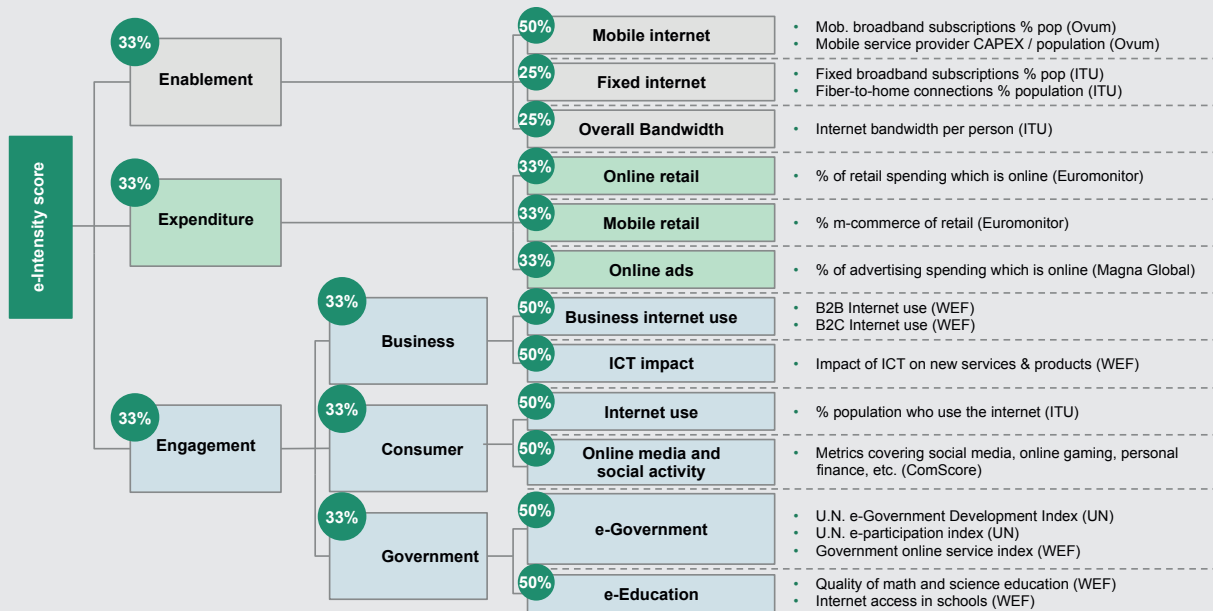
online by households in a country. It also includes consumer spending on Internet access and the relevant cost of devices used to access the Internet.

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. 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.

## EXHIBIT 10 | BCG E-Intensity Index Composition



Source: BCG analysis, Magna Global, UN, WEF, ComScore, ITU, Euromonitor, Ovum

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 with 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 10, above.

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 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.

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 emerg-

ing 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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