

Jobs in Apps

Mobile Economy in the Nordics
A Catalyst for Economic Growth

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Preface

This study is prepared on request of the Developers Alliance¹ and Google. The objective of the study is to analyse the App Economy in the Nordic countries, i.e. Sweden, Finland, Denmark and Norway.

During the study, we have interviewed several app entrepreneurs and developers² to hear about growth opportunities in the Nordics in their own words, and to gain their view on issues that could hinder continued growth. The entrepreneurs were chosen, because they as the creators are forming the core of the App Economy.

The policy proposals expressed in the report follow directly from what we have learned from interviewing some of the stars of the Nordic App Economy and the recommendations are applicable across all the Nordic countries.

We are grateful to all interviewees for sharing their insights with us.

All findings and conclusions expressed in the report are our own.

¹ The Developers Alliance is a non-profit global membership organisation that supports developers as creators, innovators, and entrepreneurs.

² The interviewees are: Fishbrain, Peppy Pals, Seriously, Too Good To Go, Tradono, Truecaller, Unity and Yousician.

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Executive summary

The App market is highly global. Through a few platforms, app developers anywhere can reach more than 2 billion smartphone users

- **Today**, the App Economy supports 145,500 high-value-added jobs in the Nordics
 - Sweden 60,000 jobs
 - Denmark 34,500 jobs
 - Finland 30,500 jobs
 - Norway 20,500 jobs
- This is a **frontrunner position** in the global app economy. This position stems from the Nordic countries being digital frontrunners in the EU for a long period. From this leading position, the Nordic countries have a unique opportunity to capitalise on the digital transformation and create more high-value-added jobs in the future.
- **Thinking global** is one of the key forces of the Nordic app developers. Because of the global nature of the app market, the Nordic countries have an opportunity to capture a disproportionately big part of the market.
- App developers use several platforms to reach the global market of **more than 2 billion smartphone users**. The majority of app companies develop to more than one platform, and Apple's iOS and Google's Android are the two most used platforms. However, many developers use at least one other store than Apple Store or Google Play. Having global access via a relatively small number of platforms, and avoiding past fragmentation problems, is especially important for entrepreneurs and start-ups as this keeps the development costs down and reduce the time to market.
- The Nordic countries are already well ahead of the EU average, and measured by app economy intensity (app jobs relative to total jobs), the Nordics are also ahead of the US average. In fact, the Nordics are **nipping at the heels of Silicon Valley**.
- **Over the next five years**, there is a potential of the App Economy adding approx. 30,000 direct jobs and 70,000 in indirect and induced employment, bringing the total potential to 100,000 supported jobs. As a comparison, the construction sector in the Nordic countries is projected to grow by 30,000 direct jobs during the same period. However, app companies are **severely hampered by shortages** of developers today. This demands immediate action if the potential is to be realised.
- If the Nordic countries are capable **of re-shoring app headquarter functions** from, e.g., the United States, there is a further potential for 30,000-40,000 supported jobs. The high projection scenario shows that the App Economy has the potential to **support up to 285,000 jobs by 2021**.

- **Policy choices** will influence whether the current Nordic frontrunners will continue to play a leading part in the global App Economy, thus obtaining some of the new high-value jobs. The difference in the number of potential supported jobs by 2021 between good conducive policy and political inaction is up to 115,000. Building on insights from interviews with the *Stars of Nordic app economy*, we recommend to:

1

Reduce bottlenecks in the labour market for developers. Today the app companies are already experiencing severe shortages of developers. The labour market bottlenecks for developers in the Nordic countries are by far the most currently pressing issue. For some app companies, the shortage is even hampering growth, forcing them to open offices in countries outside the Nordic region and Europe, in search of the right talent.

2

Accelerate growth drivers in the App Economy. Today, when app companies need to accelerate and scale their business, they move key management functions and seek the risk capital needed in the US. This presents an opportunity of accelerated Nordic growth, if more of these professionals and more risk capital could be found in the region. This would add further high-value jobs to the Nordic App Economy.

3

Maintain fundamentals supporting an environment conducive to entrepreneurs and start-ups and a regulatory framework that allows the app business to grow. Currently, regulation and focus exist in the Nordic countries and Europe, encouraging entrepreneurs and start-ups. It is important not to shift this focus or enact counterproductive policies.

- If the wrong policy choices are made, the Nordic countries will not be able to follow the global growth trend and will not be able to create the high-value jobs coming with this potential. Digitisation of jobs and society will take place with or without the involvement of the Nordic region. The question is whether we are able to fill the new high-value-added jobs in the Nordic region or see them grow in the United States and Asian countries instead.
- To be part of the digital transformation across all sectors of activity, having individuals with digital skills is crucial. Hence, the App Economy can create ripple effects, benefitting the whole society, and a continued growth of the Nordic App Economy is an increasingly important part of the digital transformation of our societies.

Chapter 1

Sizing the Nordic App Economy

The App Economy supports 145,500 jobs in the Nordic countries in 2017. This is possible through a fast-growing global market, where small and large players alike can reach up to 2 billion smartphone users, through a few platforms. In this digitised economy, the Nordic countries are frontrunners thanks to their global thinking and willingness to adapt to new opportunities.

1.1 The Nordic App Economy landscape

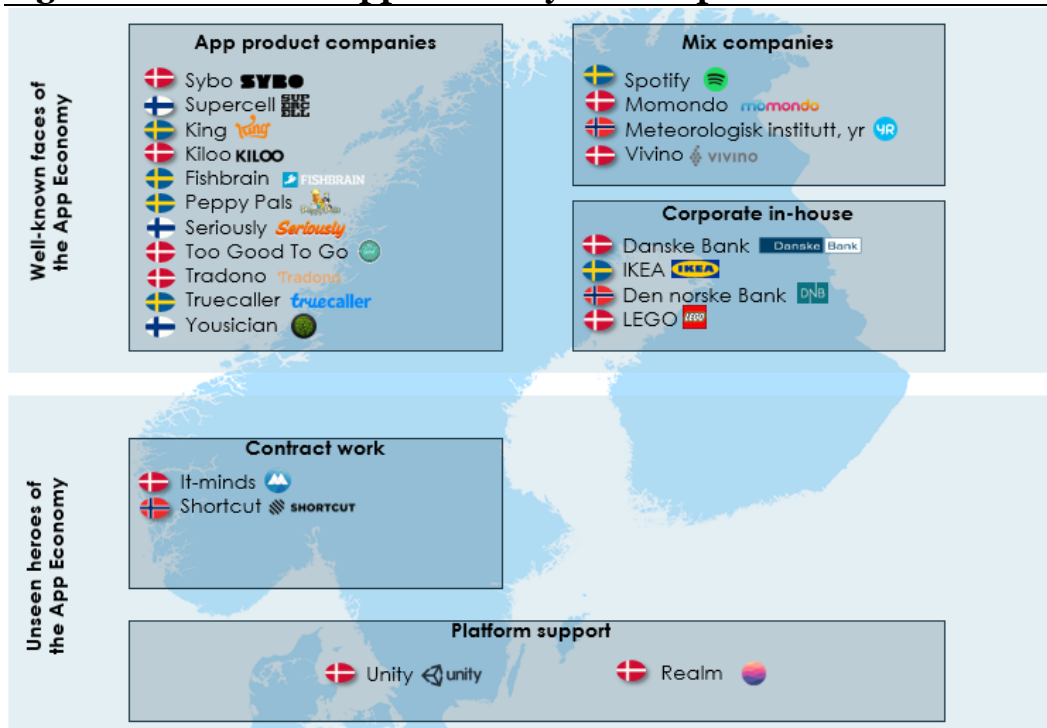
The App Economy spans a wide range of industries and companies. Some of these companies are well-known faces and others can be said to be the unsung heroes of the App Economy.

Having identified and quantified the Nordic App Economy jobs, we found that these are present in five categories of companies.

Well-known faces of the App Economy	
1	App product companies These firms have apps as their core business. They design, publish and maintain their own apps. Examples include mobile gaming superstars such as Finnish Supercell, maker of, among others, Clash of Clans, and Swedish King, maker of Candy Crush, one of the first games to successfully utilise the freemium business model.
2	Mix companies This category comprises firms, which have a large presence both on web and through apps on mobile devices. A high share of their product development is app-based, often more than half of the business. Examples include the Swedish music streaming industry giant Spotify, and Danish wine rating company Vivino.
3	Corporate in-house app development Companies which uses apps to support their core business often hire developers to manage developing in-house. This includes, e.g., Danske Bank which has a department working with the development and maintenance of their MobilePay app.
Unsung heroes of the App Economy	
4	Contract work Other businesses outsource the app development to companies engaged in contract work. This could, e.g., be Norwegian Shortcut, which has done app work for, e.g., the bank Nordea.
5	Platform support companies Besides the former four categories all involved directly with app development, some companies provide platform support to app developers. These include, e.g., Danish Unity, which offers app developers a platform to build their app on, easing the process.

There is an abundance of Nordic companies employing individuals with app skills. A fraction of these is shown in Figure 1.

Figure 1 The Nordic App Economy landscape



Note: Figure showing the many different sectors and industries where App Economy jobs are present. The figure is illustrative and shows only a fraction of the companies in the Nordic countries employing individuals with app skills.

Source: Copenhagen Economics.

In this study, we focus mainly on the app entrepreneurs in the Nordic region. We do this, as these are the creators in the App Economy and hence a fundamental prerequisite for having an advanced app economy in the Nordics. However, Figure 1 shows an important element of the App Economy, namely that it spans much broader than just the app product companies. App developers are employed in many different sectors and industries of our economies, ranging from banking to toys and the public sector.

1.2 An open doorway to a fast-growing global market

Apps are used for many different purposes, not just games and entertainment. They cover a wide variety of uses, ranging from business to leisure, in both the public and private sectors.

Overall, apps can be divided into seven categories:

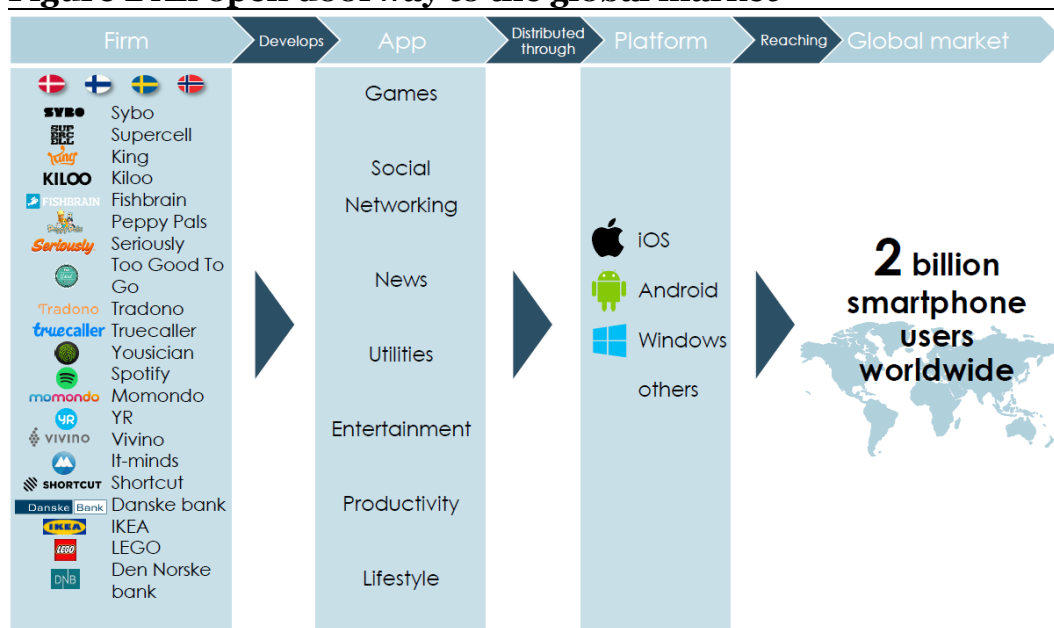
- **News**
 Both written, audio and video

- **Social networking**
 E.g. Facebook and Instagram
- **Productivity**
 Finance, calendars, translators, etc.
- **Utilities**
 Maps, weather, calculators, note-pads, communication, etc.
- **Entertainment**
 Music, film, television, etc.
- **Lifestyle**
 Fitness, travel, food & drink, dating, shopping, etc.

An unprecedented global market

The market for apps is global in an unprecedented way. Through a few digital stores such as Apple App Store, Google Play and Windows Phone Store, even minor companies from small countries can obtain access to 2 billion smartphone users across the globe (see Figure 2)³.

Figure 2 An open doorway to the global market



Note: Figure showing how app companies can reach a global market through a few platforms. The figure is illustrative and the companies depicted constitute only a fraction of the Nordic businesses which have published one or more apps.

Sources: Copenhagen Economics, Buzinga and eMarketer

³ The number of monthly active Android devices (smartphones, tablets, etc.) have reached the 2 billion milestone: <https://blog.google/products/android/2bn-milestone/>

To succeed as an app developer, being proficient in multiple coding languages is required. Out of all app job postings in Europe, 75% mention Android coding skills while 75% mention iOS (Apple) coding skills⁴. This is likewise reflected in the fact that 88% of developers know and use multiple coding languages⁵. App development is a fast-moving industry and staying up-to-date with new coding languages and tools are imperative to stay current as a developer.

Nordic app developers have demonstrated an ability to think global and build businesses around apps, which has made it possible for them to capture a disproportionately large part of the global market. As a consequence, the App Economy is extremely export-oriented – a typical Nordic app product company has 80% or more of revenues outside its home country.

Because of their global thinking, Nordic app developers use several platforms to reach the global market. To be able to obtain a successful position in the market, developers need to offer their apps on all leading platforms (see Box 1). Being present on multiple platforms prolongs the development process. It can likewise entail hiring more developers with different coding skills. This is especially important for app entrepreneurs, where developer wages are a sizeable expense and speed to market is crucial.

Box 1: The mobile platforms

To function, devices such as mobile phones and tablets need an **operating system (OS)**. The most prevalent operating systems today are Apple **iOS**, Google **Android** and Microsoft **Windows Mobile**.

Apple iOS can be found on all Apple mobile devices, including iPhones and iPads. Google Android is an open source software and can be found on devices from many different manufacturers, e.g. Samsung, Nokia, HTC, LG, Sony and many more. Microsoft Windows Mobile can be found on devices from, e.g., HP and Microsoft.

Android also permits several Nordic and European mobile and device manufacturers to enter the market and compete with the Asian manufacturers and even Apple and its iPhone. These are e.g. Doro and Zound Industries in Sweden, Bittium and HMD Global in Finland and Lumigon in Denmark. The manufacturers create thousands of jobs in the region, in addition to the App Economy figures in this report.

When a company has developed an app, it is **distributed** through one or more **app stores**. For iOS the only channel of distribution is the Apple App Store. For Android Google Play as well as third party stores exists.

Common to most app stores is that they take a 30% cut of all transactions taking place through them. The remaining **70%** goes **directly to the company** which has published the app.

Source: IDC, NetMarketShare and Statista

⁴ Mandel, M. (2016), The App Economy in Europe: Leading Countries and Cities, Progressive Policy Institute

⁵ Developers Alliance (2015), Developer Insights Report

The ability to develop apps to the global market, especially for small developers and start-ups, which form the cornerstone of the Nordic app economy, hinges on the benefits of compatibility across devices. Otherwise, app developers would have to customise their apps to each available device. This would not be feasible for small start-ups. Consequently, they would have to choose only a few devices on which to be present.

The success of Nordic app developers requires easy access to the global market and the current great outcome in terms of high-value-added jobs could not have been achieved without such compatibility (see Box 2). Further fragmentation of the market in the future would thus be detrimental to growth⁶.

Box 2: A fast-growing mobile market

- There are around **2 billion smartphone users** globally today
 - more than 500 million in China
 - around 450 million in Europe
 - more than 300 million in India
 - around 220 million in the US
 - around 20 million in the Nordic countries
- Global smartphone users will approach **3 billion by 2020**
- Annual app **downloads** have surpassed **90 billion**
- The average smartphone user uses more than **30 apps per month**
- More and more **online purchases happen on mobile**
 - In Germany, 37% of e-commerce transactions happened on mobile in 2015 and 36% in Spain as the two leading EU countries

Sources: Statista, App Annie, Criteo, GSMA and PEW Research Center

1.3 App Economy jobs in the Nordic countries

The App Economy today supports 145,500 jobs in the Nordic region distributed across the countries with 60,000 jobs in Sweden, 34,500 in Denmark, 30,500 in Finland and 20,500 in Norway.

In the job analysis, we distinguish between four types of App Economy jobs.

App specialists

Technically skilled jobs, including app development, maintenance and support⁷

⁶ Developers Alliance (2016), Competition in the Mobile App Ecosystem

⁷ The number of app specialists in each country is estimated based on data from Indeed.com and Mandel, M. (2016), The App Economy in Europe: Leading Countries and Cities, Progressive Policy Institute.

App support

Jobs within management, human resources, marketing and sales in app developer firms or in relation to app developers in other firms⁸





Indirect jobs

Indirect jobs are jobs at the suppliers to the core app economy firms, including positions in security, catering, cleaning and office utility supply

Induced jobs

Jobs supported by the spending of those directly employed at the app firms. Covers mainly service related jobs such as restaurants, grocery stores, transport and finance⁹

Table 1 App Economy jobs in the Nordic countries anno 2017

Country	Direct employment		Indirect employment	Induced employment	Total jobs supported by the App Economy	App intensity (total supported in the App Economy out of total employment)
	App specialists	App support				
	14,000	7,000	13,000	26,000	60,000	1.3%
	7,000	3,500	6,000	14,000	30,500	1.3%
	7,000	3,500	8,000	16,000	34,500	1.2%
	5,000	2,500	4,000	9,000	20,500	0.8%
Total	33,000	16,500	31,000	65,000	145,500	1.2%

Note: The number of app specialists in 2017 is estimated based on previous work by PPI¹⁰ combined with an up-to-date search on the job posting web page Indeed and developer growth rates from Vision Mobile¹¹. The indirect and induced multipliers are estimated by means of an input-output model using data from the World Input-Output Database and national statistics. For more details, see technical annex

Source: Copenhagen Economics based on PPI (2016), Statistics Sweden, Statistics Finland, Statistics Denmark, Statistics Norway, World Input-Output Database and Eurostat

Sweden has twice as many app specialists as Denmark and Finland and nearly three times as many as Norway. However, as the population of Sweden is larger than in the other countries, the app jobs relative to total employment (i.e. app intensity) is similar in Sweden and Finland, and only slightly lower in Denmark. Norway falls marginally behind the

⁸ Based on Vision Mobile (2015), European App Economy 2015 – Creating Jobs & Driving Economic Growth in Europe, we estimate 1 support job for every 2 app specialists.

⁹ The number of indirect and induced jobs supported by the App Economy in each country is estimated by using the most recent and most detailed statistical data in the input-output models customised for each country. The data comes from the World Input-Output Database and Statistics Sweden, Statistics Finland, Statistics Denmark and Statistics Norway.

¹⁰ Mandel, M. (2016), The App Economy in Europe: Leading Countries and Cities, Progressive Policy Institute.

¹¹ Vision Mobile (2016), Mobile Developer Population Forecasts 2016-2020.

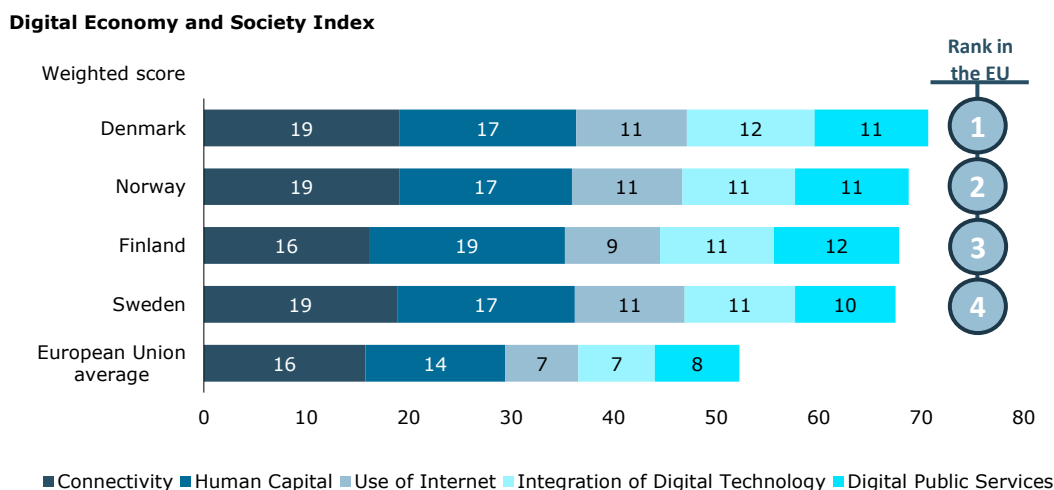
other three Nordic countries when it comes to app intensity, but is still comfortably ahead of the EU average.

In total, the App Economy supports 145,500 jobs in the Nordic countries. This is quite impressive for a relatively new industry. Of the total jobs supported by the Nordic App Economy, 49,500 are direct employment. In comparison, there are around 241,000 individuals employed in the agricultural sector in the four countries¹².

1.4 The Nordic countries have a unique position to capitalise on the digital transformation of society

The Nordic countries hold a special position as digital frontrunners in the EU (see Figure 3).

Figure 3 Nordic digital frontrunners



Note: The Digital Economy and Society Index measures the progress of EU countries towards a digital economy and society. It consists of five different indicators, each being a relevant measure of the digitisation of the economy and society. The five indicators are all evaluated on a scale from 0 to 100. To obtain the overall score, each score has been weighed by 1/5.

Source: European Commission, The Digital Economy and Society Index 2017

Digital human capital (i.e. basic internet and digital skills as well as the number of ICT specialists and STEM¹³ graduates) is generally high in the Nordic countries. This is among other things due to the advanced basic educational systems of the Nordic countries that educates a workforce, which is highly skilled and willing to adapt to new opportunities. This provides a good potential for new developer talent. Conducive policies can help to ensure that the pool of digital human capital is efficiently directed into the App Economy, promoting further growth in the Nordic countries.

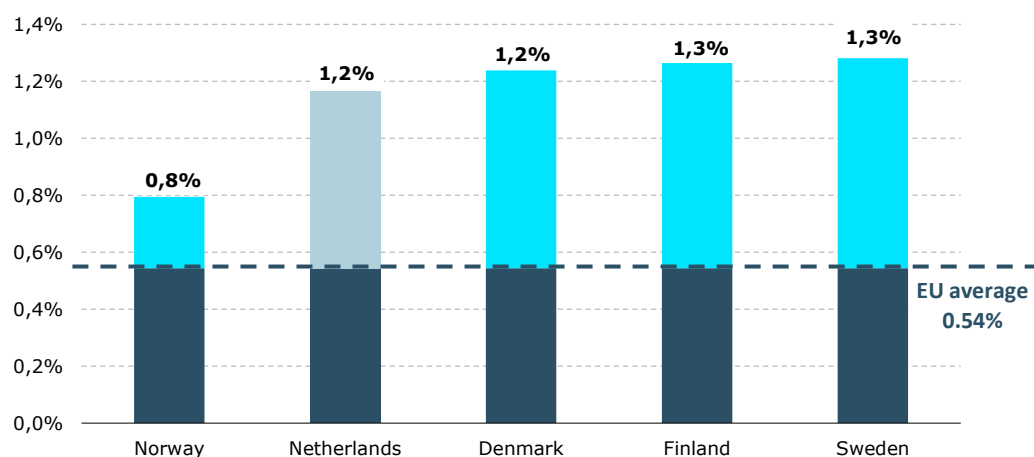
¹² European Centre for the Development of Vocational Training, Cedefop: <http://www.cedefop.europa.eu/en/publications-and-resources/data-visualisations/employment-trends>

¹³ Science, Technology, Engineering and Mathematics

Global thinking is one of the key strengths of Nordic app developers. With very small home markets, Nordic app developers are forced to target the global market directly. This global mindset gives them a competitive edge.

So far, being digital frontrunners has translated into a Nordic leadership position in the App Economy together with the Netherlands (see Figure 4).

Figure 4 App intensity in the Nordic countries compared to EU average



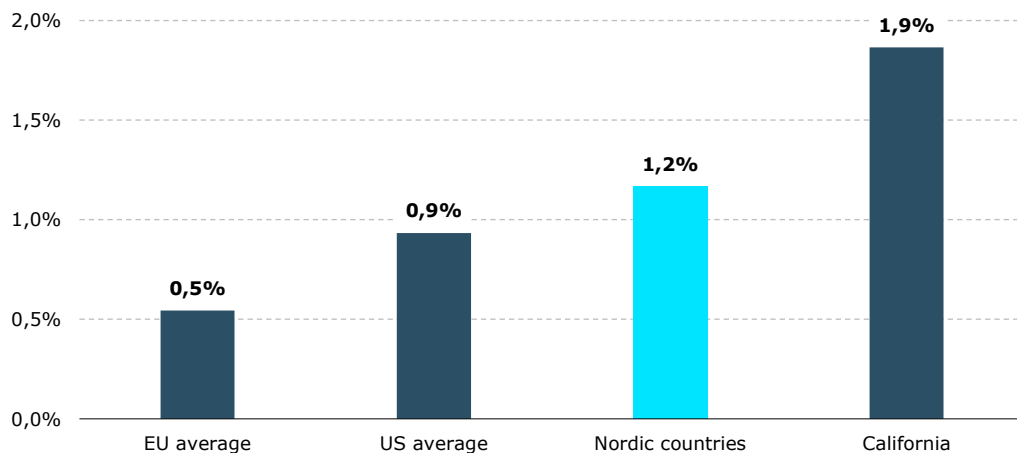
Note: Graph showing the app intensity of each country, compared to the EU-average. App intensity is the percentage of jobs supported in and by App Economy jobs out of all jobs. Numbers pertain to 2015. The app intensity of the Netherlands and the EU average has been estimated from the PPI (2016) study, using a scaling factor based on the estimated job numbers for the Nordic countries.

Source: Copenhagen Economics based on PPI (2016) and own calculations.

The app intensity (i.e. the number of jobs supported by the App Economy as a fraction of all jobs) in the Nordic countries is twice as high as the EU average. This means that the Nordic countries have twice as many jobs supported by the App Economy per 1 million jobs as the EU in general.

Furthermore, the Nordic countries are above the US average in terms of app intensity and are even nipping at the heels of California, home to the famous digital hub Silicon Valley, when it comes to app intensity (see Figure 5). This points to an interesting potential for growth of the Nordic App Economy.

Figure 5 App intensity in the Nordic countries compared to US average, EU average and California



Note: Graph showing the app intensity of the Nordic countries, compared to the US average, EU average and California. App intensity is the percentage of jobs supported in and by app economy jobs out of all jobs. Numbers pertain to 2015. The app intensity of California, the US average and the EU average has been estimated from the PPI (2016) study, using a scaling factor based on the estimated job numbers for the Nordic countries.

Source: Copenhagen Economics based on PPI (2016) and own calculations.

Chapter 2

Nordic App Economy can grow by more than 100,000 jobs in five years

If the right conditions are put in place, the Nordic App Economy could grow by another 100,000 supported jobs over the coming five years. This can only happen if the current bottlenecks in the labour market for developers are resolved such that the Nordic app companies have access to the right supply of coders and developers.

The bottlenecks in the labour market for developers are the number one concern of the Nordic App companies. This was a recurring theme in all the interviews undertaken during this study, across all countries. The app companies point to the fact that currently they cannot grow their business at the pace they would like to. This hampers the economic potential of the App Economy and means that already today the Nordic countries are missing out on job opportunities as a consequence of the shortage of developers.

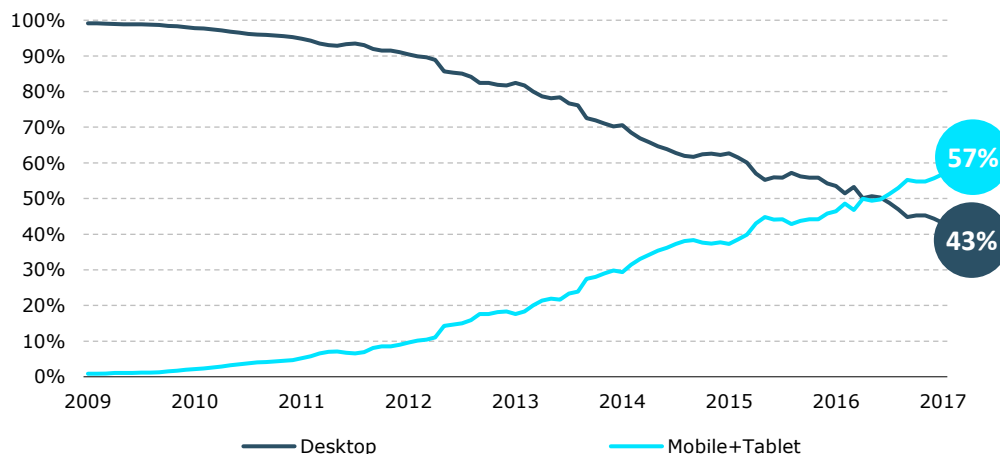
An additional 100,000 supported jobs is a conservative estimate, if the shortages are addressed, as this merely entails that the Nordic countries follow the global trend and do not take advantage of their current digital frontrunner position. With the right conducive policies, it is thus possible to add more than 100,000 supported jobs, if the Nordics succeed in providing an attractive environment for the supporting jobs and headquarter functions of the fast-growing app product firms. Today, many Nordic app developers set up these functions in the US, often in Silicon Valley.

2.1 The future is mobile

Since the introduction of the smartphone, worldwide adoption has been explosive. Following increased functionality, smartphones continually take over tasks that used to be carried out on desktop computers. Today mobile devices have overtaken desktops in internet page views (see Figure 6).

The future is mobile and the economies investing most in this will reap the largest benefits. Being digital frontrunners in the EU, having a leadership position in mobile adoption and in the App Economy, the Nordic countries are ideally positioned to reap the benefits of this development. This would further enhance and support the broader digital transformation of the Nordic economies.

Figure 6 Devices used to access web sites worldwide

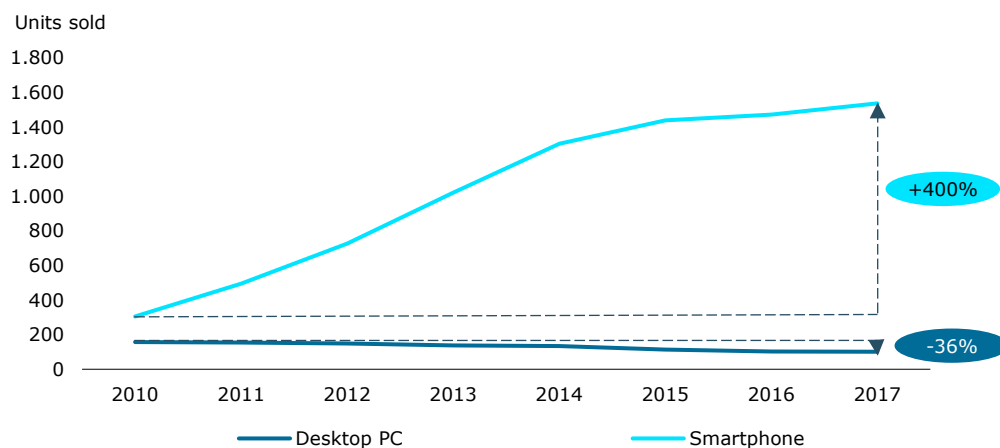


Note: Graph showing which devices people use to access web sites. More than half of worldwide web page views are now undertaken on either a mobile or tablet device.

Source: Statcounter

While desktop PCs are seeing a continuing fall in sales, sales of smartphones are growing at a staggering rate each year (see Figure 7).

Figure 7 Worldwide annual number of PCs and smartphones sold



Note: Graph showing the annual total number of PCs and smartphones sold worldwide.

Source: Statista based on IDC; <https://www.statista.com/statistics/269044/worldwide-desktop-pc-shipments-forecast/> and <https://www.statista.com/statistics/263441/global-smartphone-shipments-forecast/>.

The number of smartphones are growing especially fast in some of the fast-growing emerging economies (see Table 2).

Table 2 Steep increase in smartphone ownership in emerging economies

Percentage of adults who report owning a smartphone

	2013	2014	2015	Change 2013-2015
Turkey	17%	-	59%	+42 percentage points
Malaysia	31%	47%	65%	+34 percentage points
Chile	39%	58%	65%	+26 percentage points
Brazil	15%	24%	41%	+26 percentage points
Russia	23%	33%	45%	+22 percentage points
China	37%	55%	58%	+21 percentage points

Source: PEW Research Center (2016), Smartphone Ownership and Internet Usage Continues to Climb in Emerging Economies

These emerging markets present an enormous potential and apps are a very efficient way of reaching the rapidly growing middle classes in these fast-growing economies (see Box 3).

Box 3: A better place for retail

When it comes to retail, **apps** are much **easier to use** than mobile web pages. A consumer browsing products in an app is **3 times more likely** to buy something, than if he was using the mobile web. The whole world is constantly becoming more mobile, and in Japan and the UK, **more eCommerce transactions** now take place on mobile devices than through desktop PCs.

Source: Criteo (2016), State of Mobile Commerce

Having a global mindset, the Nordic countries are in an ideal position to tap into these growing markets and reach an unprecedented large user base.

2.2 Continued high growth of mobile presents a potential for the highly digitised Nordic countries

All key figures regarding smartphone use are growing at an astonishing rate. Mobile data traffic is growing at a staggering 47% per year. Annual app downloads are growing at 19% per year and has surpassed 90 billion¹⁴. App revenue is growing at almost the same rate as downloads (see Figure 8).

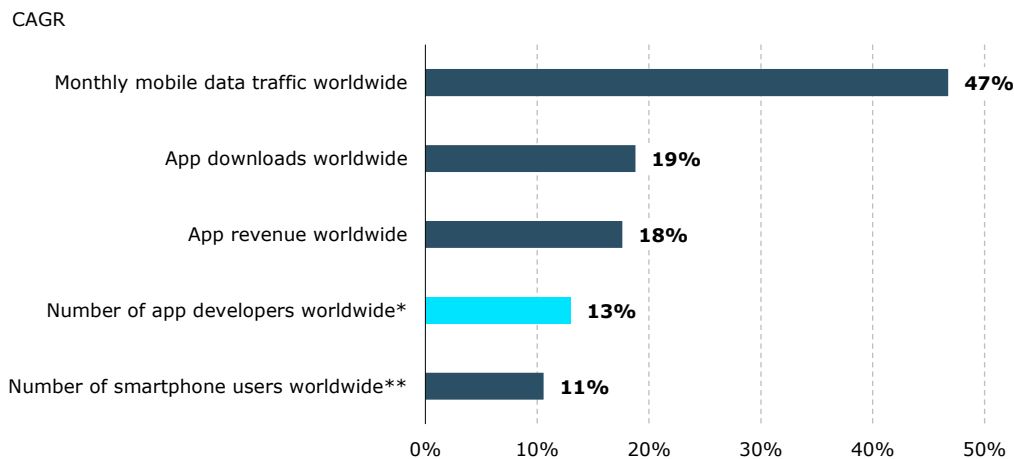
Globally, app stores paid out \$89 billion to developers in 2016, up by 27% from 2015¹⁵. Due to productivity increases and economies of scale, the number of app developers are not growing at the same pace as revenues, but are nonetheless still on an impressive 13%

¹⁴ App Annie (2017), App Annie 2016 Retrospective.

¹⁵ App Annie (2017), App Annie 2016 Retrospective and App Annie (2016), App Annie App Monetization Report.

growth path.¹⁶ In our projection of the number of jobs supported by the Nordic App Economy, we use the 13% global growth as our baseline scenario.

Figure 8 Global growth rates 2016-2021



Note: Graph showing the compound annual growth rate for the projections of the given indicators. The CAGR signifies the average yearly growth rate for the indicator for a given period, taking compound interest into account. * the period is 2015-2020. ** period is 2014-2020.

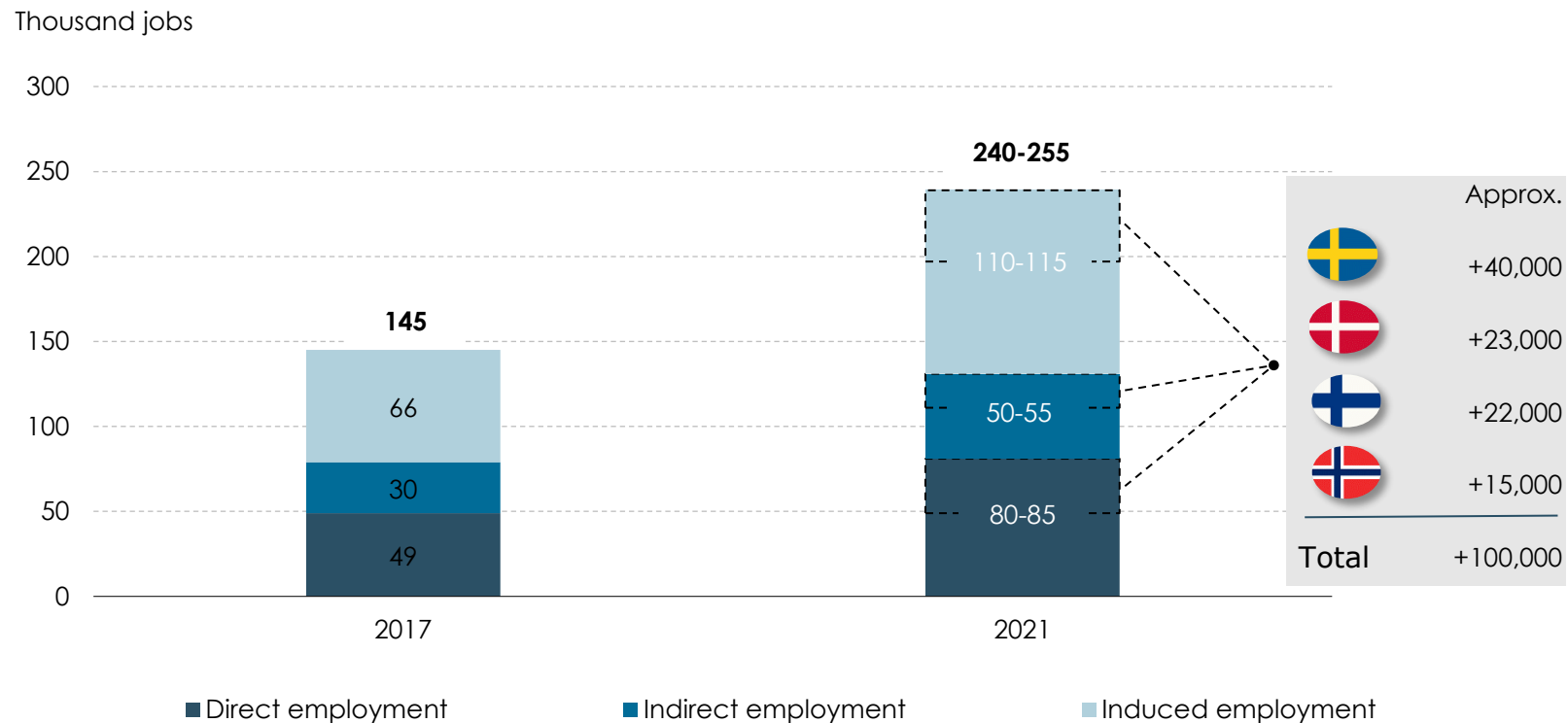
Source: Monthly mobile data traffic worldwide: Cisco whitepaper (2017), Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016-2021. App downloads worldwide and app revenue worldwide: App Annie (2016), App Annie Market Forecast, 2016-2021. Number of app developers worldwide: Vision Mobile (2016), Mobile developer population forecasts 2016-2020. Number of smartphone users worldwide: Statista, <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>, based on data from eMarketer.

2.3 Potential for more than 100,000 new jobs in the Nordics

If the right policies are enacted allowing the number of developers in the Nordic countries to follow the global growth trend of 13% per year, there is a potential for the Nordic App Economy to support 100,000 additional jobs by 2021 (see Figure 9).

¹⁶ Growth rates from Vision Mobile have previously been used in the study “European Mobile & Mobility Industries Alliance (2015), Mobilise Europe”. Growth rates of app developer employment of up to 22% has before been applied in a study for the European Commission (Eurapp (2014) J.G. Breslin, D. Card, M. Dabrowski, M. Mulligan, Sizing the EU App Economy).

Figure 9 Growth of Nordic App Economy jobs, if following global trend



Note: Graph showing the potential number of App Economy jobs in the Nordic countries, if growth follows the global trend. The compound annual growth rate for the number of developers worldwide is projected by Vision Mobile to be 13% in the years 2017-2020. As there are no projections showing a slowing of the App Economy in the immediate years, the growth rate for 2021 has likewise been set to 13%.

Source: Copenhagen Economics based on Vision Mobile (2016), Mobile Developer Population Forecasts 2016-2020 and App Annie (2016), App Annie Market Forecasts 2016-2021

The potential of 100,000 jobs is what will be realised, if the Nordic countries can follow the global trend of growing the number of developers by 13% per year. Using 13% as potential growth for the Nordic countries is a conservative assumption. As the Nordic countries are digital frontrunners in the EU, one would expect them to be able to grow beyond the global trend if all conditions are optimal. With the right policies, the growth potential will thus extend beyond 100,000 jobs.

Today app companies are experiencing growth-hampering bottlenecks in the labour market. They simply cannot get the developers they need, and their ability to capture their share of the growing global market is being held back by lack of developers. A typical small app developer is experiencing a slowing of growth of 15%-20% because of the developer shortage. Hence, if the growth depicted in Figure 9 is to be realised, this demands immediate action to address this shortage in both the long and the short run.

When demand exceeds supply, as is currently the case for developers in the Nordic countries, bottlenecks arise in the labour market. If these are allowed to persist over time, companies will start to move their operations to other countries, where the supply of labour is larger. One way or the other, the companies will find the labour they need to thrive. The question is whether it will be in the Nordic countries, benefitting the local economies or in some other country.

Of the growth potential of 100,000 supported jobs depicted in Figure 9, approx. 30,000 are direct jobs. In comparison, the number of business and administration professionals in the Nordics are projected to increase by 49,000 jobs, the construction sector by 30,000 jobs while the agricultural sector decreases by 15,000 jobs combined in the four countries, in the same period¹⁷. This implies that in five years from now, direct app employment could amount to 80,000 or what corresponds to around one-third of projected employment in agriculture. The App Economy thus presents an ample opportunity for adding jobs to the economies of the Nordic countries.

When app companies start to gain success, it is crucial to be able to scale accordingly and most of all, do this fast. Besides adding developers to the company, this entails hiring extra people in marketing, HR, finance and other administrative functions. However, today app companies move many of these headquarter functions to e.g. the US, as the availability of people with the right skills is higher there. If the Nordics can provide more of this talent locally, there is a potential for adding 30,000-40,000 extra supported jobs during the next five years.

2.4 App Economy jobs are high-value jobs

The jobs in the App Economy are generally high-value-added jobs. The core App Economy jobs are the actual app developers. In the national statistics, these are represented in

¹⁷ European Centre for the Development of Vocational Training, Cedefop: <http://www.cedefop.europa.eu/en/publications-and-resources/data-visualisations/employment-trends>

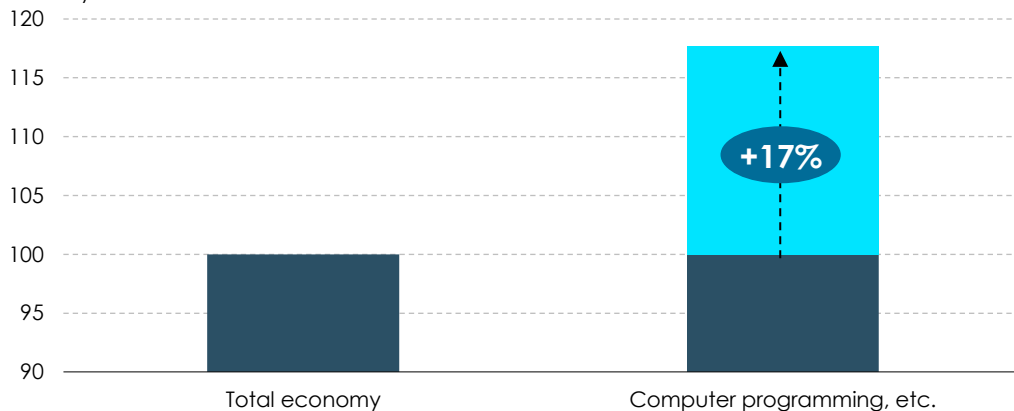
the official statistics as “computer programming, consultancy and related activities; information service activities”¹⁸.

On average, jobs in computer programming add 17% more value than an average job in the Nordic countries.

Figure 10 High value added in the App Economy

Value added per employee

Index, total economy = 100



Note: Graph showing an index of the combined value added per employee in the industry “Computer programming, consultancy and related activities; information service activities” in the input-output tables of the four Nordic countries, compared to a combined average for the total economy. Average value added per employee across the four economies is index 100.

Source: Copenhagen Economics based on World Input Output Database and national statistics

Succeeding with continued growth of the App Economy and helping more people to acquire the skills required to be productive in this sector would add several billions to GDP across the Nordic countries.

A recent government report showed a potential from digital transformation of DKK 87 billion in Denmark alone¹⁹.

The digital frontrunner position of the Nordic countries presents a unique opportunity to ride the digitisation wave and create jobs in the process. Digitisation of jobs and society will take place with or without the involvement of the Nordic region. The question is whether we are able to fill the new high-value-added jobs in the Nordic region or see them grow in the United States and Asian countries instead.

¹⁸ As this is a firm-wide code, it is not exclusively made up of app developers, as app developers can also be found in other industries of the national statistics. Because of this, among other things, estimating the GDP contribution from app developers is not straightforward.

¹⁹ Danish Ministry of Industry, Business and Financial Affairs, (2017), Danmark som digital frontløber.

2.5 The ripple effect on other industries of a growing App Economy

Expansion and improvement of the App Economy in the Nordic countries can ripple through the whole economy. The ripple effect is an economic spill-over, where the knowledge and skills of companies in the App Economy can give rise to benefits across the value chain. This could, e.g., be through productivity increases for its suppliers and consumers.

Many apps increase the productivity of the user by offering easier and smarter ways of carrying out different tasks. Productivity increases from apps are however difficult to assess on a larger societal scale. That they exist are, however, undisputed and they thus add value to society beyond the number of jobs supported by the App Economy.

There is also the possibility that individuals with app skills move into other sectors, taking with them a digital and efficient way of thinking. In the long run, this might entail positive effects through a broader range of industries.

As development of the app sector helps prepare the Nordic countries for the digital transformation of society, this presents a unique opportunity for being global frontrunners and capitalising on digitisation.

Chapter 3

Identifying the key policy choices influencing job growth in the Nordic App Economy

If the right conducive conditions are put in place, to allow the number of Nordic app developers to grow by the global trend of 13% per year, there is a potential for the Nordic App Economy to support 100,000 additional jobs by 2021.

Furthermore, if it is possible to re-shore more app headquarter functions, i.e. HR, marketing, finance and management, to the Nordic countries there is a potential for increasing the number of supported jobs by an additional 30,000-40,000. This brings the total potential number of jobs supported by the Nordic App Economy to 285,000 by 2021.

3.1 Policy choices influence the growth of App Economy jobs in the Nordic countries

The growth in the number of jobs supported by the Nordic App Economy is highly dependent on the policy choices being made today. App companies in the Nordic region are already experiencing growth-hampering shortage of developers. This demands immediate action, if the growth potential of the 100,000 extra jobs supported by the Nordic App Economy is to be realised.

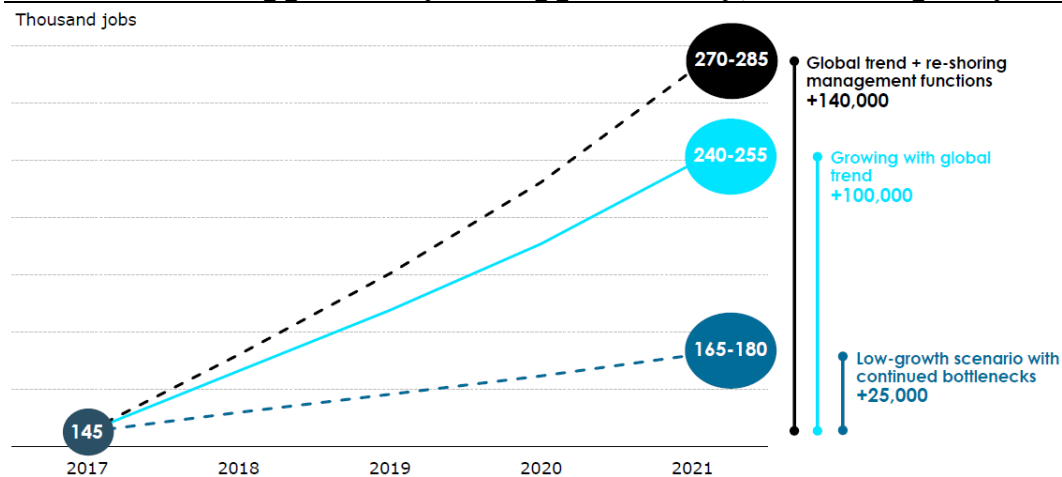
When app companies start to gain traction in the market, they need to add HR, management and support jobs to their team of core developers. These are, e.g., business and marketing professionals with an intimate understanding of the digital sector. To be successful, the app firms need to scale their business very rapidly and need HR and marketing professionals with this particular experience. This very often goes hand in hand with the access to the right risk capital (e.g. venture capital). However, many of the interviewed app developer companies stated that they are unable to find individuals with these skills in the Nordic countries. As a consequence, they turn to the US to find people with the required skills, and many app firms have their headquarter and support functions in the US, typically in Silicon Valley.

The Nordic region has an opportunity to add even more jobs to the App Economy, if more people with the right skills in support jobs could be found or attracted to work here, and gradually grow the competences needed to provide management and support functions in the Nordic region. Increasing the number of app HQ functions in the Nordic countries could add an additional 30,000-40,000 supported jobs. This brings the total potential to approx. 140,000 additional jobs supported by the App Economy in 2021 (see Figure 11). If the potential increase in app HQ functions is distributed proportionally to the number of

developers across the Nordic countries, the total number of additional jobs would be 59,000 in Sweden, 29,500 in Finland, 31,500 in Denmark and 19,500 in Norway.²⁰

Should the growth-hampering bottlenecks persist, there is a risk of the growth in jobs only amounting to 25,000 or less (see Figure 11). The difference between good conducive policy choices and laissez-faire inaction is up to 115,000 supported jobs.

Figure 11 Projection of the combined number of jobs in the Nordic countries supported by the App Economy, based on policy



Note: Projection showing three scenarios for the number of jobs supported by the App Economy in the Nordic countries from 2017 to 2021. Not addressing the shortage is based on linkage of data from several sources on projections of supply, demand and shortage of ICT workers in the Nordic countries. These are Empirica for the European Commission (2014), "E-Skills for Jobs in Europe: Measuring Progress and Moving Ahead" with associated country specific reports and the Danish Business Authority (2016), "Virksomheders behov for digitale kompetencer". Addressing the shortage of workers assumes that policies and initiatives are enacted to increase the supply of developers. As a result, job growth in the Nordic countries is set equal to the global average job growth of developers in the App Economy. This can be said to be a conservative assumption, as the Nordic countries currently have the highest app intensities in the EU, even ahead of the USA. Increasing the ratio of support jobs shows the potential, if the Nordic countries are able to increase the ratio of support jobs to app specialists in the future. Job growth of app professionals in this scenario follows global growth. Global CAGR for App Economy jobs for the period is 13% as projected by Vision Mobile.

Source: Copenhagen Economics based on Vision Mobile (2016), Mobile Developer Population Forecasts 2016-2020, App Annie (2016), App Annie Market Forecasts 2016-2021, Empirica for the European Commission (2014), E-Skills for Jobs in Europe: Measuring Progress and Moving Ahead and Danish Business Authority (2016), Virksomheders Behov for Digitale Kompetencer

Through the interviews carried out during this study, all firms across the Nordic countries expressed the bottleneck in the labour market for developers as their number one concern. They are pointing to the fact that they cannot grow their business at the pace they would like to, hampering their economic potential. Many app developers have set up offices in other countries, to obtain the desired workforce. This means that already today the Nordic countries are missing out on job opportunities as a consequence of these shortages of developers.

²⁰ The total number of supported jobs by 2021 would accordingly be 119,000 in Sweden, 60,000 in Finland, 66,000 in Denmark and 40,000 in Norway.

3.2 Policy recommendations

To achieve the full potential of the Nordic App Economy, policy-makers in all four countries must focus on maintaining the good fundamental environment and regulation, reduce the bottlenecks in the labour market for developers and accelerate the growth drivers related to management and support jobs, and the access to risk capital (see Figure 12).

1

Reduce bottlenecks in the labour market for developers

The severe shortage of developers in the Nordic countries is by far the most pressing issue for the developers. For some, the bottlenecks are even hampering growth, forcing them to open offices in countries outside the Nordic region and Europe, in search of the right talent. To reduce bottlenecks, policy-makers can consider the following four actions.

A) Provide short-term intense coding courses

Being a skilled developer is not necessarily correlated with a long education. Not everybody needs to complete a university degree to become a capable developer or coder. If individuals possess a natural interest (maybe spurred as a kid), an intense training course might be enough. One example of this is Udacity, which provides online training and “nano-degrees” in, e.g., app development and coding.

This recommendation provides part of an instant solution to a currently pressing problem, immediately taking the Nordic countries one step closer towards realising the potential of 100,000 jobs by 2021, but cannot stand alone as the only solution.

B) Increase uptake and completion rate at university level

Increasing the uptake and completion rate of candidates on computer science and IT programmes is an integral part of increasing the digital workforce. However, this is a long-term investment to a currently pressing problem and cannot stand alone.

C) Attract international talent

Many developers expressed the need for attracting international talent and international workforce. Not only to address the bottlenecks in the local labour market, but also to bring valuable international knowledge into a globally thinking organisation. Decreasing the barriers to workforce mobility from countries outside the EU will therefore provide an instant improvement as a part of addressing the current labour shortage. Again, this solution cannot stand alone, but will provide an important part of an integrate solution to the labour shortages.

D) Introduce (more) coding in primary school to spur interest

(More) experience with coding as a child can spur interest for pursuing a career in this field later in life. This can help to increase the future workforce for digital firms.

The road to becoming a skilled developer does not necessarily go through university. For some, the interest is spurred as a child and for many of the best developers, self-learning actually paved the way to a career as app developer later in life. For others, an early experience with coding can lead them to an IT education at university. Common for these solutions are that they are long-term answers to a currently pressing problem and hence cannot resolve the immediate bottleneck.

2 Accelerate growth drivers

According to our interviews with successful and fast-growing Nordic app developers, employees with the right skills in app support jobs are very hard to come by in the Nordic countries (and in Europe in general). This means that when up-coming app developers obtain success and experience accelerating growth and the need to scale their business, they have to go to, e.g., the United States to find people with the right skills.

This opens up for the possibility of enhancing the growth of the App Economy by adding more jobs in support functions.

A) Foster skills for App Economy growth (HQ functions)

Add more people with skills in business, product management and marketing within the digital economy. This can either be done by increasing uptake at university level, introducing new study programmes with a digital focus or provide further training for the professionals already in jobs, who might be in need of angling their knowledge towards the digital area.

B) Better access to capital

The interviewed developers pointed out that risk capital is easier to access in the United States than in the Nordic countries. This provides an opportunity for the Nordic countries to increase access to risk capital and angel investors.

3 Maintain fundamentals

In the Nordic countries, the fundamentals are in place in terms of an environment conducive to digital start-ups and entrepreneurs. Policy-makers should ensure to maintain these fundamentals and avoid enacting counterproductive policies in these areas.

There are two points to this recommendation.

A) Good environment for entrepreneurs and start-ups

The Nordic countries have a stable economic environment where it is easy to start a new business²¹, with government seed funding programmes and high social security.

B) Stable regulatory framework

To succeed as an app developer, being proficient in multiple coding languages is required. As shown, Nordic app developers use several platforms to reach the global market. These platforms are substitutable and developers need to be able to offer their apps on all leading platforms to access the full potential of the market.

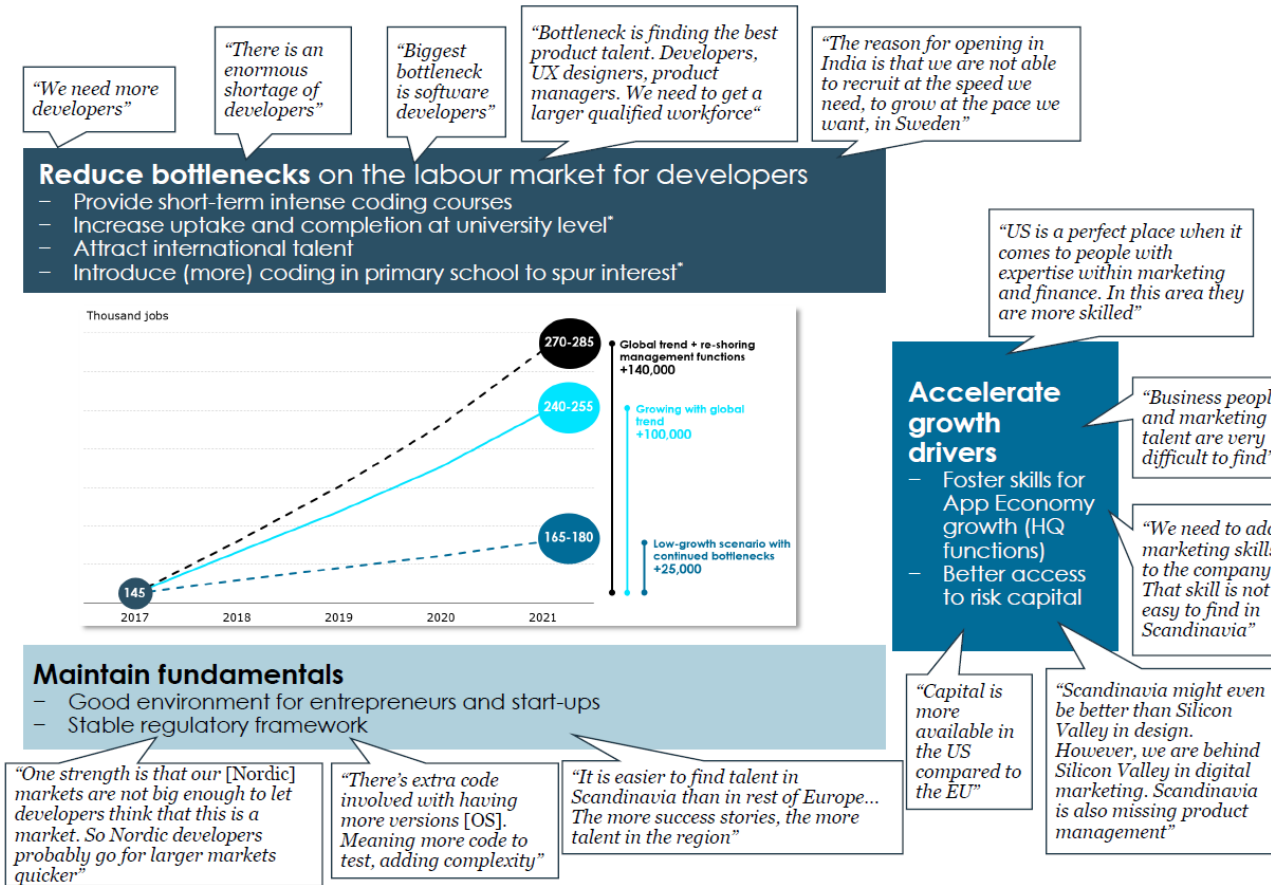
To continue the success, Nordic app developers need continued easy access to a global market. The App Economy is extremely export-oriented – a typical Nordic app firm has 80% or more of revenues outside the home country.

The ability to develop apps to the global market, especially for small developers and start-ups, which forms the cornerstone of the Nordic app economy, hinges on the benefits of compatibility across devices. Compatibility keeps development costs down and reduces time to market. Both crucial aspects for entrepreneurs and start-ups.

The current great outcome in terms of high value added jobs could not have been achieved without such compatibility. Thus, it is crucial for the continued growth to maintain the regulatory framework, which ensures the well-functioning business model for the app economy.

²¹ World Bank (2016), Doing Business 2017

Figure 12 Policy recommendations



Note: Figure depicting the policy recommendations based on developer interviews and knowledge collected in the study. * These recommendations are long-term solutions as it takes several years before the effect on the labour market for developers can be seen. All quotes are from the Nordic app developers interviewed during the study.

Source: Copenhagen Economics based on developer interviews.

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