



International Digital Economy and Society Index (I-DESI)

FINAL REPORT

A study prepared for the European Commission
DG Communications Networks, Content & Technology
by:

 **Capgemini Consulting**

*Digital
Single
Market*

This study was carried out by Capgemini Consulting for the European Commission, Directorate General for Communications Networks, Content and Technology



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Executive Summary

Reviewing digital performance of Europe at global level

The Digital Single Market Strategy aims to enhance the transformation and the growth potential of the European Digital Economy, and is currently one of the top-priorities of the Juncker Commission. To achieve a truly Digital Union, reforms are needed at the EU level, as well as at national and regional levels. The European Commission has introduced The Digital Economy and Society Index (DESI) to yearly evaluate the evolution of five key dimensions of the Digital Economy in EU member states in order to understand what these reforms should address. Each dimension reflects a relevant policy area: Connectivity, Human Capital, Use of Internet (citizens), Integration of Digital Technology (businesses), and Digital Public Services. Each dimension consists of both supply and demand indicators.

Obviously, the Digital Economy is not something typically European, but a global phenomenon. In order to leverage the potential of the digital economy in Europe and identify room for improvement, it is also important to review the digital performance of the EU on a global level. This report introduces the International DESI (I-DESI), which evaluates the performance of both the individual EU countries and the EU as a whole in comparison to 15 other countries: Australia, Brazil, Canada, China, Iceland, Israel, Japan, Korea (Rep.), Mexico, New Zealand, Norway, Russia, Switzerland, Turkey and the United States.

The International DESI is structured like the DESI, but not strictly comparable

The I-DESI follows the same structure as the existing DESI, but it differs significantly from the DESI with respect to the indicators used. Ideally, the I-DESI would have been prepared with indicators identical to those used in the DESI. However, experience shows that there are many differences in data collection and definitions when moving outside of Europe. This is not necessarily a bad thing (even though one would wish for global consistency in statistical data collection), nor does it result in a less valuable analysis, just a *different* analysis.

Indicators included in the I-DESI seek to portray the same phenomena as those included in the DESI. However, the specific definitions of many indicators in the I-DESI differ from those in the DESI. The I-DESI uses data from various internationally recognised sources, such as the OECD, the United Nations, commercial data providers (e.g. ITU and Google/TNS Infratest) and also national statistical offices. This results in the fact that the I-DESI and the DESI are not directly comparable. The I-DESI scores and rankings for EU-countries on individual indicators, sub-dimensions, dimensions and in the overall index may differ from the scores and rankings in the DESI. In order for a country to learn in which areas improvements are necessary and to fully comprehend the I-DESI, how it is composed, what definitions are used and how calculations were performed, it is highly advisable to carefully read the methodological note and the indicator descriptions in the annex of this report. This is especially helpful in understanding differences between I-DESI and DESI. The Commission and project team are open for questions or feedback.

In addition, due to different availability of indicators for different countries outside the EU, the I-DESI 2015 was developed using a tiered approach. Tier-1 comprises the countries for which a richer set of indicators could be gathered. It was calculated using 28 indicators, for the EU28 countries, Australia, Canada, Iceland, Japan, Korea (Rep.), Norway, Switzerland, and the United States. Tier-2 was calculated in order to include a broader set of countries for which there are less indicators available than for the Tier-1 countries. Tier 2 is based on a smaller set of 18 indicators and comprises all the Tier-1

countries plus Brazil, China, Israel, Mexico, New Zealand, Russia and Turkey. The two tiers are in fact separate indices and should not be directly compared to each other as they consist of different indicators (and different weighting schemes).

Overall results: top European performers also lead globally, but Europe as a whole has room for improvement

The main ranking of countries in the I-DESI 2015 (Tier-1) shows that the top European performers are also leading countries at the global stage. The top-three performing EU countries (Sweden, Denmark, and Finland) are closely followed by Korea (Rep.), Iceland and the United States. The other non-EU countries (Norway, Japan, Switzerland, Canada, and Australia) are also performing above the EU average.

Regarding *Connectivity*, Korea (Rep.) and Japan are ahead of Europe. Korea (Rep.) is among the top performers on all sub-indicators of this dimension, and excels especially in the speed of their internet connections. Japan is leading in mobile broadband (both take-up and coverage). The top-three performing EU countries are on par or just behind Japan. Switzerland also reaches a high level of connectivity.

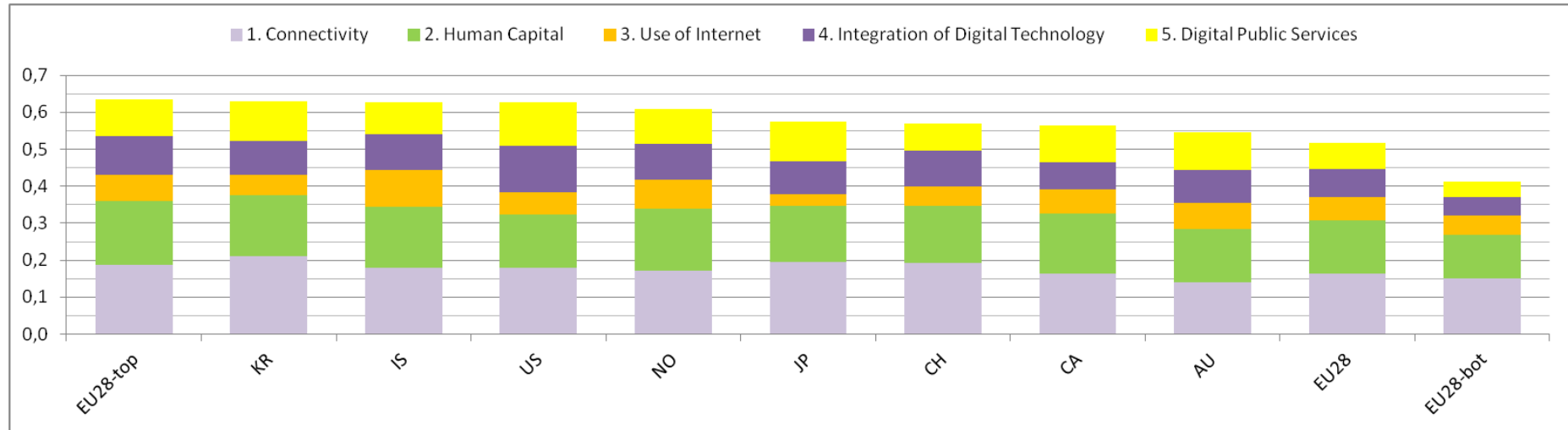
The *Human Capital* dimension focuses on digital knowledge and skills. The results show that EU countries are in the lead. The top-three of EU countries is also leading at a global stage, followed by Norway on par with the first non-European country: Korea (Rep.). Canada performs well above the EU average. Japan, the United States and Australia are still above but closer to the EU average. Zooming in to the individual indicators, Iceland leads in frequency of internet use, and Finland and Sweden have the highest percentage of people with ICT specialist skills as well as the highest share of graduates with STEM education.

Use of the Internet focuses on the performance of a wide mix of online activities by citizens. On average, the EU is far ahead of Japan, Korea (Rep.) and the United States. Iceland is the best performer in this dimension, and it even leads in two of the three sub-dimensions (Content and Communication). Top EU countries complement Iceland in the top-three. Japan and Korea (Rep.) score far below the EU average in this dimension. In particular, usage of social networks is very low in Korea (Rep.), whereas online shopping and banking is very low in Japan. Australia, which has low usage of social networks, scores particularly well in online banking and shopping. The United States rank below, but close to, the EU average.

Results in *Integration of Digital Technology*, which focuses on the digitisation of businesses, show the United States as the clear world leader. The top three best performing EU countries (Finland, Denmark and Sweden) are following the United States, but at some distance. In the United States, businesses exploit the advantages of technologies such as RFID and cloud services. In particular, a high share of companies has an online presence. Ireland and the Czech Republic are Europe's top performers in e-commerce. The EU's three worst performers (Greece, Bulgaria and Romania) are well behind, explaining the relatively low EU average.

The *Digital Public Services* dimension focuses on the demand for and supply of online public services as well as the countries' commitment to open data. Results show that the United States is leading this dimension, closely followed by the average of the best performing EU countries (being France, the United Kingdom and the Netherlands). They are followed by Korea, Japan, Australia and Canada, all being way ahead of the EU average. Quick wins for the EU could be realized by improving the state of online public services in countries lagging behind.

Figure I. I-DESI 2015 main ranking (Tier-1¹)



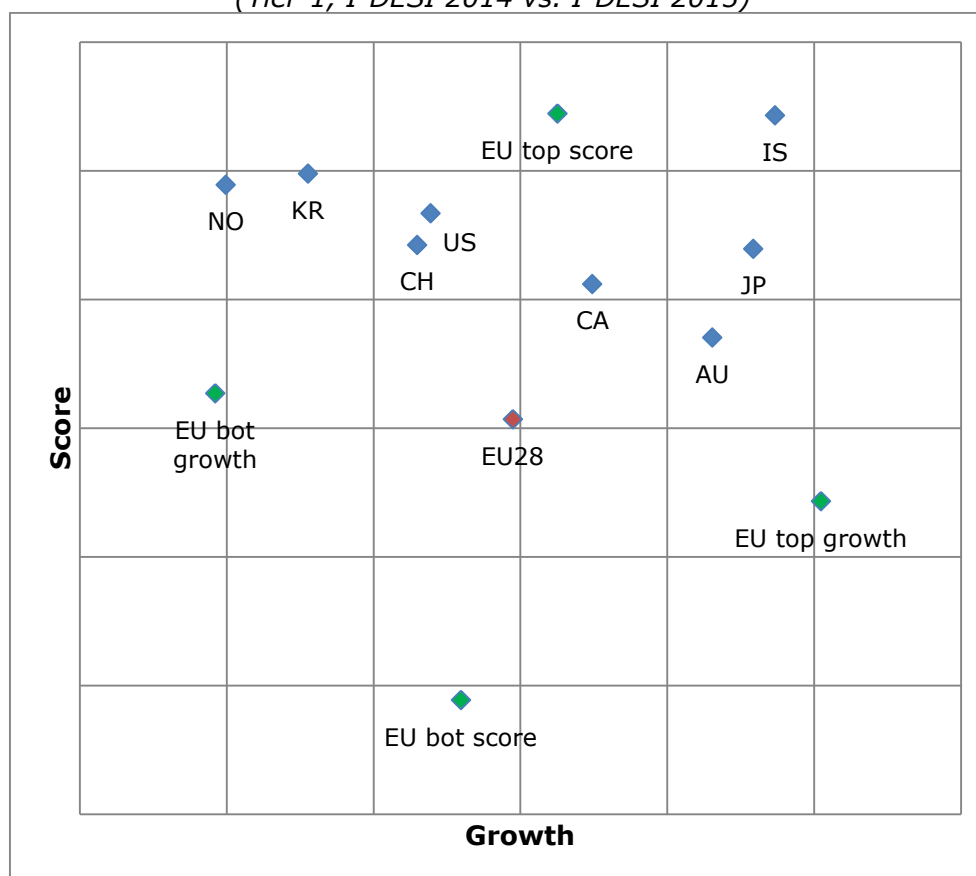
¹ Consult Annex 1 for the list of country acronyms. EU28-top indicates the average of the three best performing EU countries. EU28-bot provides that insight for the worst performers.

Closing the gap within Europe to realise the potential of a Digital Single Market

The results of this report show that European countries can compare with the best worldwide, and some are even ahead. It also shows that the European countries combined - the ultimate goal of a Digital Single Market - are not on par with global top performers. **Is Europe closing the gap?**

The analysis also allows to compare countries over time (I-DESI 2014 vs. I-DESI 2015). In figure II, countries are displayed based on their absolute performance in 2014 (vertical axis) and their growth in performance (horizontal axis). It reveals that, although the European Union as a whole (EU28) is behind major economies in terms of absolute performance, it is advancing faster than for instance Korea and the United States. It also shows that European countries outperform their global counterparts on one or the other axis: the three top-performers of the EU reach highest absolute scores, while demonstrating a faster growth than countries such as Norway, Korea, Switzerland and the United States. The potential of a European Digital Single Market arises from this analysis; the challenge – and unmistakable need to remain competitive in the Digital era – is to unite and close the gaps within the Union itself. That would deliver on the promise of a European advantage.

*Figure II. Country performance and progress over years
(Tier-1, I-DESI 2014 vs. I-DESI 2015)²*



Results for countries only included in Tier-2 (Brazil, China, Israel, Mexico, New Zealand, Russia and Turkey) show them typically performing below the EU average across all dimensions, except for a few exceptions. China is, for instance, a top-performer in the

² EU28-top indicates the average of the three best performing EU countries. EU28-bot provides that insight for the worst performers.

Human Capital dimension, and Russia also scores above the EU average on this dimension. Another notable positive exception is New Zealand, which consistently performs above the EU average, and is even leading in two dimensions (Use of the Internet and Integration of Digital Technology).

Abstract

This report introduces the International Digital Economy and Society Index (I-DESI), which evaluates the digital performance of EU countries and the EU as a whole, in comparison to 15 other countries (Australia, Brazil, Canada, China, Iceland, Israel, Japan, Korea (Rep.), Mexico, New Zealand, Norway, Russia, Switzerland, Turkey and the United States). The I-DESI benchmarks the development of the digital economy and society in Europe against top world peers so as to identify room for improvement. The results show that the top countries in Europe are also leading in the global stage. The three top performing countries (Sweden, Denmark and Finland) are closely followed by Korea (Rep.), United States and Japan. The EU as a whole scores high in three out of the five main dimensions (Use of the Internet, Human Capital and Integration of Digital Technology). However, the results also show that the EU is behind the non-EU top performers in the other two dimensions (Connectivity and Digital Public Services) and on specific individual indicators. Moreover, there are substantial differences between EU member states concerning both score and progress over time (I-DESI 2014 vs. I-DESI 2015). Europe is progressing to slowly bridge this gap, which is pivotal to realise the potential of a Digital Single Market.

1 Introduction

1.1 Background

Enhancing and improving the Digital Single Market is one of the top-priorities of the Juncker Commission³. Internet and digital technologies have become the driving force for transforming the modern world and its economy. The vast economic potential of this digital transformation for European economies has captured the attention of both national governments and European policy-makers due to its potential to contribute to Europe's competitiveness, employment and industrial leadership. Transforming into a digital economy, and ensuring that Europe's economy, industry and employment take full advantage of what digitalization offers, has the potential to contribute €415 billion per year to our economy and create hundreds of thousands of new jobs. Europe's strategy to embrace the digital economy is laid out in its Digital Single Market strategy⁴, unveiled in May 2015. It focuses on:

- better access for consumers and businesses to digital goods and services across Europe: facilitating e-commerce, tackling geo-blocking, modernising copyright and simplifying VAT arrangements;
- creating the right conditions, by levelling a playing field and environment for digital networks and services to flourish: infrastructure as a backbone for innovative digital services, 4G, increasing transparency and trust, personal data protection;
- digital for growth - maximizing the growth potential of the digital economy: industry 4.0, standards, data economy, cloud computing, interoperable e-services and digital skills.

The Digital Single Market Strategy aims to maximise the growth potential of the European Digital Economy and of its society, so that every European citizen can enjoy its full benefit. But in order to get there, a lot of work remains to be done. To achieve a real Digital Union and to reap the benefits of a Digital Single Market, reforms are needed at EU-level, but they are also needed at national- and regional-level in Member States. In order to know what is needed at these different levels, it is important to regularly evaluate the current stage of the several components of aspired digital economy. The European Commission has therefore introduced The Digital Economy and Society Index (DESI). The DESI is a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU member states in digital competitiveness.

But in order to leverage the potential of the digital economy in Europe and to discover where Europe could improve, it is also of great relevance to benchmark Europe's digital performance on a global scale.

1.2 Objectives

The objective of the study is to develop the International Digital Economy and Society Index (I-DESI), and to calculate the index for two years (covering data for 2013 and 2014, or as recent as possible when these years are not available).

This is done through procuring existing data suitable for the development of the I-DESI. This international index allows for comparisons between the EU and other leading world

³ https://ec.europa.eu/priorities/index_en

⁴ <http://ec.europa.eu/priorities/digital-single-market/>

economies, and reveals where the EU stands with regards to its digital maturity as compared to these other countries. By including 2013 and 2014 data, progress on the five dimensions in the index can be tracked.

The International DESI (I-DESI) measures progress towards a digital economy and society of EU countries individually and the average EU performance compared to 15 other countries: Australia, Brazil, Canada, China, Iceland, Israel, Japan, Korea Mexico, New Zealand, Norway, Russia, Switzerland, Turkey, and the United States.

The outcome of the study enables European and national policymakers to draw international comparisons regarding the digital performance of their region or country. These comparisons are important, because they define Europe's performance at a global scale with regards to their digital maturity. Europe has the ambition to embrace the digital economy, with the aim of enhancing Europe's competitiveness, creating employment and strengthening Europe's industrial leadership.

1.3 Data gathering

The index is partly based on desk research, consulting the databases and reports of relevant organizations. Among these organizations are international organizations like the OECD, the United Nations, and the European Union (Eurostat). Data stemming from the databases of these organizations is complemented by data from national statistical (census) bureaus, and by data originating from commercial data providers (e.g., ITU). For some indicators related to the use of internet, the OECD relies on the Google Consumer Barometer⁵. We followed their approach in using these data, which is gathered and developed by TNS Infratest on behalf of Google.

To tap into (knowledge of) data sources that are difficult to find online or understand due to language issues, the study team relied on its network of contacts. Ideally the team contacted researchers within the statistical bureau of each non-EU country.

The collected data (either through web research or received from contacts) is checked and validated, a 'logic control' and quality control on the data received:

- Is it the right data: is it the data we are looking (definition) for and does it comply with our criteria?
- Is the data complete?
- Are the data values conform expectations?

1.4 Overview of the (International) Digital Economy and Society

This I-DESI is structured around the same 5 dimensions as the original European DESI (table 1.1). Together they compose the key elements of the Digital Economy: Connectivity and Human capital (digital skills of users and practitioners) can be considered as the enablers of the digital economy and society, of which citizens ('Use of internet') and businesses ('Integration of Digital Technology') and governments ('Digital public services') can and should benefit.

⁵ <https://www.consumerbarometer.com/en/>

Table 1.1 (I-)DESI dimensions

Dimension	Description
Connectivity	The Connectivity dimension measures the deployment of broadband infrastructure and its quality. Access to fast broadband-enabled services is a necessary condition for competitiveness.
Human Capital	The Human Capital dimension measures the skills needed to take advantage of the possibilities offered by a digital society. Such skills go from basic user skills that enable individuals to interact online and consume digital goods and services, to advanced skills that empower the workforce to take advantage of technology for enhanced productivity and economic growth.
Use of Internet	The Use of Internet dimension accounts for the variety of activities performed by citizens already online. Such activities range from consumption of online content (videos, music, games, etc.) to modern communication activities or online shopping and banking.
Integration of Digital Technology	The Integration of Digital Technology dimension measures the digitisation of businesses and their exploitation of the online sales channel. By adopting digital technology businesses can enhance efficiency, reduce costs and better engage customers, collaborators and business partners. Furthermore, the Internet as a sales outlet offers access to wider markets and potential for growth.
Digital Public Services	The Digital Public Services dimension measures the digitisation of public services, and focuses in particular on eGovernment. Modernisation and digitisation of public services can lead to efficiency gains for the public administration, citizens and businesses alike as well as to the delivery of better services for the citizen.

The I-DESI, much like the DESI, allows for four main types of analysis:

- General performance assessment: to obtain a general characterisation of the performance of individual Member States and the EU as a whole by observing their overall index score and the scores of the main index dimensions.
- Zooming-in: to pinpoint the areas where the EU and Member State performance could be improved by analysing the scores of the index's sub-dimensions and individual indicators, in comparison with non-European countries.
- Follow-up: to assess whether there is progress over time (2013-2014).
- Comparative analysis: to cluster Member States according to their index scores, comparing countries in similar stages of digital development in order to flag the need for improvement in relevant policy areas.

Ideally, the I-DESI would have been prepared with indicators that are identical to the ones used in the DESI. The experience is however that there are many differences in data collection and definitions when moving outside of Europe. This is not necessarily a bad thing (even though one would wish for global consistency in statistical data collection), and does not result in a less valuable analysis, just a *different* analysis. The next chapter will further explain the differences.

1.5 Structure of this document

This document presents the methodology used for the study and the results of the assessment for all Member States and the selected external countries, gathered through desk research and provided by national statistics offices and international sources.

This final report is structured around five chapters:

1. Introduction providing the background and context of the study;
2. The research approach;
3. The ranking and results for Tier-1
4. The ranking and results for Tier-2;
5. The conclusion and insights.

A detailed description of the indicators comprised in the I-DESI is included in Annex 2.

2 Approach

This chapter explains how the I-DESI is structured, which criteria have been used, how the data is gathered and what kind of analyses have been performed in order to obtain robust data and valuable insights. The methodology builds on the method of the existing DESI, and is structured around the same dimensions as the DESI. Therefore, this chapter is based on the DESI Methodological Note⁶, which served as the starting point for I-DESI research.

2.1 Structure of two tiers in the I-DESI

The I-DESI 2015 uses a tiered approach as it was proven impossible in practice to collect comparable data for all indicators for all countries. Based on availability of indicators it was possible to make two groups of countries, based on the following approach:

- the first tier is computed for the EU countries plus at least the USA, Japan and Korea. The second tier is computed using a shallower set of indicators for the EU countries plus all the remaining countries;
- the first tier includes as many indicators as possible that correspond with the DESI indicators.
- the first tier is not limited to EU countries and the USA, Japan and Korea. If for other countries, e.g. Australia, the same amount of data is available as for USA, Japan and Korea, then Australia will be added to the first tier;

This lead to two subsets of countries: the first subset of countries (Tier-1, EU28 plus Australia, Canada, Iceland, Japan, Korea, Norway, Switzerland, the United States) is calculated based on 28 indicators, whilst the second subset of countries (Tier-2: Tier-1 plus Brazil, China, Israel, Mexico, New Zealand, Russia and Turkey) is calculated based on a shallower set of 18 indicators⁷.

The structure of both Tier-1 and Tier-2 is presented in table 2.2. The two tiers are separate indices and cannot be directly compared, since they consist of different indicators and consequently, different weightings were applied. In particular dimension 4 differs significantly between Tier-1 and Tier-2. The progress of the several countries is tracked by comparing I-DESI 2014 scores with I-DESI 2015 scores. For both Tier-1 and Tier-2 in the I-DESI 2014 some indicators had to be dropped due to data availability. It is important to take these different sets of indicators into account when interpreting the results.

Table 2.1 Countries included in Tier-1 and Tier-2

Tier-1	All EU28 countries	Japan	Korea (Rep.)	United States	Australia	Canada	Iceland	Norway	Switzerland
Tier-2	All Tier-1 countries	Brazil	China	Israel	Mexico	New Zealand	Russia	Turkey	

The main dimensions of the I-DESI represent the five principal policy areas of concern for a digital economy and society. These are not isolated areas that contribute separately to digital development, but are in fact interconnected. As such, developments in the digital

⁶ Available at <https://ec.europa.eu/digital-agenda/en/news/desi-2016-methodological-note>

⁷ Not included are: Fixed Broadband Coverage, ICT specialists, Online News reading, Online banking, Electronic Information Sharing, RFID, Social Media, Web Presence, Cloud, eCommerce Turnover

economy cannot be achieved through isolated improvements in particular areas but through concerted improvement in all areas.

Table 2.2 Structure of the I-DESI 2015 and 2014 for Tier-1 and Tier-2 (• = indicator is used)

Main dimensions	Sub-dimensions	Indicators	Tier-1		Tier-2	
			2015	2014	2015	2014
1. Connectivity	1.1. Fixed Broadband	1.1.1. Fixed BB Coverage	•	•		
		1.1.2. Fixed BB Subscriptions	•	•	•	•
	1.2. Mobile Broadband	1.2.1. Mobile BB Subscriptions	•	•	•	•
		1.2.2. 3G Coverage	•	•	•	
	1.3. Speed	1.3.1. Average Connection Speed	•	•	•	•
		1.3.2. Fast BB Subscriptions	•	•	•	•
	1.4. Affordability	1.4.1. Fixed BB Subscription charge	•	•	•	•
2. Human Capital	2.1. Basic Skills and Usage	2.1.1. Daily Internet Users	•	•	•	•
		2.1.2. Regular Internet Users	•	•	•	•
	2.2. Advanced skills and development	2.2.1. ICT specialists	•	•		
		2.2.2. STEM graduates	•	•	•	•
3. Use of Internet	3.1. Content	3.1.1. Reading News Online	•	•		
		3.1.2. Music, Videos and Games	•	•	•	•
		3.1.3. Video on Demand	•		•	
	3.2. Communication	3.2.1. Social Networks	•	•	•	•
	3.3. Transactions	3.3.1. Online Banking	•	•	•	•
		3.3.2. Purchase online products	•	•	•	•
4. Integration of Digital Technology	4.1. Business digitization	4.1.1. Electronic Information Sharing	•			
		4.1.2. RFID	•			
		4.1.3. Social Media	•			
		4.1.4. Online Presence	•	•	•	
		4.1.5. Cloud Services	•			
	4.2. eCommerce	4.2.1. SMEs Selling Online	•	•	•	•
		4.2.2. eCommerce Turnover	•	•		
5. Digital Public Services	5.1. eGovernment	5.1.1. eGovernment Users	•	•	•	•
		5.1.2. Transactional services	•	•	•	•
		5.1.3. Connected Services	•	•	•	•
		5.1.4. Open Data	•	•	•	•

2.2 Detailed description of dimensions and indicators

2.2.1 Connectivity dimension

This dimension covers both the supply and demand side of connectivity. A necessary condition for the development of a digital society is the ability of its members to connect to the Internet. Nowadays however, a simple Internet connection is no longer sufficient. In order to benefit from the full spectrum of developments offered by the Internet, the availability of high-speed Internet connections start to be desirable, if not mandatory. Hence connectivity is a necessary infrastructure of the digital economy and society.

The Connectivity dimension is divided into four sub-dimensions, each focusing on a relevant aspect of connectivity to the Internet.

2.2.1.1 Fixed Broadband

This sub-dimension focuses on whether citizens have the possibility to connect to the Internet via a fixed broadband connection, and on the extent to which they do in fact connect to the Internet that way. These phenomena are captured respectively by the Fixed BB Coverage and by the Fixed BB Subscriptions indicators.

2.2.1.2 Mobile Broadband

This sub-dimension focuses on whether citizens use the broadband capabilities of their mobile devices (Mobile BB Subscriptions indicator) and the extent to which they have access to the Mobile 3G network (3G coverage indicator).

2.2.1.3 Speed

The Speed sub-dimension focuses on the availability and use of high-speed Internet connections (defined as those offering at least 10 Mbps download speed). The actual use of such connections by the population is captured in the Subscriptions to Fast broadband (BB) indicator, whilst the actual speed offered is measured in the Average Connection Speed indicator.

2.2.1.4 Affordability

Finally, this sub-dimension measures the affordability of having a broadband Internet connection by means of the Fixed broadband (BB) Subscription Charge indicator. This indicator captures the monthly subscription charge that a potential user would have to pay to obtain a basic fixed broadband connection as a percentage of her gross income (i.e. fixed broadband is considered to be any dedicated connection to the Internet at downstream speeds equal to, or greater than, 256 kbit/s).

2.2.2 Human Capital dimension

Having a connection to the Internet is not sufficient; it must be paired with the appropriate skills to take advantage of the Internet and of the myriad of possibilities unravelled by a digital society. Those skills range from basic usage skills that enable individuals to take part in the digital society and consume digital goods and services, to advanced skills that empower the workforce to develop new digital goods and services and to take advantage of technology for enhanced productivity and economic growth. Digital skills are also a necessary infrastructure for the digital economy and society.

The Human Capital dimension is divided into two sub-dimensions.

2.2.2.1 Basic skills and usage

The Basic Skills and usage sub-dimension captures the digital skills level of the general population. In particular, it assesses whether citizens are able to use the Internet and use it on a regular and frequent basis (Daily Internet Users indicator, Frequent Internet Users indicator).

2.2.2.2 Advanced skills and development

The Advanced skills and development sub-dimension concerns the workforce and its potential to maintain and grow the digital economy. It takes into account the percentage of people in the workforce with ICT specialist skills (ICT Specialists indicators) and the share of the graduates with STEM education (Science, Technology, Engineering and Mathematics; STEM graduates indicator).

2.2.3 Use of Internet dimension

Citizens, who are empowered with an Internet connection and the necessary skills to take advantage of it, can engage in a wide range of online activities. These can be through consumption of online content (e.g., news, music, videos, or games, obtaining media-rich information or engaging in online social interaction), through modern communication activities (e.g., using social networks), or through eCommerce. Nowadays this mix of activities can only be enjoyed to its fullest using the high-speed connectivity provided by a broadband subscription.

The Use of Internet dimension is divided into three sub-dimensions.

2.2.3.1 Content

The Content sub-dimension measures the extent to which a country's Internet users get online content via their broadband connections. It uses three indicators to portray the country's consumption of content online: the percentage of Internet users that read news online (Reading News Online indicator); the percentage of Internet users that consume music, videos or games online (Music, Videos and Games indicator); and the percentages of Internet Users who used the internet for video-on-demand services (Video on Demand indicator).

2.2.3.2 Communication

The Communication sub-dimension measures the extent to which a country's Internet users communicate and interact online using their broadband connections. To do so, it concentrates on one indicator: and the percentage of Internet users that use social networks (Social Networks indicator).

2.2.3.3 Transactions

The Transactions sub-dimension captures the propensity of Internet users to perform transactions online. It concentrates on two indicators: whether users go online to fulfil their banking needs (Online Banking indicator), or to purchase products or services (Shopping indicator).

2.2.4 Integration of Digital Technology Dimension

On the business side, digitization is one of the main contributors to competitive advantage and growth. Adoption of digital technologies can enhance efficiency, reduce costs or allow for closer engagement with customers, collaborators or business partners, and is becoming a mandatory requirement for being competitive. This, together with the ability to use the Internet as a point-of-sale, can contribute significantly to the modernisation of businesses.

The Integration of Digital Technology dimension is divided into two sub-dimensions.

2.2.4.1 Business digitization

The Business digitization sub-dimension measures the level of adoption of digital technologies by a country's businesses. It focuses on five technologies: the sharing of information electronically inside companies via ERP (Electronic Information Sharing

indicator), the use of Radio-frequency Identification technologies (RFID indicator), the engagement with clients, partners and other stakeholders via social media (Social Media indicator), the extent to which they have an online presence (Online Presence indicator) and the use of Cloud services (Cloud Services indicator).

2.2.4.2 eCommerce

The eCommerce sub-dimension focuses on the exploitation of the online sales channel by a country's small and medium enterprises. It captures this via two indicators: the percentage of SMEs that have sold online (SMEs Selling Online indicator) and the average turnover they realised from online sales (eCommerce Turnover indicator).

2.2.5 Digital Public Services Dimension

Business and citizen interaction with the Public Sector can be improved and made significantly more efficient through the use of digital technologies. Such efficiency gains materialise both on the side of the Public Administration as well as on the citizen and business side. Public Administrations can take advantage of technology to better address the increasingly demanding set of business and citizen needs, while simultaneously realising significant cost reductions. With better and more streamlined Public Services, citizens and businesses gain in efficiency, both due to more functionality as well as to reductions in time spent. The Digital Public Services consists of one sub-dimension.

2.2.5.1 eGovernment

The eGovernment sub-dimension captures the level of development of a country's eGovernment services. It does so using four indicators: the percentage of the population that have engaged with the public administration online (eGovernment Users indicator); the extent to which government websites offer transactional services (Transactional Services indicator); the extent to which government websites offer connected services (Connected Services indicator); and the government commitment to open data (by means of the Open Data indicator).

2.3 Comparability I-DESI with the DESI

There are a few significant differences between the DESI and I-DESI that are important to understand when interpreting the results. Both indices follow the same structure but use different sources for the indicators. Furthermore, instead of the 30 indicators in the DESI-2015, the I-DESI 2015 uses less indicators and applies a tiered structure.

The DESI includes the 28 EU member states, whilst the I-DESI is an international comparison, including the EU28 and 8 other countries in a first tier and 15 countries in a second tier (see Table 1.2). In order to establish the international comparison, some other indicators had to be included in the I-DESI as compared to the DESI, mainly due to data availability for this broader set of countries.

The I-DESI includes a smaller set of indicators (28 indicators in Tier-1, 18 indicators in Tier-2 – see paragraph 2.1 for the tiered structure) along the same dimensions as the DESI. The data included in the index were mostly collected by the European Commission services (Eurostat), the OECD, the United Nations, the International Telecommunication Union and TNS on behalf of Google, complemented by data originating from national statistical offices, commercial databases and commercial studies.

This resulted in the fact that the majority of the indicators used in the I-DESI is not exactly the same as the ones used in the DESI. Still, the indicators comprised in the I-DESI aim to picture the relevant phenomena measured in the

DESI to the highest possible degree of accuracy given the data availability constraints.

In table 2.3 the correlations between the I-DESI (both Tier-1 and Tier-2) and the DESI scores and rankings of the EU countries are presented for both 2014 and 2015.

Table 2.3 Correlations between scores and rankings DESI with I-DESI Tier-1 and Tier-2

		Tier-1		Tier-2	
		2015	2014	2015	2014
Overall index	score	93%	92%	92%	90%
	rank	94%	91%	93%	91%
1. Connectivity	score	76%	75%	81%	79%
	rank	75%	76%	81%	81%
2. Human Capital	score	94%	93%	69%	74%
	rank	94%	93%	62%	67%
3. Use of Internet	score	73%	80%	72%	78%
	rank	79%	81%	80%	82%
4. Integration of Digital Technology	score	94%	82%	83%	88%
	rank	89%	81%	84%	88%
5. Digital Public Services	score	62%	56%	67%	56%
	rank	61%	59%	66%	60%

Whilst a high correlation can be noticed between both indices on the overall index (above 90%), the specific scores and rankings for the EU countries on the five dimensions in the I-DESI show some differences compared to their counterparts in the DESI. Tier-1 shows lower correlations on the dimensions Connectivity, Use of Internet and, most notably, Digital Public Services. As regards Tier-2, the correlation on Human Capital is relatively low though still acceptable.

There are a few countries that show considerable differences with regards to their performance in the I-DESI as compared to the DESI, as for instance shown by France. The relative big difference for France is caused by different definitions and data used for Connectivity and Digital Public Services in the I-DESI. For both Spain and Greece, the difference is mainly due to a better I-DESI performance in the dimension Connectivity. The lower position in the I-DESI as compared to the DESI for Poland is mainly caused by a lower performance on Digital Public Services.

In order to prepare an international comparison, the I-DESI had to rely for the majority of the indicators on different sources than the sources used in the DESI. Indicators and definitions used in the I-DESI are not directly comparable with those comprised in the DESI. For this reason, it is possible that countries score higher or lower on indicators and dimensions that seem to be the same (in the I-DESI and the DESI).

Two examples to illustrate and explain these differences:

- France ranks third (of EU28 member states) in the I-DESI indicator Fast Broadband Subscriptions (1.3.2) from the ITU database, which uses 10 Mbps as threshold, while they rank 23nd in the DESI indicator Subscriptions to Fast Broadband (1.c.2) from the EC data collection, which uses a 30Mbps threshold. This example shows that slight changes in definitions and indicators can have impact on scores and rankings. However, in terms of generating insights for policy on what to improve, this analysis teaches us that France is doing very well on providing broadband subscriptions with a lower speed, while having room to improve in providing faster broadband internet.

- In the I-DESI, the dimension 'Digital Public Services' uses different sources to compare countries. The DESI builds on the European Commission's eGovernment benchmark and uses the indicators Pre-filled Forms (5.a.2) and Online Service Completion (5.a.3). However, this research does not include countries outside of Europe and hence the I-DESI uses the UN eGovernment benchmark and consists of the indicators Transactional Services (5.1.2) and Connected Services (5.1.3). While France performs much better in the UN benchmark, Poland performs much better in the EU benchmark. Even though both sources are well recognized and authoritative data collections, there are clear differences between the indicators used. Pre-filling online forms with personal data that is already known by government is a very important element of eGovernment and shows both efficiency of the internal public administration as well as ease of use for citizens and businesses. The definition is more specific compared to the UN description⁸. Another difference lies in the fact that the UN benchmark mostly focuses on national websites, whereas the EU benchmark also includes local websites that are part of the Life Events under assessment.

The I-DESI is very well suited for comparing Europe to other global economies. The DESI is very well suited for drawing comparisons between European countries. For this reason, this report will show in respective charts the average of all EU member states (EU28) and also the spread of scores obtained in the EU. The latter is illustrated by including 'EU28-top' (calculated as the average of the three best performing countries in a category) and 'Eu28-bot' ('bottom' which is calculated as the average of the three worst performing countries in a category).

2.4 Methodological considerations

To create the I-DESI, we relied on existing archival data, which mainly originated from international organizations and national statistical bureaus. It was beyond the scope of this assignment to collect additional primary data, e.g. questionnaires. This paragraph describes the method used for gathering this data.

2.4.1 Indicator criteria

Indicators used in the I-DESI preferably comply with the following requirements:

- Must be collected on a regular basis. In order to fulfil the monitoring function, the indicators used in the index must be collected ideally on a yearly basis (or at least with a pre-defined regularity).
- Must be relevant for a policy area of interest. All indicators in the index must be accepted as relevant metrics in their specific policy areas.
- Must not be redundant. The index should not contain indicators that are redundant, either statistically or in terms of interpretation.

As a principle, data originating from 2014 is included in the I-DESI 2015. Similarly, data originating from 2013 is included in the I-DESI 2014. These criteria guided the data collection, but in some cases the study team had to slightly deviate from these criteria, for instance, regarding regularly updated data. There are cases in which we had to rely on the most recent available data, for instance with regards to OECD data. As a rule, a cut-off date of five years is used: data is not older than five years, starting from the respective I-DESI years (2014 and 2015). In cases where the most recent available data was older than five years, the value was estimated based on least available data.

⁸ UNITED NATIONS E-GOVERNMENT SURVEY 2014. Available online on: https://publicadministration.un.org/egovkb/portals/egovkb/documents/un/2014-survey/e-gov_complete_survey-2014.pdf

The I-DESI has a three-layer structure. It is composed of 5 main dimensions, each divided in a set of sub-dimensions, which are in turn composed by individual indicators. The study team aimed to stay as close as possible to the structure of the original European data, but due to limited data availability (i.e. too many missing observations in the added countries) some indicators have been dropped. When encountering missing values for a certain indicator, the following steps have been taken (in order):

- First try to impute the missing data point;
- Investigate the feasibility of a proxy-indicator;
- If not sufficient: drop the indicator (and adjust the weightings within the sub-dimension accordingly);

2.4.2 Weighting

Some dimensions, sub-dimensions and individual indicators are more relevant than others, and for this reason they were given higher weight in the computation of the final index score for each country (table 2.4)⁹.

Table 2.4 Weighing per dimension

Dimension	Weight
Connectivity	25%
Human Capital	25%
Use of Internet	15%
Integration of Digital Technology	20%
Digital Public Services	15%

Connectivity and Human Capital can be considered as the most relevant dimensions because they represent the infrastructure of the digital economy and society. Hence, they were given higher weights. Integration of Digital Technology captures the use of ICT by the business sector, which, according to growth accounting theories is one of the most important drivers of growth. It was given a relatively high weight, but not as high as the previous two dimensions. Finally, Use of Internet (by citizens) and Digital Public Services are enabled by the infrastructure and their contribution is strengthened by the quality of such infrastructure. For this reason, they received a relatively lower weight.

Weights were also assigned at the sub-dimension and individual indicator level. Weights used at the sub-dimension level are summarised in table 2.5¹⁰.

Within the Connectivity dimension, the sub-dimensions Fixed Broadband and Speed are considered to be the most important sub-dimensions (weighted 33%), followed by Mobile Broadband (22%) and then by Affordability (11%)¹¹. All sub-dimensions within the Human Capital and Use of Internet dimensions are considered of equal importance and are therefore weighted equally. Regarding Integration of Digital Technology¹², the Business Digitisation sub-dimension is considered as more important than the

⁹ The same weightings as applied in the DESI are used in the I-DESI

¹⁰ Since the weight assignment for sub-dimensions is local to the dimension that they are part of, then the sum of weights of the sub-dimensions within each dimension should add up to 100%.

¹¹ Again, same weightings as in the DESI were applied, except for the subdimension eGovernment

¹² 4.1 indicators are not included in Tier-2. Therefore, a weight of 100% is attributed to subdimension 4.2 in Tier-2.

eCommerce sub-dimension, and therefore weighted higher at 60%. Within the Digital Public Services dimension, eGovernment is the only sub-dimension, weighted 100%.

Table 2.5 Weighing per sub-dimension

Dimension	Sub-dimension	Weight
1. Connectivity	1.1 Fixed Broadband	33%
	1.2 Mobile Broadband	22%
	1.3 Speed	33%
	1.4 Affordability	11%
2. Human Capital	2.1 Basic Skills and Usage	50%
	2.2 Advanced skills	50%
3. Use of Internet	3.1 Content	33%
	3.2 Communication	33%
	3.3 Transactions	33%
4. Integration of Digital Technology	4.1 Business Digitization	60%
	4.2 eCommerce	40%
5. Digital Public Services	5.1 eGovernment	100%

2.4.3 Normalisation

In order to aggregate indicators into the sub-dimensions and main dimensions of the I-DESI, the indicators were normalised. Normalisation was done by using the min-max method, which consists on a linear projection of each indicator onto a scale between 0 and 1. For indicators with positive direction (i.e., where higher is better), the 0 value in the normalised scale was anchored to the minimum value in the indicator original scale, and the value 1 in the normalised scale was anchored to the maximum value in the indicator's scale. The opposite happened for indicators with negative direction.

To allow for inter-temporal comparisons of index scores, the minima and maxima for the normalisation of each indicator were fixed and will be used for normalisation in the future versions of the I-DESI. Table 2.6 presents the values that were chosen as the minimum and maximum of each indicator for normalisation purposes.

Table 2.6 Minima and maxima used for normalisation

Indicator	Unit	Min	Max
1.1.1. Fixed BB Coverage	% of households	70%	100%
1.1.2. Fixed BB Subscriptions	per 100 inhabitants	0	50
1.2.1. Mobile BB Subscriptions	per 100 inhabitants	0	160
1.2.2. 3G coverage	% of population	60% ¹³	100%
1.3.1. Average Connection Speed	in Mb per second	0	30
1.3.2. Fast BB Subscriptions	% of subscriptions equal to or above 10 Mbps	0%	100%
1.4.1. Fixed BB Subscription Charge	% of individual gross income	0%	4%

¹³ The value for China in the I-DESI 2015 is below the minimum value. Therefore, a normalized value of 0 is attributed to China for this specific indicator.

Indicator	Unit	Min	Max
2.1.1. Daily Internet Users	% of internet users	30%	100%
2.1.2. Regular Internet Users	% of individuals who used Internet in the last 3 months	0%	100%
2.2.1. ICT Specialists	% of total employment	0%	10%
2.2.2. STEM graduates	% of graduates in STEM subjects	0%	50%
3.1.1. Reading News Online	% of internet users	33%	100%
3.1.2. Music, Videos and Games	% of internet users	0%	100%
3.1.3. Video on Demand	% of internet users	0%	100%
3.2.1. Social Networks	% of internet users	0%	100%
3.3.1. Online Banking	% of internet users	0%	100%
3.3.2. Purchase Online Products	% of internet users	0%	50%
4.1.1. Electronic Information Sharing	% of enterprises	0%	50%
4.1.2. RFID	% of enterprises	0%	60%
4.1.3. Social Media	% of enterprises	0%	80%
4.1.4. Online presence	% of enterprises	0%	100%
4.1.5. Cloud Services	% of enterprises	0%	60%
4.2.1. SMEs selling online	% of SMEs	0%	60%
4.2.2. eCommerce turnover	% of turnover	0%	60%
5.1.1. eGovernment users	% of population	0%	100%
5.1.2. Transactional Services	% of services	0%	100%
5.1.3. Connected Services	% of services	0%	100%
5.1.4. Open Data	% of datasets	0%	100%

2.4.4 Data imputation I-DESI 2015

Some indicators had missing observations for some countries. Values for those observations were estimated by using a previous year's indicator value (not older than five years) or by using the Amelia II¹⁴ (in the statistical program R). The Amelia estimation process uses as an input the set of other indicators for which the squared correlation with the indicator with missing observations is the highest.

In the I-DESI 2015, 42 missing observations are imputed by using Amelia II, which corresponds to 3,7% of all observations (overall total of 1.148 observations). The indicators with the highest number of missing observations are Video on Demand (3.1.3), Purchase Online Products (3.3.2) and Social Media (4.1.3), with each 4 missing values (9% of the total 43 observations). In the I-DESI 2015 there are 57 values estimated by using data from previous years, of which 38 (67%) originate from 2013 and 14 (25%) from 2012. Table 2.7 presents the list of all missing observations in I-DESI 2015 and the values resulting from both the estimation process Amelia and previous year values.

¹⁴ James Honaker and Gary King and Matthew Blackwell, "Amelia II: A Program for Missing Data", Journal of Statistical Software, Vol. 45, Issue 7, Dec 2011. <http://www.jstatsoft.org/v45/i07/>

Table 2.7 Missing data points I-DESI 2015

Indicator	Country	Method	Value
1.1.1 Fixed BB Coverage	Korea (Rep.)	value 2013	98%
1.2.2 3G Coverage	Mexico	imputed	87%
	Russia	imputed	95%
	Turkey	imputed	89%
	Austria	value 2013	96%
	Finland	value 2011	95%
	France	value 2012	98%
	Japan	value 2013	100%
	United States	value 2012	100%
1.3.2 Fixed BB Subscriptions	Israel	value 2013	99%
	Mexico	imputed	46%
	Japan	value 2013	89%
1.4.1 Fixed BB Subscription Charge	Israel	value 2011	42%
	Switzerland	value 2013	3.6%
	Greece	value 2013	1.1%
	Iceland	value 2013	0.9%
	Malta	value 2013	0.8%
2.1.1 Internet Users	Luxembourg	imputed	82%
3.1.1 News	Australia	imputed	73%
3.1.2 Music, Videos and Games	Cyprus	imputed	36%
	Luxembourg	imputed	33%
	Malta	imputed	37%
3.1.3 Video on Demand	Cyprus	imputed	22%
	Iceland	imputed	36%
	Luxembourg	imputed	25%
	Malta	imputed	29%
3.2.1 Social Networks	Malta	value 2013	73%
3.3.1 Banking	Australia	value 2013	85%
	United States	value 2013	51%
	Israel	value 2013	39%
	New Zealand	value 2012	75%
	Brazil	imputed	32%
	Mexico	imputed	17%
	Russia	imputed	38%
3.3.2 Purchase Online Products	Cyprus	imputed	5.4%
	Iceland	imputed	7.0%
	Luxembourg	imputed	10%
	Malta	imputed	7.4%
4.1.1 Electronic Information Sharing	Australia	imputed	27%
	Japan	imputed	35%
	United States	imputed	36%
	Canada	value 2013	21%
	Switzerland	value 2011	39%
	Korea (Rep.)	value 2013	36%
4.1.2 RFID	Canada	value 2013	3.0%
	Japan	value 2013	8.0%
	Korea (Rep.)	value 2013	42%
	United States	value 2012	52%
	Australia	imputed	17%
	Switzerland	imputed	14%
4.1.3 Social Media	Switzerland	imputed	39%
	France	imputed	44%
	Korea (Rep.)	imputed	28%
	United States	imputed	43%
	Canada	value 2013	32%
	Japan	value 2013	16%

Indicator	Country	Method	Value
4.1.4 Online Presence	United States	value 2013	82%
	Brazil	value 2013	56%
	China	imputed	55%
	Israel	imputed	62%
	Russia	imputed	63%
4.1.5 Cloud Services	Australia	value 2013	19%
	Canada	value 2012	31%
	Switzerland	value 2011	8.6%
	Korea (Rep.)	value 2013	12%
4.2.1 SMEs Selling Online	Israel	imputed	20%
	Russia	imputed	7.4%
	Iceland	value 2013	33%
	Canada	value 2013	17%
	Switzerland	value 2011	34%
	Japan	value 2013	22%
	Korea (Rep.)	value 2013	15%
	United States	value 2013	28%
	Brazil	value 2012	18%
	China	value 2013	5.2%
	Turkey	value 2013	8.1%
	Mexico	value 2012	7.2%
4.2.2 eCommerce Turnover	Belgium	value 2012	14%
	Iceland	value 2012	14%
	Korea (Rep.)	value 2012	28%
	Luxembourg	value 2012	23%
	Australia	value 2012	9.0%
	Portugal	value 2013	12%
	Slovenia	value 2013	11%
	United States	value 2013	20%
	Canada	imputed	17%
	Switzerland	imputed	18%
	Japan	imputed	19%
5.1.1 eGovernment Users	Japan	imputed	57%
	China	imputed	33%
	Mexico	imputed	15%
	Australia	value 2013	50%
	Canada	value 2012	55%
	Brazil	value 2013	27%
	Israel	value 2013	35%
	New Zealand	value 2012	51%
	Russia	value 2013	16%
5.1.4 Open Data	Estonia	imputed	65%
	Luxembourg	imputed	63%

2.4.5 Data imputation I-DESI 2014

The same process for coping with missing values in the I-DESI 2014 is used as for the I-DESI 2015: using values no more than five years old or using Amelia II.

Amelia estimation has been done for 40 missing observations, which corresponds to 4,2% of all observations (overall total of 947 observations). The indicator with the highest number of missing observations is eGovernment Users (5.1.1) with 6 missing values (14% of the total 43 observations). In the I-DESI 2014 there are 19 values estimated by using data from previous years, of which 15 (79%) from 2012. Table 2.8 presents the list of all missing observations in I-DESI 2014 and the values resulting from both the estimation process Amelia and previous year values.

Table 2.8 Imputation of missing data points I-DESI 2014

Indicator	Country	Method	Value
1.1.1 Fixed BB Coverage	Switzerland	imputed	99%
1.2.2 3G Coverage	Luxembourg	imputed	95%
	Finland	value 2011	95%
	France	value 2012	98%
	Hungary	value 2012	97%
	Netherlands	value 2012	99%
	Sweden	value 2012	100%
	United States	value 2012	100%
1.3.2 Fixed BB Subscriptions	Mexico	imputed	36%
	New Zealand	imputed	69%
	Israel	value 2011	42%
	Netherlands	value 2012	59%
	China	value 2012	16%
2.1.1 Internet Users	Luxembourg	imputed	81%
	Mexico	imputed	74%
2.2.1 ICT Specialists	Korea (rep.)	imputed	4.1%
3.1.1 News	Australia	imputed	68%
	Belgium	imputed	69%
	Switzerland	imputed	68%
3.1.2 Music, Videos and Games	Cyprus	imputed	35%
	Iceland	imputed	34%
	Luxembourg	imputed	31%
	Malta	imputed	34%
	Mexico	imputed	36%
3.2.1 Social Networks	Mexico	imputed	46%
3.3.1 Banking	Switzerland	imputed	76%
	Brazil	imputed	40%
	Mexico	imputed	20%
	Russia	imputed	41%
	New Zealand	value 2012	75%
3.3.2 Purchase Online Products	Cyprus	imputed	3.1%
	Iceland	imputed	8.4%
	Luxembourg	imputed	9.4%
	Malta	imputed	4.7%
	Mexico	imputed	5.0%
4.2.1 SMEs Selling Online	Israel	imputed	19%
	Russia	imputed	14%
	Switzerland	value 2011	34%
	Brazil	value 2012	14%
	Mexico	value 2012	7%
4.2.2 eCommerce Turnover	Australia	value 2012	9%
	Belgium	value 2012	14%
	Denmark	value 2010	17%
	Iceland	value 2012	14%
	Korea (rep.)	value 2012	28%
	Luxembourg	value 2012	23%
	Canada	imputed	16%
	Switzerland	imputed	15%
	Japan	imputed	19%
5.1.1 eGovernment Users	Japan	imputed	52%
	Korea (rep.)	imputed	49%
	United States	imputed	48%
	China	imputed	29%
	Mexico	imputed	22%
	Turkey	imputed	24%
5.1.4 Open Data	Estonia	imputed	61%
	Luxembourg	imputed	53%
	Latvia	imputed	41%
	Turkey	imputed	38%

2.4.6 Method of aggregation

In I-DESI, the aggregation of indicators into sub-dimensions, of sub-dimensions into dimensions, and of dimensions into the overall index was performed from the bottom up using simple weighted arithmetic averages following the structure of the index (table 2.1). As an example, the top-level I-DESI score for country X was calculated using the formula:

$$\begin{aligned} I - DESI_{Country\ X} &= 0,25 * Connectivity_{Country\ X} + 0,25 * Human_capital_{Country\ X} + 0,15 \\ &\quad * Use_of_Internet_{countryX} + 0,2 * Integration_Digital_Technology_{countryX} + 0,15 \\ &\quad * Digital_Public_Services_{countryX} \end{aligned}$$

Where $Connectivity_{countryX}$ is the score obtained by country X in the Connectivity dimension, and so on for the remaining dimensions in the formula.

The sources and the calculations are provided at the indicator-level in the Appendix.

3 Results for Tier-1

This chapter presents the results of the I-DESI study for Tier-1. It presents key findings concerning the ranking of EU countries, the EU as a whole and 8 other relevant countries, as well as their progress over time. The scores are normalized between 0 and 1 (with higher values meaning better performance). As explained in the methodological chapter, results are divided in two tiers: Tier-1 includes Japan, Korea, the United States, Norway, Canada, Australia, Iceland and Switzerland. Tier-2 includes Brazil, China, Israel, Mexico, New Zealand, Russia and Turkey, using a smaller set of indicators. The average of the three best performing EU member states ('EU28-top') is included in each graph in this chapter, as well as the average of the three worst performing EU member states ('EU28-bot'), the overall EU28 average and the country score of the non-EU countries.

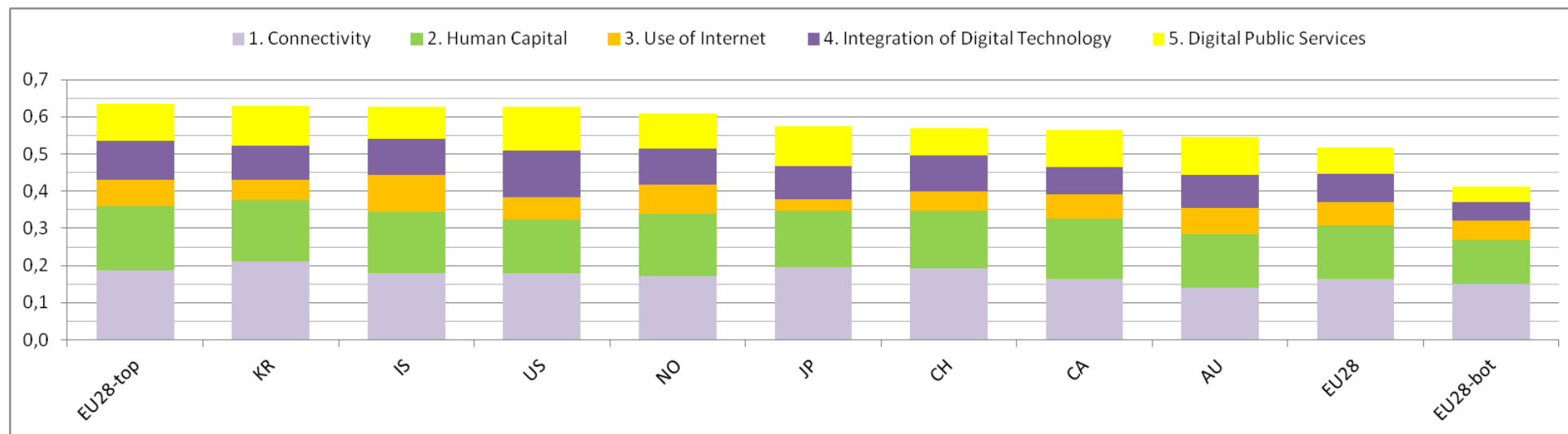
First, the overall results are presented. Next, the results per dimension are discussed in the five subsequent paragraphs. Findings regarding the progress over time (I-DESI 2014 to I-DESI 2015) are presented in paragraph 3.7.

3.1 Overall results

3.1.1 The I-DESI ranking for Tier-1

Figure 3.1 presents the main ranking of countries in the I-DESI 2015. I-DESI scores range from 0 (worst) to 1 (best). The height of each bar in the chart corresponds to the score achieved by the corresponding country, and the height of each colour within the bar corresponds to the contribution of the corresponding dimension to the overall score (taking into account the weight attributed to the dimension).

Figure 3.1 I-DESI 2015 main ranking (Tier-1¹⁵)



¹⁵ Consult Annex 1 for the list of country acronyms

Top European performers are leading countries on a global stage as well. In the I-DESI 2015, the best performing EU countries are Sweden, Denmark and Finland ('EU28-top'), closely followed by Korea, Iceland and the United States. With a score of 0.57, Japan is also performing above the EU average of 0.52. Other non-Member States that are performing above the EU average are Norway, Switzerland, Canada and Australia. The EU average is negatively impacted by the scores of most notably Romania, Poland and Bulgaria ('EU28-bot').

Table 3.1 presents the scores and ranking positions for all countries in the I-DESI and for each of the five main dimensions.

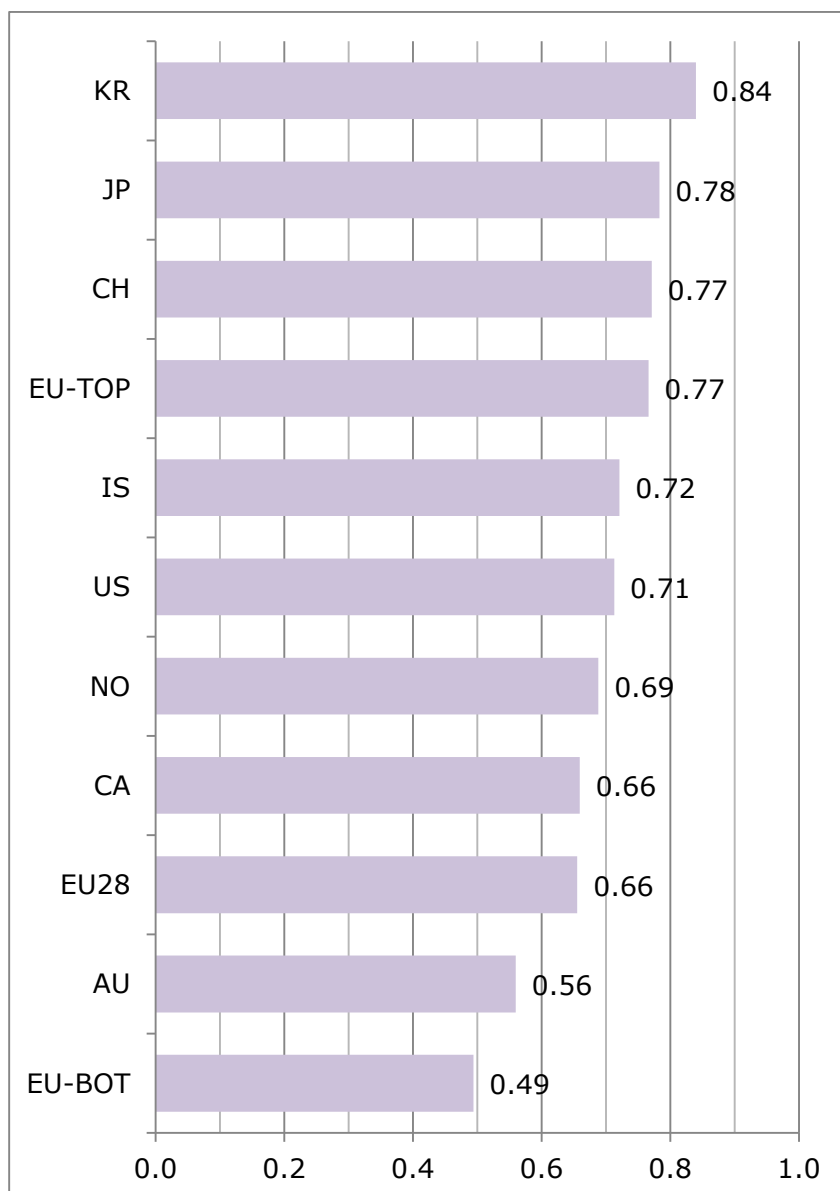
Table 3.1 Scores in I-DESI 2015 Tier 1 (overall index and dimensions)

	I-DESI		1 Connectivity		2 Human Capital		3 Use of Internet		4 Integration of Digital Technology		5 Digital Public Services	
	score	rank	score	rank	score	rank	score	rank	score	rank	score	rank
EU28 top	0.63	1	0.77	4	0.70	1	0.52	3	0.53	2	0.77	2
KR	0.63	2	0.84	1	0.67	3	0.36	8	0.45	6	0.73	3
IS	0.63	3	0.72	5	0.66	4	0.66	1	0.48	5	0.58	8
US	0.63	4	0.71	6	0.58	8	0.41	7	0.62	1	0.79	1
NO	0.61	5	0.69	7	0.67	2	0.52	2	0.49	3	0.63	7
JP	0.57	6	0.78	2	0.60	7	0.21	11	0.44	8	0.71	4
CH	0.57	7	0.77	3	0.62	6	0.35	9	0.48	4	0.49	9
CA	0.57	8	0.66	8	0.64	5	0.45	5	0.37	10	0.67	6
AU	0.55	9	0.56	10	0.58	9	0.46	4	0.45	7	0.69	5
EU28	0.52	10	0.66	9	0.57	10	0.42	6	0.38	9	0.47	10
EU28 bot	0.41	11	0.49	11	0.47	11	0.32	10	0.23	11	0.26	11

3.2 Connectivity

A prerequisite for developing a digital society is having the digital infrastructure in place. High-speed and affordable internet connections are crucial in the development of the digital economy. Figure 3.2 presents the composite score per non-EU country, the three best and worst performing EU countries and the EU28 average on the Connectivity dimension.

Figure 3.2 Performance per country on dimension 1 Connectivity (Tier-1, I-DESI 2015)



It is clear that Korea and Japan are ahead of Europe with regards to connectivity. In particular Korea is far ahead of all other countries (0.84). Korea is among the top performers on all sub-dimensions, and excels at the speed of their internet connections. Leading European countries are Denmark, the United Kingdom and Sweden. As a non-EU member state, Switzerland is on par with the EU top performers (scoring 0.77). The three worst performing EU countries are Slovakia, Cyprus and Poland.

With regards to fixed broadband (both take-up and coverage), Switzerland leads the way in the global stage, followed by the Netherlands, Denmark and France. While Korea is the 7th worldwide performer with regards to this sub-dimension. Japan and the United States score just above the EU average. Australia is the second-worst performing country.

Whilst Japan is an average performer with regards to fixed broadband, they are leading the way with regards to mobile broadband (take-up and coverage). Japan is closely followed by the Nordic countries (Finland, Sweden and Denmark) and Estonia. Australia is the 6th best performer, followed by Korea and the United States.

With regards to speed, Korea is the top performer, offering by far the highest average internet speed. Japan is second, and leading European countries such as Bulgaria and the Netherlands are way behind Korea. The EU average is on an equal level as compared to the United States, Canada and Australia.

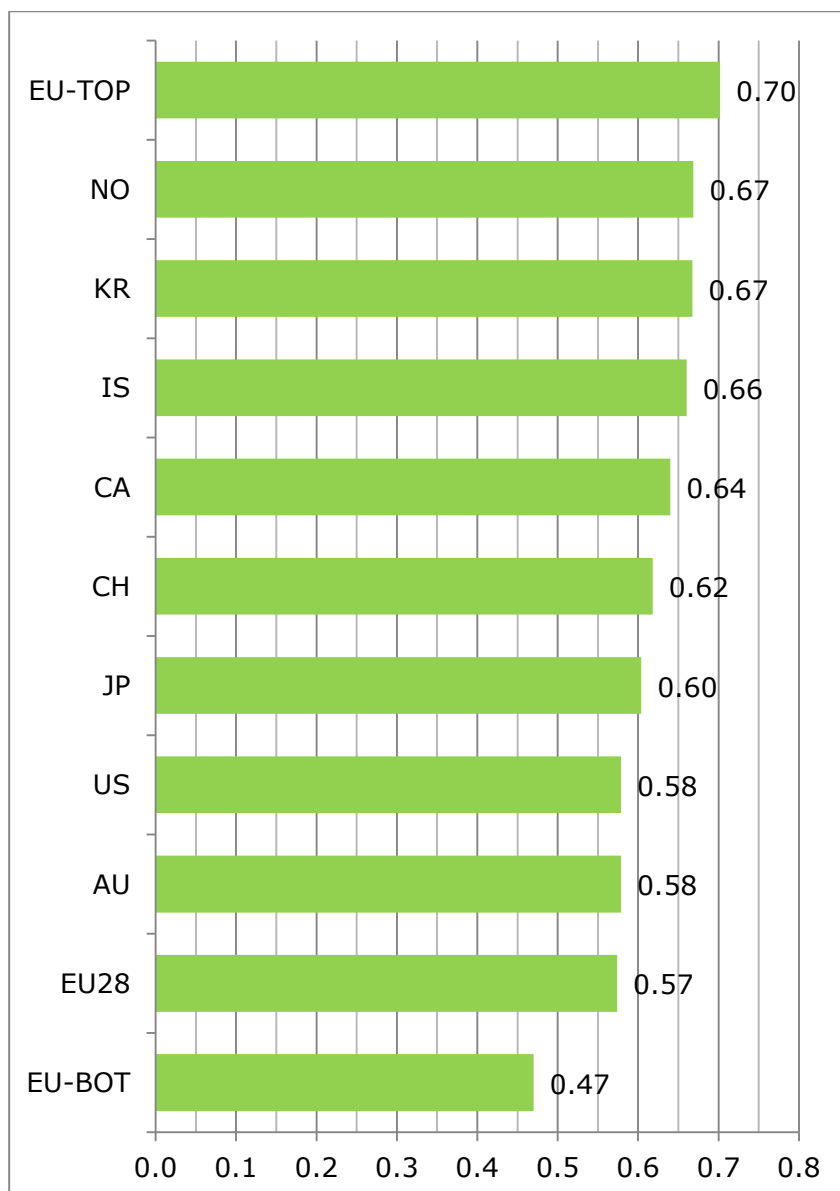
Internet is offered at high speed in Korea, but it is relatively expensive as compared to other countries. Korea is performing below the EU average when it comes to affordability of their internet connections. The affordability of fixed broadband is best in the United States, followed by the United Kingdom and Romania.

Fixed broadband connections are relatively expensive in some countries that perform well on other Connectivity-dimensions, such as Denmark, Sweden and the Netherlands. The most expensive country for fixed broadband is Australia, whilst Canada is relatively expensive as well.

3.3 Human Capital

A physical infrastructure is not the only prerequisite for a digital society: it needs to be complemented by the appropriate knowledge and skills to take advantage of the possibilities offered by the internet and the digital society. Figure 3.3 presents the composite score per country of the Human Capital dimension.

Figure 3.3 Performance per country on dimension 2 Human Capital (Tier-1, I-DESI 2015)



European countries lead the way with regards to human capital, with Sweden, Finland and the United Kingdom performing better than Korea (0.67). Japan performs above the European average (0.60 versus 0.57), while the United States and Australia are average performers with scores slightly above the European average (0.58 both). Bulgaria, Romania and Italy clearly lag behind on this dimension. They are the three worst performing EU countries.

When zooming in to the frequency of internet use, Iceland is in the lead. The frequency of internet use is high in Iceland, far ahead of number 2, 3, and 4 (Japan, Norway and

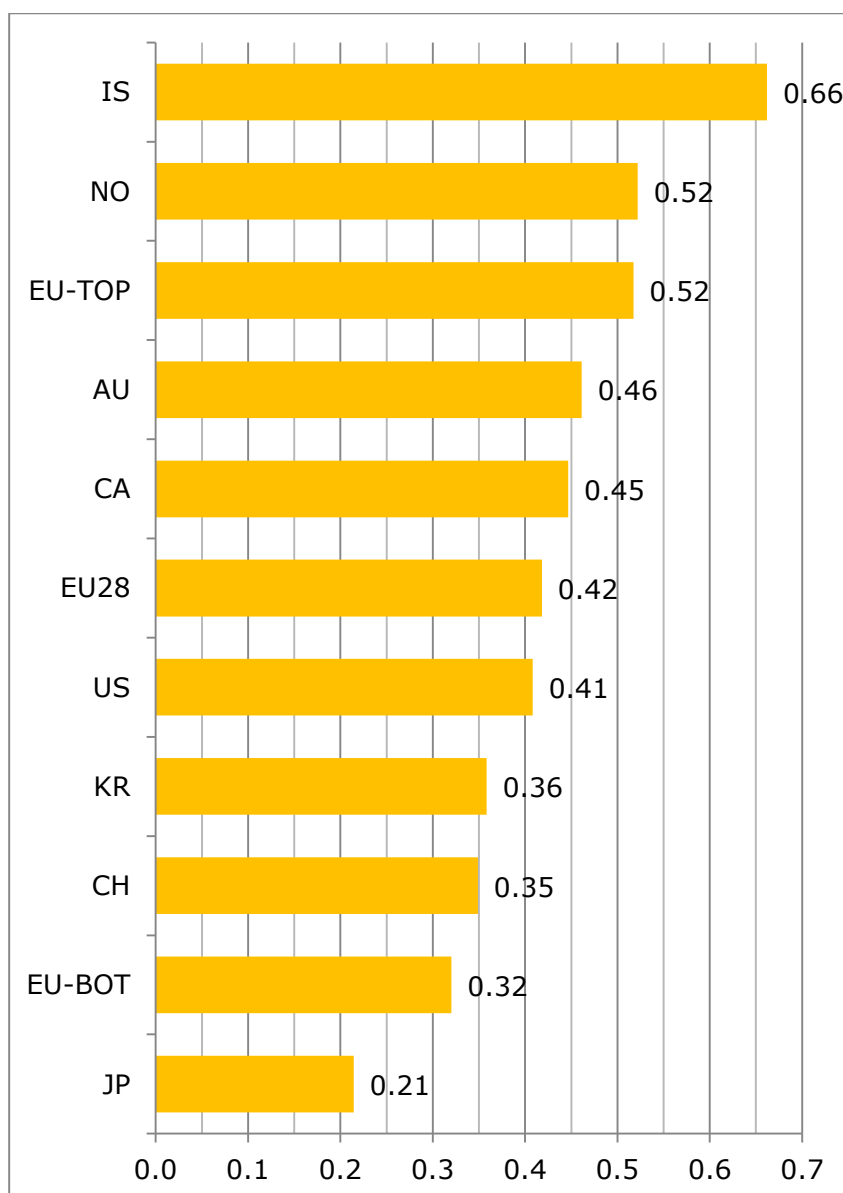
Denmark). The top-five is complemented by Korea, whilst the United States and Australia are average performers, but still above the EU average.

Considering the workforce and the potential to maintain and grow the digital economy, Finland and Sweden are clearly leading the way. The advanced skills and development sub-dimension measures the percentage of people with ICT specialist skills and the share of graduates with STEM education. The top-seven countries on this sub-dimension are all European countries, followed by Korea. On average, the EU is well ahead of the United States, Australia, and most notably Japan. After Latvia, Japan is the worst performing country on this sub-dimension.

3.4 Use of the Internet

Through the high-speed connectivity provided by a broadband subscription, and the basic skills to take advantage of this connectivity, a wide mix of online activities can be enjoyed by both citizens and businesses. These elements enable citizens to consume online content such as music, videos, games, shopping and banking. Figure 3.4 presents the composite score per country of the Use of Internet dimension.

Figure 3.4 Performance per country on dimension 3 Use of the Internet (Tier-1, I-DESI 2015)



On average, the EU is far ahead of Japan, Korea and the United States with regards to the use of the internet. Especially the relatively low consumption of online content in Japan (0.21) is remarkable, while Korea is among the lowest performers as well (0.36). The three best performing EU member states are Latvia, Luxembourg and Malta. Iceland is streets ahead of all the others (0.66). The consumption of online content is unparalleled in Iceland at a global stage. When zooming in on the sub-dimensions, Iceland is leading two out of the three sub-dimensions, again streets ahead of others:

Iceland is leading with regards to Content (e.g., reading the news online, online gaming, online music and online videos), and Communication (usage of social networks). Nine out of the ten countries in the top-ten of sub-dimension Content, are European countries: the United States is ranking 10th. Australia, Korea and Japan are below the EU average with regards to the usage of online content, with Japan scoring even below the average of the three worst performing EU member states (Italy, Romania and Germany).

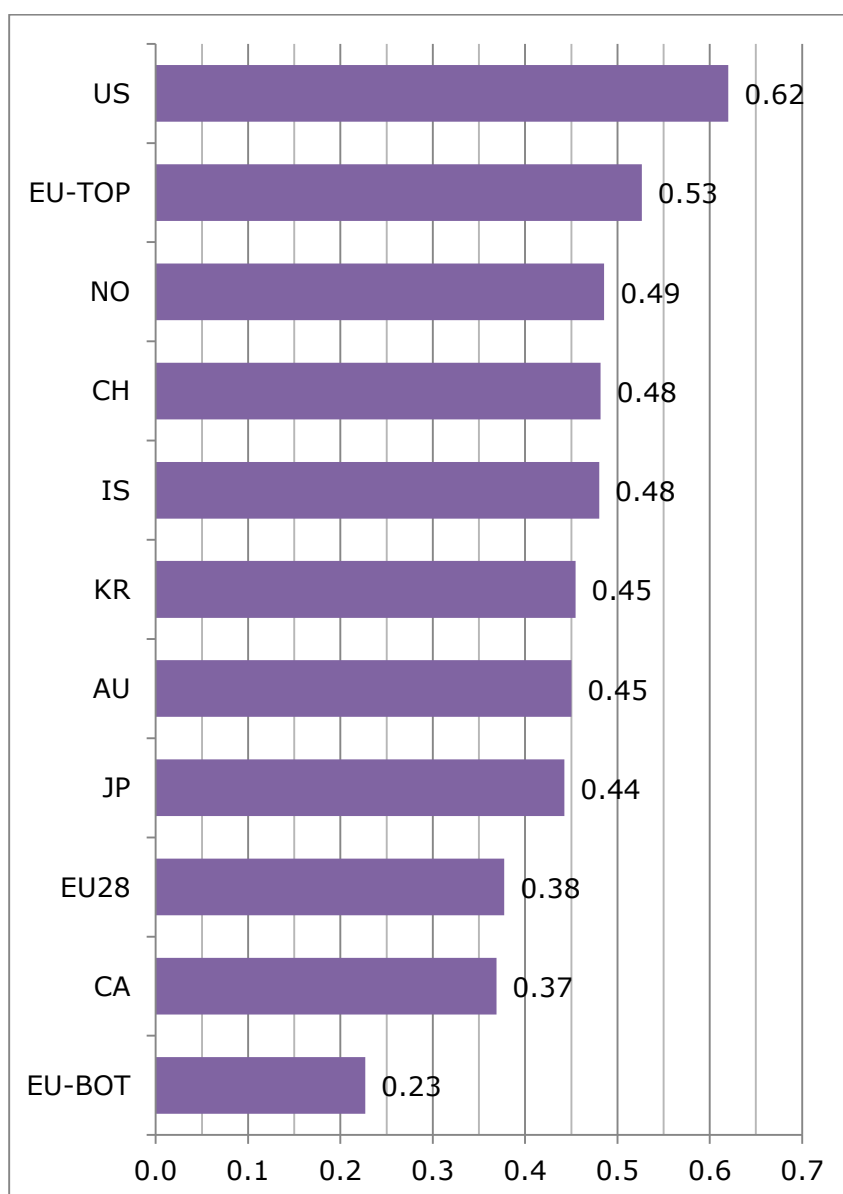
The top-ten of countries with regards to Social Network usage consists of European countries only. The EU is well ahead of all non-European countries under consideration in Tier-1, and leading European countries such as Iceland, Latvia and Portugal are way ahead of Canada, Australia, the United States, Japan and Korea. Compared to all other countries, the usage of social networks in Korea is very low.

Although Australia is lagging behind with regards to the usage of social networks, they are leading the way with regards to online banking and online shopping. Australia is followed by the Netherlands and the United Kingdom, and the top-five is complemented by Norway and Korea. The weak performance of Japan on this sub-dimension is notable. Online shopping, and online banking in particular, has not quite caught on to the extent that it has in other countries. Canada and the United States are above the EU average.

3.5 Integration of Digital Technology

The adoption of digital technologies can contribute significantly to the modernisation of businesses, and ultimately their and Europe's competitiveness. Hence, it is of great importance to evaluate how European businesses are performing in comparison to other leading world economies, most notably Japan, Korea and the United States. Figure 3.5 presents the composite score per country of the Integration of Digital Technology dimension.

Figure 3.5 Performance per country on dimension 4 Integration of Digital Technology (Tier-1, I-DESI 2015)



The United States is the clear world leader with regards to the integration of digital technologies by businesses, way ahead of other countries (scoring 0.62). The Scandinavian countries Finland, Denmark and Sweden constitute the three best performing countries of the EU, performing better than all the others except the United States. When scrolling down to the EU average (0.38), we see that Australia, Korea and Japan are all performing above the EU average, taking the advantage of the

opportunities that digital technologies offer to businesses. Canada (0.37) is just below the EU average. The three worst performing EU member states are Latvia, Romania and Bulgaria.

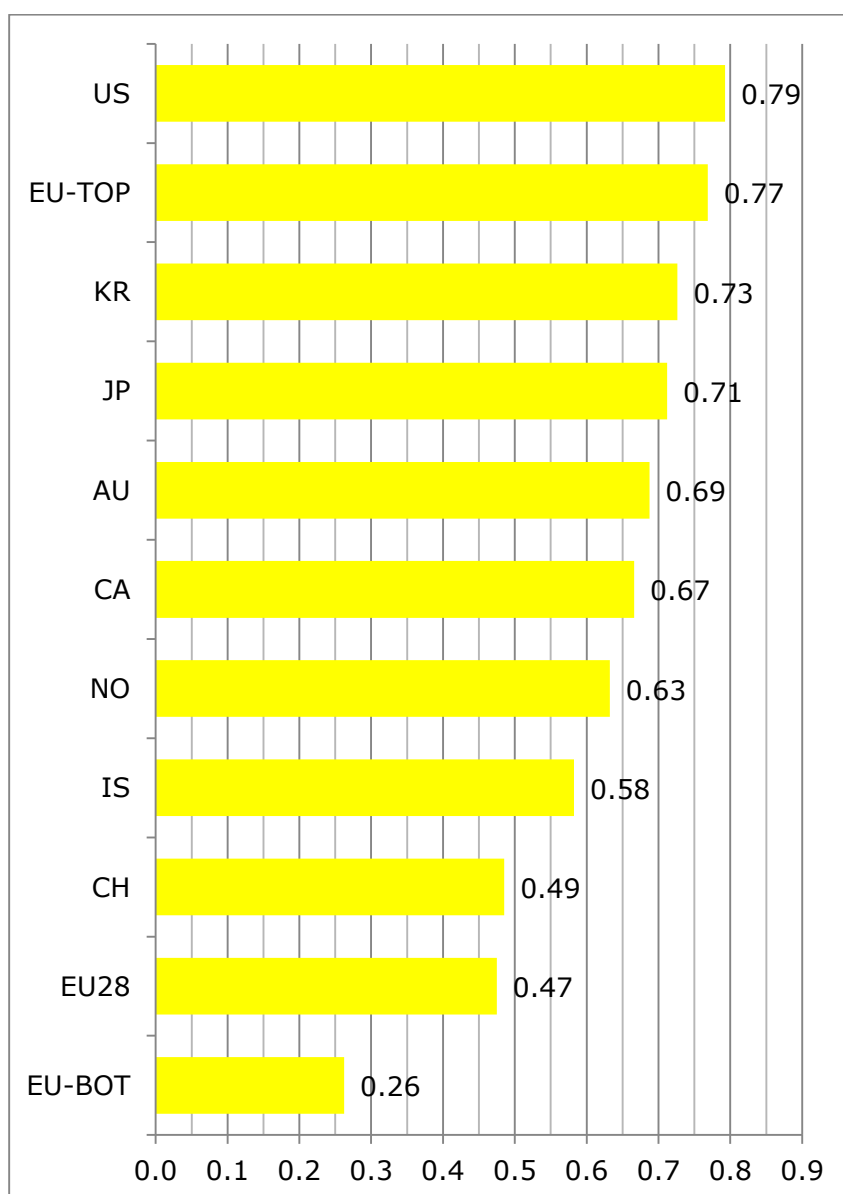
In the United States, businesses exploit the advantages of technologies such as RFID and cloud services, and a relatively high share (82%) of the companies has an online presence. This results in a high score on the sub-dimension business digitization, followed by the Scandinavian countries. Australia and Canada are below the EU average on this sub-dimension.

Ireland and the Czech Republic are Europe's top performers with regards to eCommerce, and are leading in the global league as well. They are followed by Australia and the United States. eCommerce adoption is measured in terms of the percentage of SME's that sell online and the eCommerce turnover as a percentage of total turnover. Korea and Japan are way above the EU average, and Canada is on an equal level as compared to the EU average. Greece, Bulgaria and Romania are lagging behind.

3.6 Digital Public Services

Business and citizen interaction with the Public Sector can be improved and made significantly more efficient through the use of digital technologies. Such efficiency gains materialise both on the side of the Public Administration as well as on the business side. Therefore, an efficient provision of public services enhances the competitiveness of Europe, whilst realizing significant cost reductions. Figure 3.6 presents the composite score per country of the Digital Public Services dimension.

Figure 3.6 Performance per country on dimension 5 Digital Public Services (Tier-1, I-DESI 2015)



The United States is in the lead regarding eGovernment, performing slightly better than EU top performers (France, the United Kingdom, the Netherlands). Countries are assessed on four indicators in this dimension, being eGovernment users (percentage of population using the internet to interact with public authorities), Transactional services offered by the public authorities, Connected services offered by the public authorities, and the extent to which data is publicly available (open data). Korea and Japan are

ranking just behind the EU top performers. Australia and Canada are present in the top-ten list of countries, performing above the EU average. Bulgaria, Croatia, Malta ('EU-bot') need to step up and improve and digitalize their public services.

3.7 Tracking progress

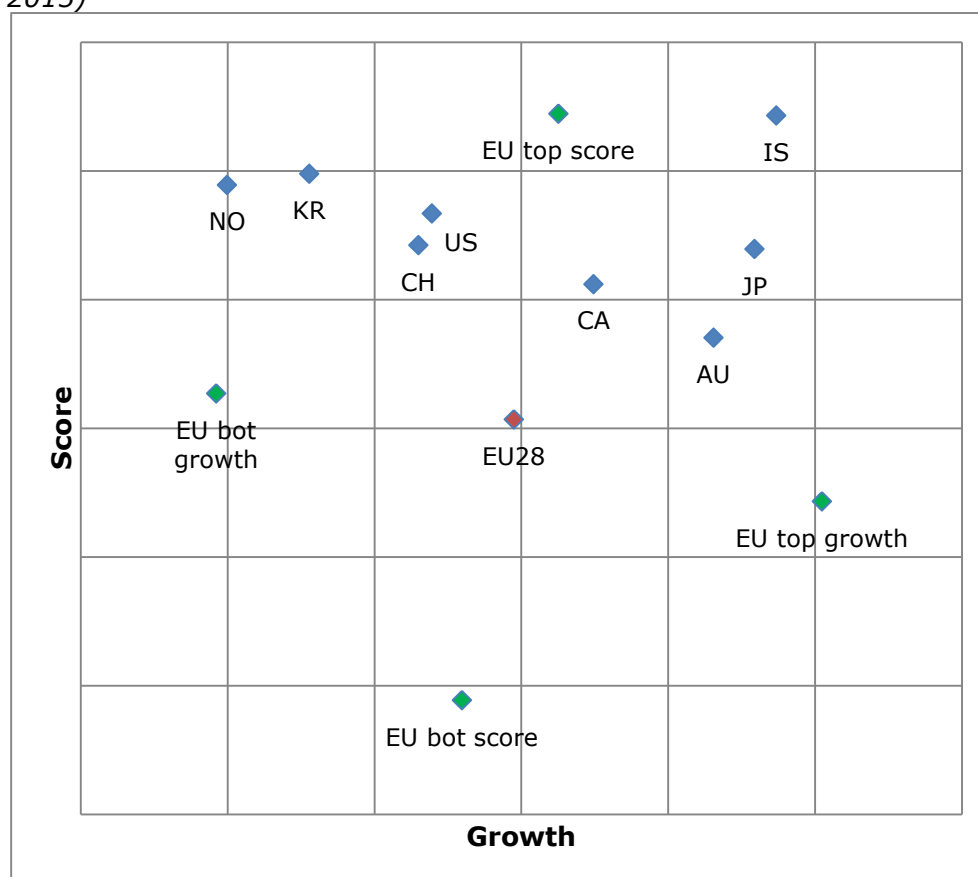
An annual update of the I-DESI allows for comparisons over time. Due to the availability of 2013 data, progress can be tracked over the 2013 - 2014 period (I-DESI2014 – I-DESI 2015). Table 3.2 presents the scores and ranking positions for all countries in the I-DESI 2014 (and the average of the three best and worst performing EU countries) and for the five main dimensions.

Table 3.2 Scores and rankings I-DESI 2014 (overall index and dimensions) Tier-1

	I-DESI		1. Connectivity		2. Human Capital		3. Use of Internet		4. Integration of Digital Technology		5. Digital Public Services	
	score	rank	score	rank	score	rank	score	rank	score	rank	score	rank
EU top 3	0,67	1	0,72	4	0,69	1	0,56	3	0,68	2	0,76	3
NO	0,65	2	0,66	7	0,65	3	0,59	2	0,63	6	0,76	2
KR	0,65	3	0,83	1	0,68	2	0,48	5	0,51	10	0,68	4
IS	0,64	4	0,70	5	0,65	4	0,64	1	0,65	4	0,53	8
US	0,63	5	0,69	6	0,56	8	0,47	7	0,65	5	0,76	1
CH	0,62	6	0,74	3	0,60	6	0,41	9	0,71	1	0,53	9
JP	0,59	7	0,77	2	0,58	7	0,22	11	0,67	3	0,60	7
CA	0,59	8	0,63	9	0,62	5	0,47	6	0,57	8	0,64	6
AU	0,56	9	0,50	10	0,56	9	0,48	4	0,62	7	0,66	5
EU28	0,54	10	0,63	8	0,56	10	0,44	8	0,53	9	0,51	10
EU bottom 3	0,44	11	0,46	11	0,46	11	0,34	10	0,34	11	0,34	11

Figure 3.7 presents the performance and progress of countries over time (I-DESI 2014 vs. I-DESI 2015). In this figure, non-EU Tier-1 countries are plotted based on their absolute performance in I-DESI 2015 (vertical axis) and their growth in performance (horizontal axis). The EU average is plotted, as well as the EU top-three average regarding absolute performance ('EU top score') and growth ('EU top growth'). The averages of the three worst performing EU countries regarding score ('EU bot growth') and progress ('EU bot growth') are also shown. From this graph, it could be observed how countries are performing and developing as compared to the EU28 average (displayed in red). To allow for a good comparison over the two years, the I-DESI 2015 score on the vertical axis is recalculated with the same subset of indicators that is available for I-DESI 2014. EU scores are plotted in green, the EU average in red and other countries in blue.

Figure 3.7 Country performance and progress over years (Tier-1, I-DESI 2014 vs. I-DESI 2015)



In light of the scores and growth of the countries, it should be noticed that Australia, Canada, Iceland and Japan score above and grow faster than the EU average. Norway, Korea, Switzerland and the United States are amongst the countries that score above the EU average, but at the same time they are growing slower than the EU average.

Figure 3.8 – 3.12 are similar to figure 3.7, portraying the performance and progress of the countries for each of the five specific dimensions.

The best overall performer regarding growth on Connectivity is Korea, with a relatively high score but a slow growth over 2014-2015. Although the majority of the countries performs above the EU average, many of them (Korea, Japan, Iceland, Norway, the United States) are growing slower than the EU on average.

Korea shows the slowest growth on Human Capital. The best performing EU countries ('EU top score') report a relatively high growth rate. In contrast, the worst performing EU countries on this dimension remain behind, and show no progress as compared to 2013.

On the dimension Use of Internet Iceland is doing best on both performance as well as growth. Iceland leaves all the others far behind. Japan has the lowest score, but has a slightly higher growth than the EU28 average. Korea and the United States are performing just under the EU28, but are showing the lowest growth of all Tier-1 countries.

The improvement rate of the EU top performers is similar to other top performers such as Switzerland and Iceland on the Integration of Digital Technology. Korea is behind the EU average, both on absolute performance and on growth.

On the fifth dimension Digital Public Services the United States is the best performing country on score, but Japan, Korea, Canada, Iceland and the three top-performers of the EU all show a higher growth than the United States.

Figure 3.8 Country performance and progress over years dimension 1. Connectivity (Tier-1, I-DESI 2014 vs. I-DESI 2015)

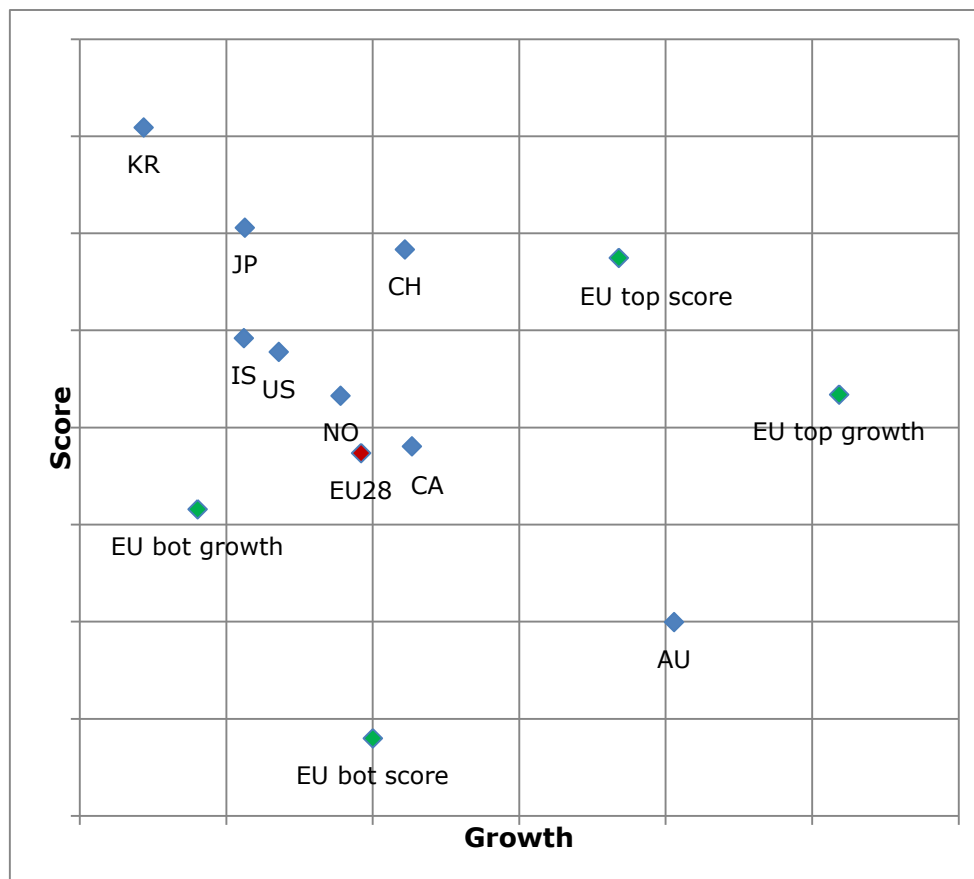


Figure 3.9 Country performance and progress over years dimension 2. Human Capital (Tier-1, I-DESI 2014 vs. I-DESI 2015)

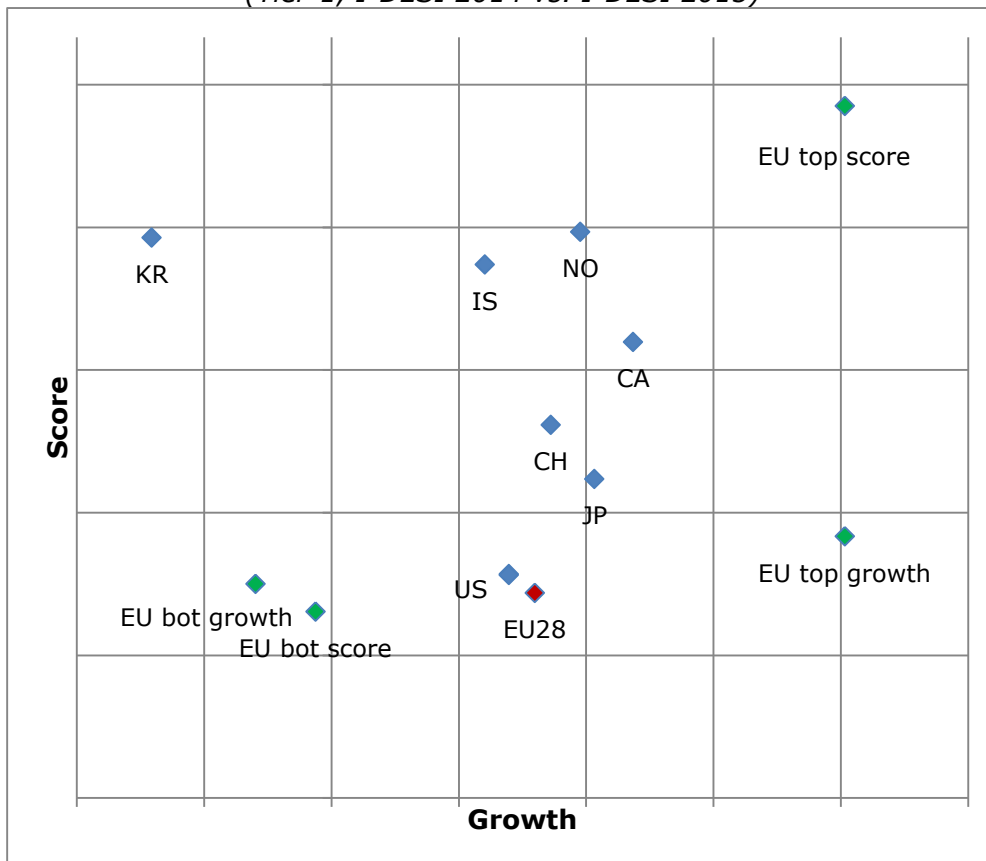


Figure 3.10 Country performance and progress over years dimension 3. Use of Internet (Tier-1, I-DESI 2014 vs. I-DESI 2015)

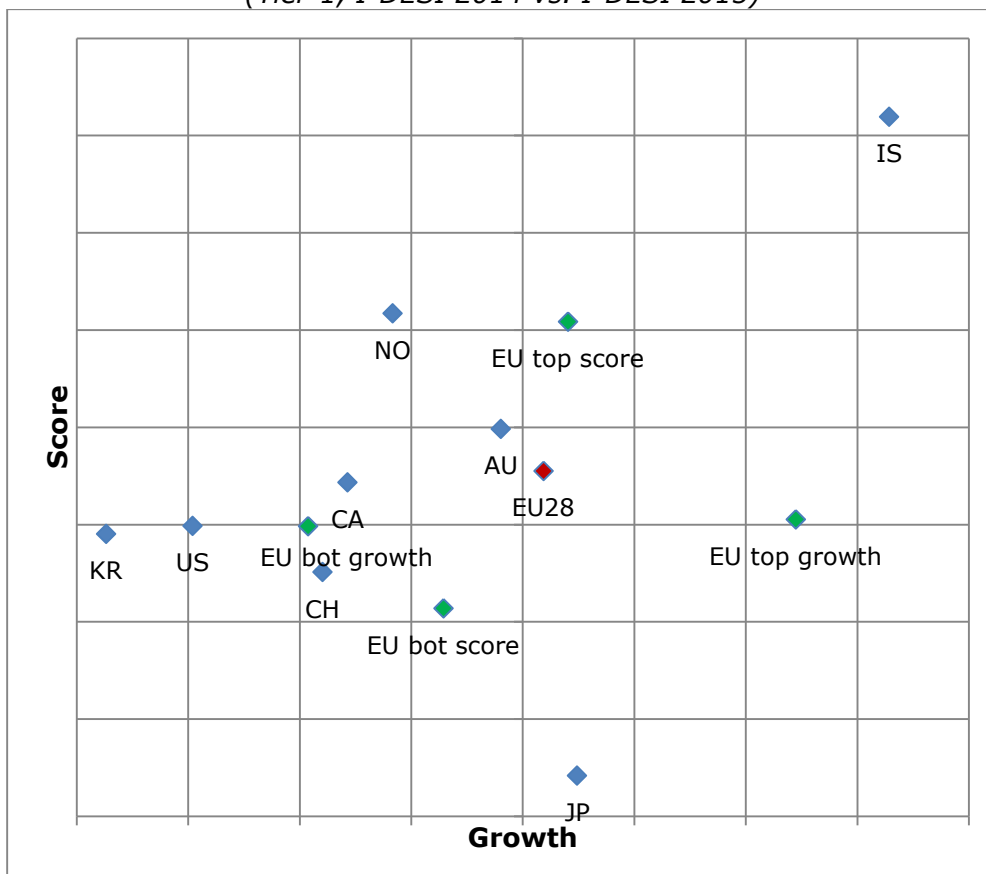


Figure 3.11 Country performance and progress over years dimension 4. Integration of Digital Services (Tier-1, I-DESI 2014 vs. I-DESI 2015)

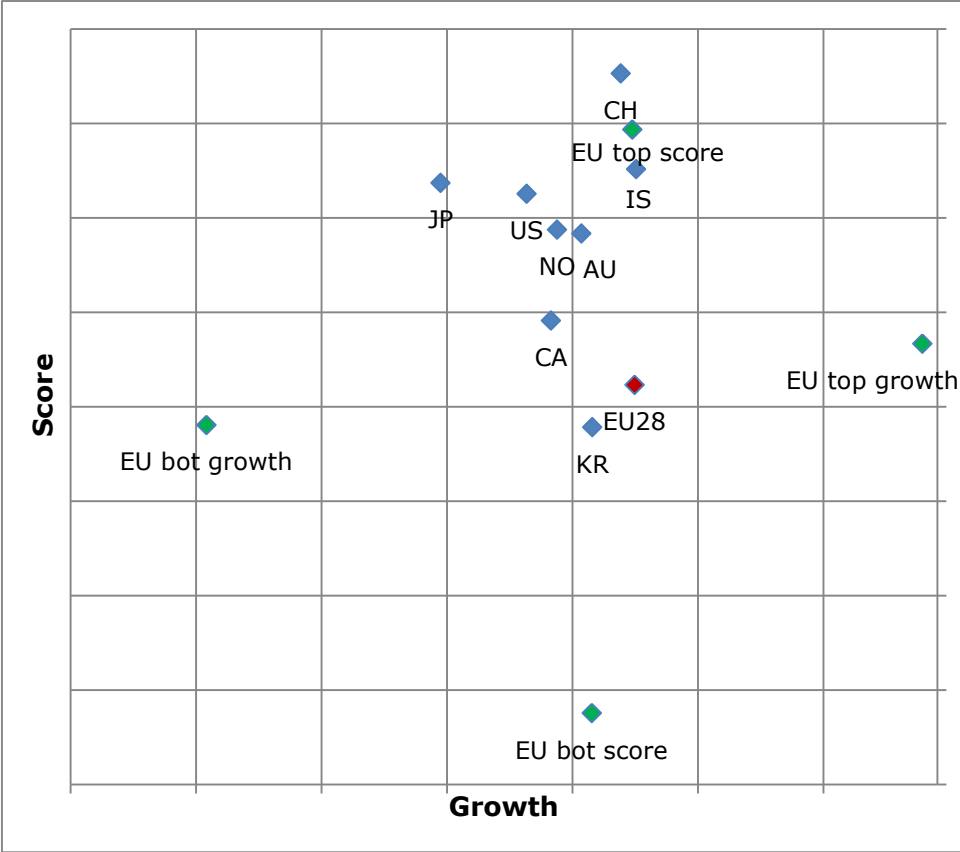
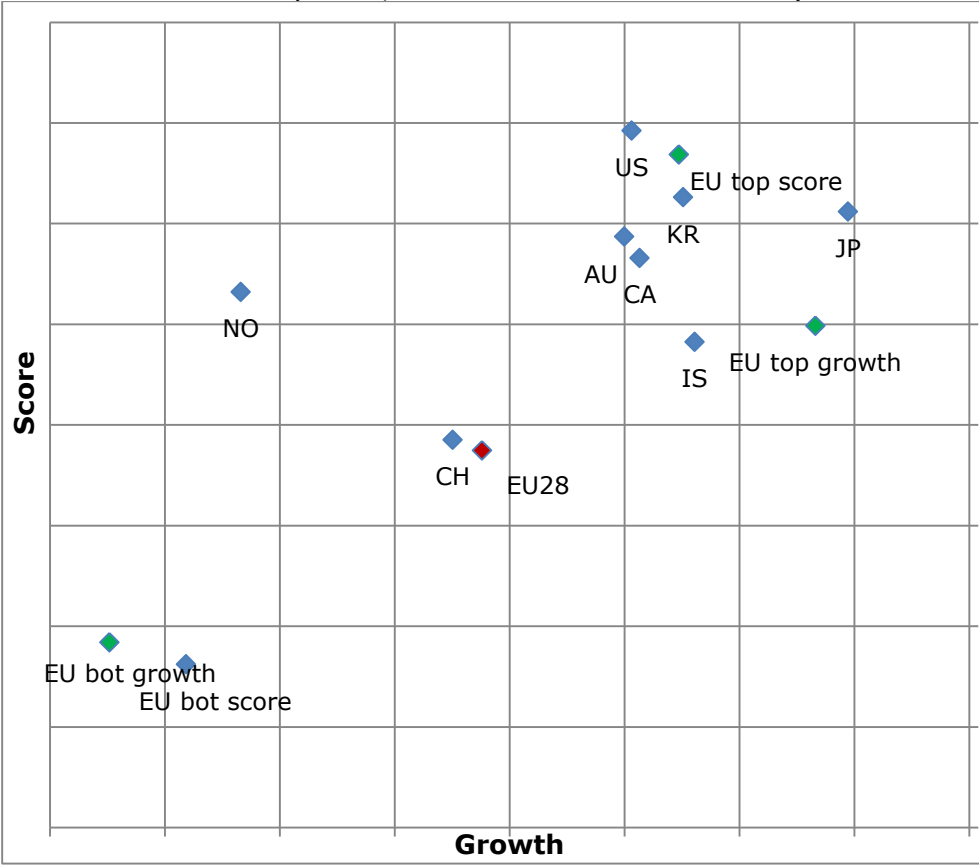


Figure 3.12 Country performance and progress over years dimension 5. Digital Public Services (Tier-1, I-DESI 2014 vs. I-DESI 2015)



4 Results for Tier-2

4.1 Differences between Tier-2 and Tier-1

This chapter presents the results of the I-DESI study for Tier-2. Tier-2 differs from Tier-1 on two elements: the countries that are included and the indicators that are used. In the tables 4.1 and 4.2 (presented here again for convenience) the differences are shown.

Table 4.1 Countries that are included in Tier-1 and Tier-2

Tier-1	All EU28 countries	Japan	Korea (Rep.)	United States	Australia	Canada	Iceland	Norway	Switzerland
Tier-2	All Tier-1 countries	Brazil	China	Israel	Mexico	New Zealand	Russia	Turkey	

Table 4.2 Indicators that are used (●) in Tier-1 and Tier-2

Main dimensions	Sub-dimensions	Indicators	Tier-1		Tier-2	
			2015	2014	2015	2014
1. Connectivity	1.1. Fixed Broadband	1.1.1. Fixed BB Coverage	●	●		
		1.1.2. Fixed BB Subscriptions	●	●	●	●
	1.2. Mobile Broadband	1.2.1. Mobile BB Subscriptions	●	●	●	●
		1.2.2. 3G Coverage	●	●	●	
	1.3. Speed	1.3.1. Average Connection Speed	●	●	●	●
		1.3.2. Fast BB Subscriptions	●	●	●	●
	1.4. Affordability	1.4.1. Fixed BB Subscription charge	●	●	●	●
2. Human Capital	2.1. Basic Skills and Usage	2.1.1. Daily Internet Users	●	●	●	●
		2.1.2. Regular Internet Users	●	●	●	●
	2.2. Advanced skills and development	2.2.1. ICT specialists	●	●		
		2.2.2. STEM graduates	●	●	●	●
3. Use of Internet	3.1. Content	3.1.1. Reading News Online	●	●		
		3.1.2. Music, Videos and Games	●	●	●	●
		3.1.3. Video on Demand	●		●	
	3.2. Communication	3.2.1. Social Networks	●	●	●	●
	3.3. Transactions	3.3.1. Online Banking	●	●	●	●
		3.3.2. Purchase online products	●	●	●	●
4. Integration of Digital Technology	4.1. Business digitization	4.1.1. Electronic Information Sharing	●			
		4.1.2. RFID	●			

Main dimensions	Sub-dimensions	Indicators	Tier-1		Tier-2	
			2015	2014	2015	2014
		4.1.3. Social Media	•			
		4.1.4. Online Presence	•	•	•	
		4.1.5. Cloud Services	•			
	4.2. eCommerce	4.2.1. SMEs Selling Online	•	•	•	•
		4.2.2. eCommerce Turnover	•	•		
5. Digital Public Services	5.1. eGovernment	5.1.1. eGovernment Users	•	•	•	•
		5.1.2. Transactional services	•	•	•	•
		5.1.3. Connected Services	•	•	•	•
		5.1.4. Open Data	•	•	•	•

The key findings concerning the ranking of EU countries, the EU as a whole and 15 other relevant countries (together Tier-2) are presented in this chapter, as well as their progress over time. The scores are normalized and range from 0-1 (with higher scores meaning better performance).

First, the overall results are presented. Next, results per dimension are discussed in the five subsequent paragraphs. Findings regarding the progress over time (I-DESI 2014 – I-DESI 2015) are presented in paragraph 4.7.

4.2 Overall results

4.2.1 The I-DESI ranking for Tier-2

Figure 4.1 presents the main ranking of countries in the I-DESI 2015 Tier-2. I-DESI scores range from 0 (worst) to 1 (best). The height of each bar in the chart corresponds to the score achieved by the corresponding country, and the height of each colour within the bar corresponds to the contribution of the corresponding dimension to the overall score (taking into account the weight attributed to the dimension). The average of the three best performing EU member states ('EU28-top') is included in each graph in this chapter, as well as the average of the three worst performing EU member states ('EU28-bot'), the overall EU28 average and the country score of the non-EU countries.

Just as is in Tier-1, top European performers are leading countries on a global stage as well. The best performing country is Iceland, followed by the top-EU member states (Denmark, the United Kingdom, Sweden). Korea complements the top-three, scoring 0,64. With a score of 0.62, Japan and the United States are performing above the EU average of 0.54, but are behind of Norway and New Zealand (both scoring 0.63).

Whilst Australia and Canada are performing above the EU average, Russia lags behind the EU with a score of 0.47. But Russia is still ahead of China, Turkey, Brazil and Mexico, with Turkey, Brazil and Mexico ranking behind all EU countries. They are even below the three worst performing EU countries Romania, Bulgaria and Poland. In particular Brazil (0.38) and Mexico (0.34) score low in the overall ranking.

Figure 4.1 I-DESI 2015 main ranking (Tier-2)

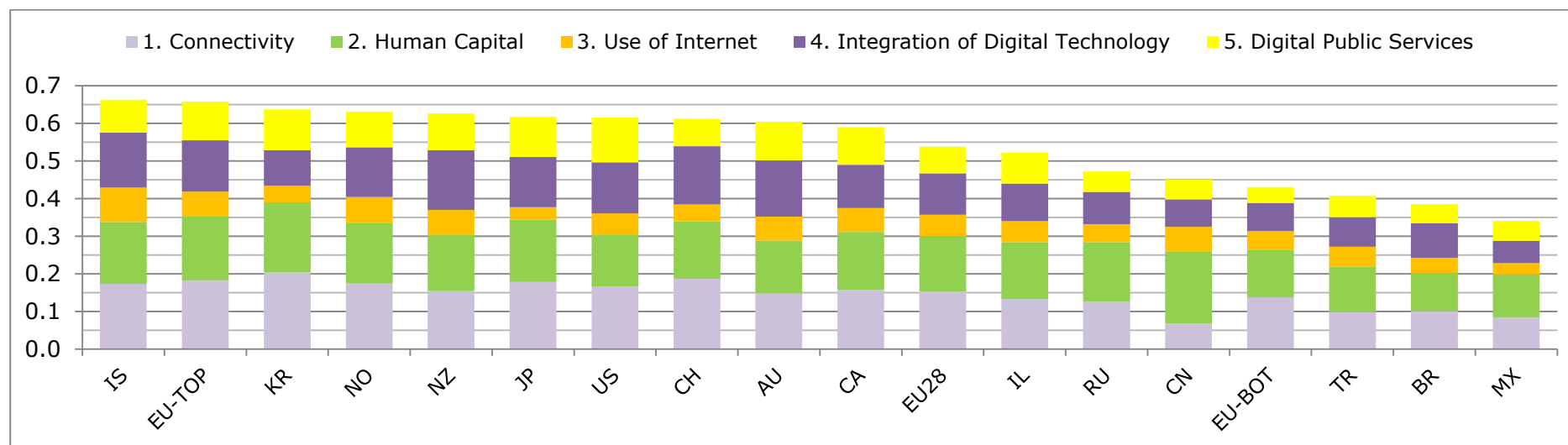


Table 4.3 presents the scores and ranking positions for all countries in the I-DESI Tier-2 and in each of the five main dimensions.

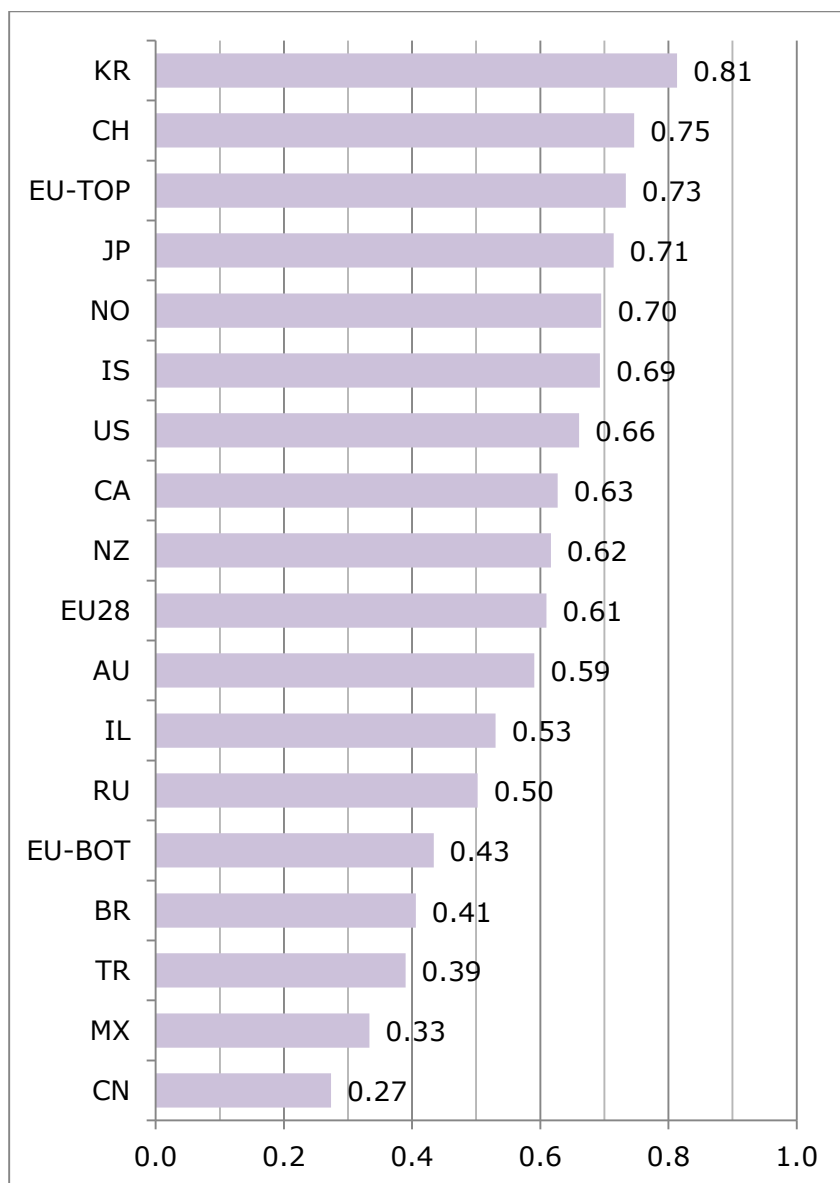
Table 4.3 Scores in Tier-2, I-DESI 2015 (overall index and dimensions)

	I-DESI		1 Connectivity		2 Human Capital		3 Use of Internet		4 Integration of Digital Technology		5 Digital Public Services	
	score	rank	score	rank	score	rank	score	rank	score	rank	score	rank
IS	0.66	1	0.69	6	0.66	5	0.61	1	0.73	4	0.58	9
EU28 top	0.66	2	0.73	3	0.69	3	0.48	2	0.71	5	0.77	2
KR	0.64	3	0.81	1	0.75	2	0.29	14	0.47	12	0.73	3
NO	0.63	4	0.70	5	0.65	6	0.45	3	0.66	8	0.63	8
NZ	0.63	5	0.62	9	0.59	11	0.44	4	0.79	1	0.65	7
JP	0.62	6	0.71	4	0.66	4	0.22	17	0.67	7	0.71	4
US	0.62	7	0.66	7	0.56	14	0.37	9	0.68	6	0.79	1
CH	0.61	8	0.75	2	0.61	9	0.30	13	0.78	2	0.49	11
AU	0.60	9	0.59	11	0.56	13	0.42	7	0.75	3	0.69	5
CA	0.59	10	0.63	8	0.62	8	0.42	6	0.58	9	0.67	6
EU28	0.54	11	0.61	10	0.59	12	0.38	8	0.55	10	0.47	12
IL	0.52	12	0.53	12	0.61	10	0.37	10	0.50	11	0.55	10
RU	0.47	13	0.50	13	0.63	7	0.32	12	0.43	14	0.36	14
CN	0.45	14	0.27	18	0.76	1	0.44	5	0.37	16	0.35	16
EU28 bot	0.43	15	0.43	14	0.50	15	0.28	15	0.35	17	0.26	18
TR	0.41	16	0.39	16	0.49	16	0.35	11	0.39	15	0.38	13
BR	0.38	17	0.41	15	0.40	18	0.27	16	0.46	13	0.34	17
MX	0.34	18	0.33	17	0.46	17	0.20	18	0.30	18	0.35	15

4.3 Connectivity

A prerequisite for developing a digital society is having the digital infrastructure in place. High-speed and affordable internet connections are crucial in the transformation into a digital economy. Figure 4.2 presents the composite score per country of the Connectivity dimension.

Figure 4.2 Performance per country on dimension 1 Connectivity (Tier-2, I-DESI 2015)



It is clear that Korea is ahead of Europe and all other countries with regards to connectivity (scoring 0.81). Korea is among the top performers on all sub-dimensions, and excels at the speed of their internet connections. Leading European countries (as indicated by 'EU-top') are Denmark, the Netherlands and the United Kingdom. Switzerland is the second best performing country, whilst Japan is amongst the top performers as well (scoring 0.71).

The United States and Canada are performing just above the EU average, whilst the EU is on average ahead of Australia (EU scoring 0.61, and Australia 0.59). Among the poor performers are Brazil (0.41), Turkey (0.39), Mexico (0.38) and in particular China (0.27).

They are ranked behind the three worst performing EU member states, being Cyprus, Croatia and Slovakia.

With regards to fixed broadband (both take-up and coverage), Belgium leads the way at a global stage, followed by the Iceland and Denmark. Whilst Canada is the 4th worldwide performer with regards to this sub-dimension, New Zealand and the United States are on par with the EU average (0.62). Countries such as Japan (0.59) and Australia (0.55) are behind the EU, and in particular China (0.29), Turkey (0.23), Brazil (0.23) and Mexico (0.21) are way behind the EU, and even behind the worst performing countries in the EU.

Whilst Japan is just below the EU average with regards to fixed broadband, they are leading the way with regards to the take-up and coverage of mobile broadband (both scoring 0.88). Japan is closely followed by Finland, Estonia and Sweden – the EU's top performers on this sub-dimension. . Australia, Korea and the United States are among the top performers as well, while also New Zealand (0.75) is performing above the EU average (0.69). Countries such as Turkey and China are not only behind with respect to fixed broadband, but also in the take-up and coverage of mobile broadband. In particular in China, the mobile broadband coverage and take-up is very low.

With regards to speed, Korea is leading the way, offering by far the highest average internet speed. Japan is second, and leading European countries such as Bulgaria and the Netherlands are way behind Korea. The EU average (0.49) is on an equal level as compared to the United States (0.51), Canada (0.50) and Australia (0.48). The average connection speed in Turkey, Mexico, Brazil and China is low, but still higher than in the European countries Italy, Croatia and Cyprus.

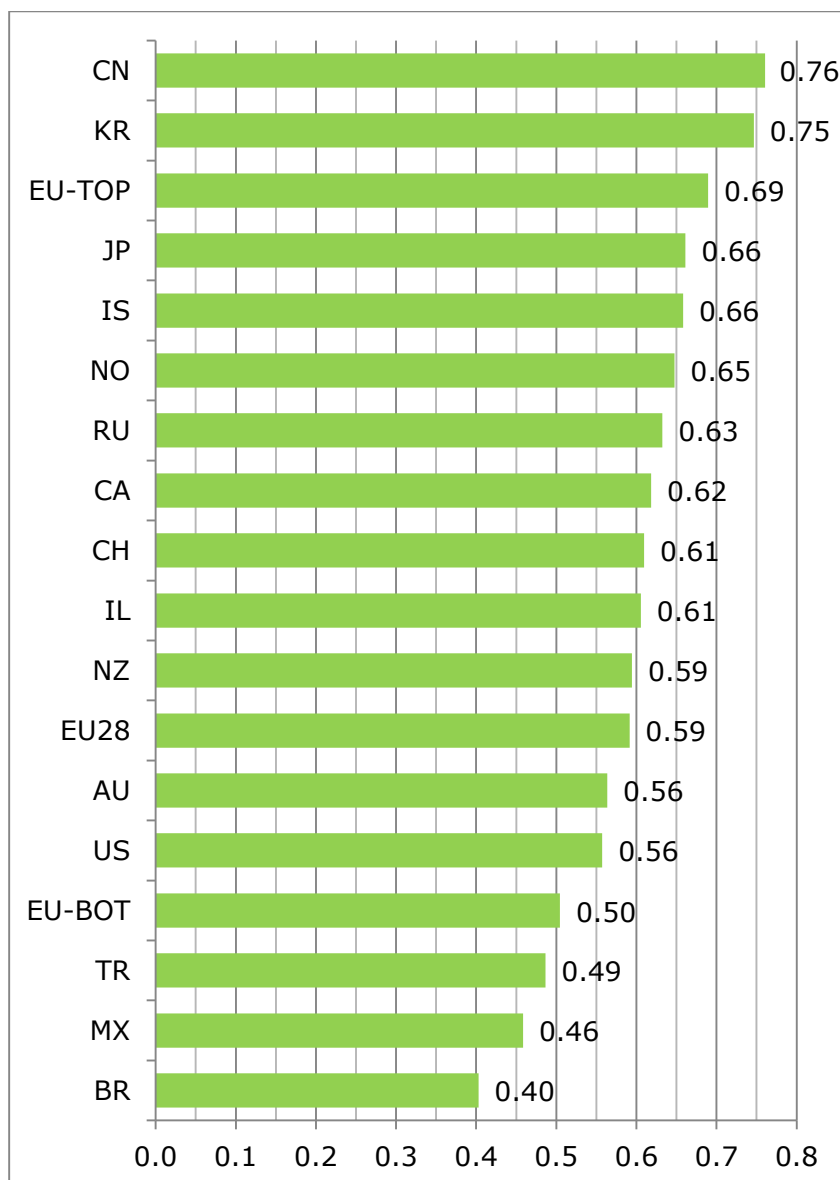
Internet is offered at high speed in Korea, but it is relatively expensive as compared to other countries. Korea is performing below the EU average if it comes to affordability of their internet connections. The affordability of fixed broadband is the greatest in the United States and Russia, followed by the United Kingdom and Romania.

Fixed broadband connections are relatively expensive in some countries that perform well on other Connectivity-dimensions, such as Canada, New Zealand and Australia. The Nordic countries are below the EU average, and the most expensive country for fixed broadband is Mexico.

4.4 Human Capital

A physical infrastructure is not the only prerequisite for a digital society. It needs to be complemented by the appropriate knowledge and skills to take advantage of the possibilities offered by the internet and the digital society. Figure 4.3 presents the composite score per country of the Human Capital dimension.

Figure 4.3 Performance per country on dimension 2 Human Capital (Tier-2, I-DESI 2015)



China (0.76) and Korea (0.75) lead the way with regards to human capital, followed by Sweden, Finland, and the United Kingdom ('EU-top'). Japan ranks 4th, and countries such as Australia and the United States are below the EU average (0.59). With a score of 0.63, Russia is performing better than the EU average. Turkey, Mexico and Brazil clearly lag behind on this dimension, and are below the three worst performing EU member states Poland, Italy and Romania.

When zooming in on the frequency of internet use (average of daily and regular use), Iceland is in the lead. The frequency of internet use is very high in Iceland (0.96), leading the ranking before Japan, Norway and Denmark. The top-five is complemented by Korea and Sweden, whilst the United States, New Zealand and Australia are average

performers, but still above the EU average. China (0.64)¹⁶ and Russia (0.70) are below the EU average (0.75), and Mexico is scoring very low (0.38).

Considering the workforce and the potential to maintain and grow the digital economy, China clearly leads the way, being ahead of all the others: China is scoring 0.88, followed by Korea (0.62). The high Chinese score is most likely caused by the definition of the STEM indicator in the I-DESI index. Leading for China to a (much) higher indicator value than when the original DESI-definition would be used, because of the very large population and a relatively high proportion of technically oriented students.

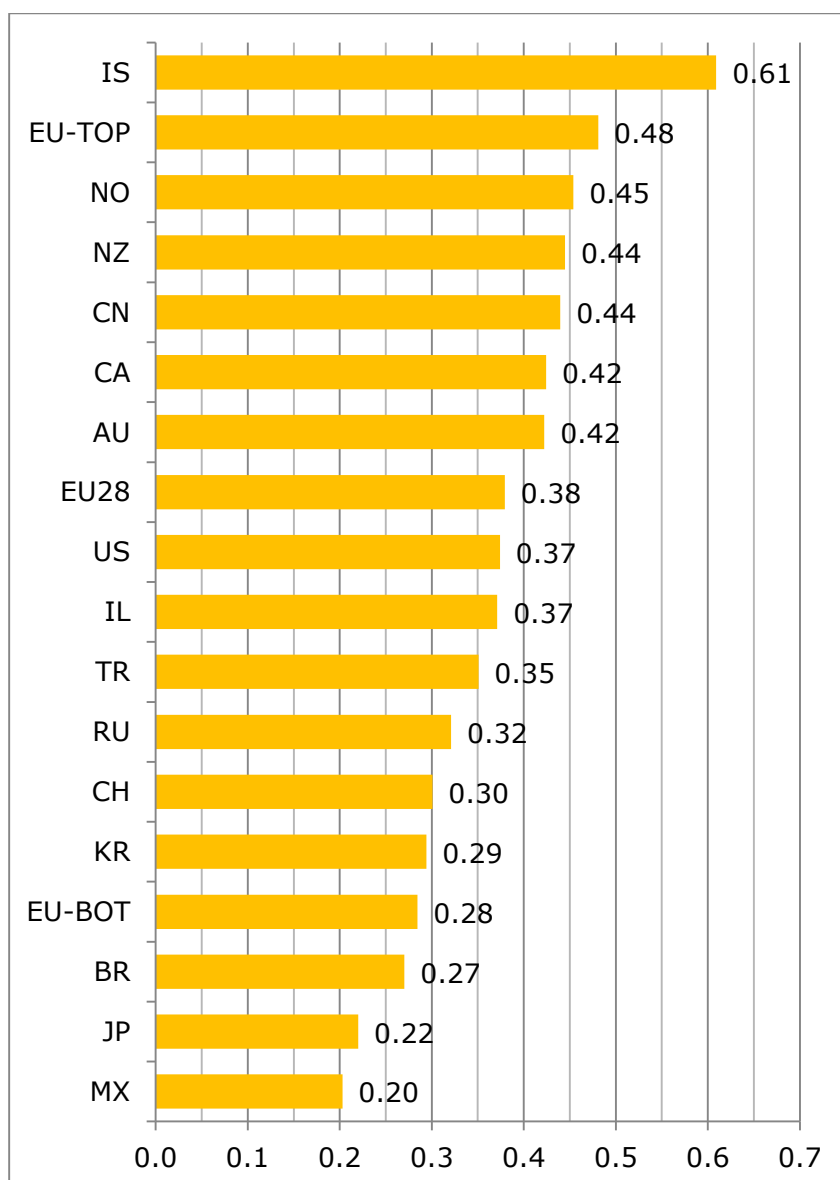
The advanced skills and development sub-dimension measures the percentage of people with ICT specialist skills and the share of graduates with STEM education. Worth mentioning in this regard are the relatively high scores of Russia (0.56) and Mexico (0.54), both performing above the EU average. On average, the EU is well ahead of Japan, Canada, New Zealand, the United States, Australia and Brazil. As compared to other sub-dimensions, the low performances of the United States and Australia (both being amongst the four worst performing countries) are remarkable.

¹⁶ The score and rank of China on Daily Internet Use (0.79 / 10) is much better than on Regular Internet Use (0.49 / 43).

4.5 Use of the Internet

Through the high-speed connectivity provided by a broadband description, and the basic skills to take advantage of this connectivity, a wide mix of online activities can be enjoyed by both citizens and businesses. These elements enable citizens to consume online content such as music, videos, games, shopping and banking. Figure 4.4 presents the composite score per country of the Use of Internet dimension.

Figure 4.4 Performance per country on dimension 3 Use of the Internet (Tier-2, I-DESI 2015)



On average, the EU is ahead of Korea, Brazil, Russia, Turkey and Mexico with regards to the use of the internet. Especially the relatively low consumption of online content in Korea and Japan is striking. Iceland (0.61) is clearly in the lead, followed by the top performing countries of the EU, being the United Kingdom, Malta and Latvia. The three worst performing EU member states of this dimension are Italy, Romania and Germany, but they are still performing better than Brazil, Japan and Mexico.

When zooming in to the sub-dimensions, it stands out that Iceland is high performing on two out of the three sub-dimensions: Iceland is second with regards to Content (e.g., online gaming, online music and online videos), and leading with regards to Communication (usage of social networks). Eight out of the ten countries in the top-ten of sub-dimension Content, are European countries: Canada is ranking 6th, and the United States 7th. Australia, Korea and Japan are below the EU average with regards to the usage of online content, with Japan and Korea scoring very low: 0.16 and 0.17 respectively, against an EU average of 0.27.

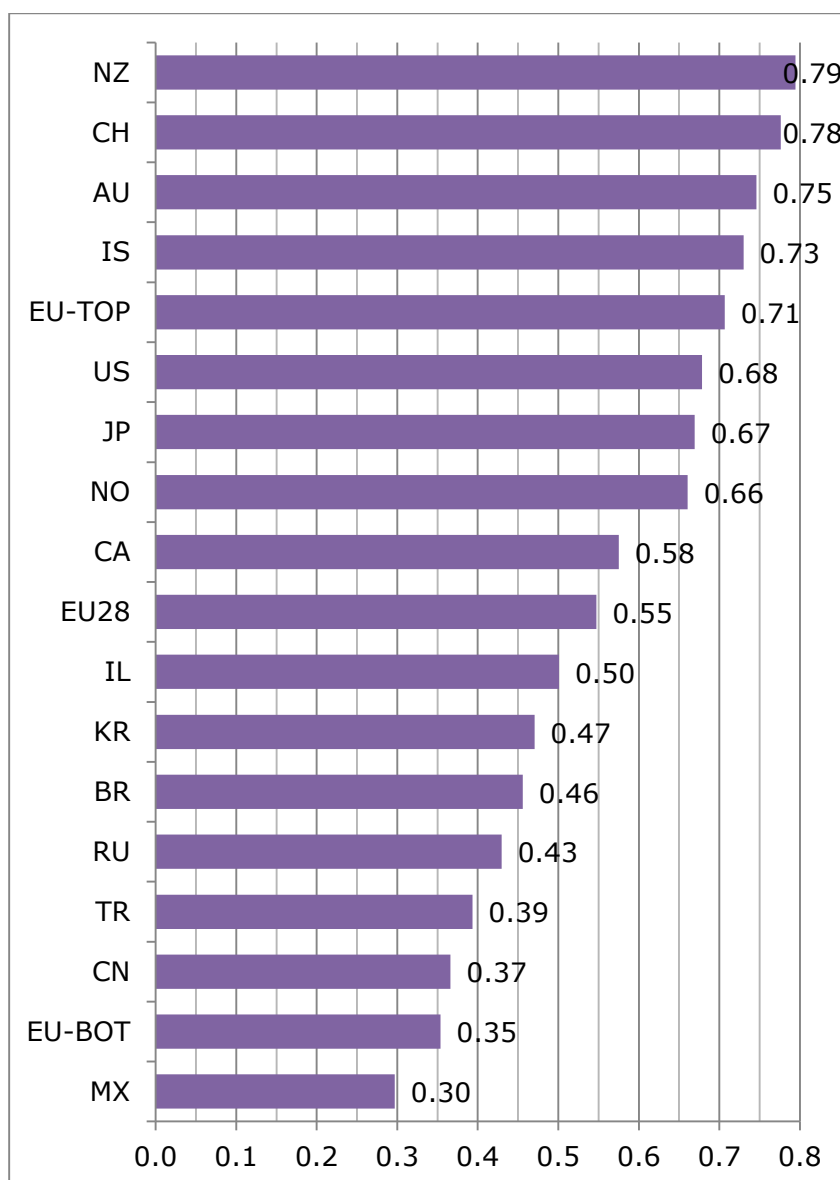
The top-ten of countries with regards to Social Network usage consist of European countries only. The EU is well ahead of almost all non-European countries under consideration in Tier-2, and only Turkey (0.56) and Russia (0.54) are performing above the EU average (0.49). New Zealand, Australia and Canada are below the EU average. Remarkable are the low performances of countries that rank high on the overall Tier-2 ranking, such as the United States (0.35), Japan (0.30) and Korea (0.14).

Although Australia is lagging behind with regards to the usage of social networks, they are leading the way (0.62) with regards to online shopping. Australia is followed by the Netherlands and the United Kingdom, whilst the top-five is complemented by Norway and Korea. New Zealand is among the top performers. The weak performance of Japan on this sub-dimension stands out (0.20). Online shopping has not quite caught up in Japan to the extent that it has in other countries. Canada and the United States are above the EU average. Although countries as Russia, Brazil and Mexico are behind the EU average on this indicator, they are still ahead of Greece, Bulgaria and Romania.

4.6 Integration of Digital Technology

The adoption of digital technologies can contribute significantly to the modernisation of businesses, and ultimately their and Europe's competitiveness. Hence, it is of importance how European businesses are performing in this regard when compared to other leading and emerging world economies. In Tier-2, the integration of digital technologies by businesses is captured by the percentage of enterprises with online presence and the percentage of SMEs selling online. Figure 4.5 presents the composite score per country of the Integration of Digital Technology dimension.

Figure 4.5 Performance per country on dimension 4 Integration of Digital Technology (Tier-2, I-DESI 2015)



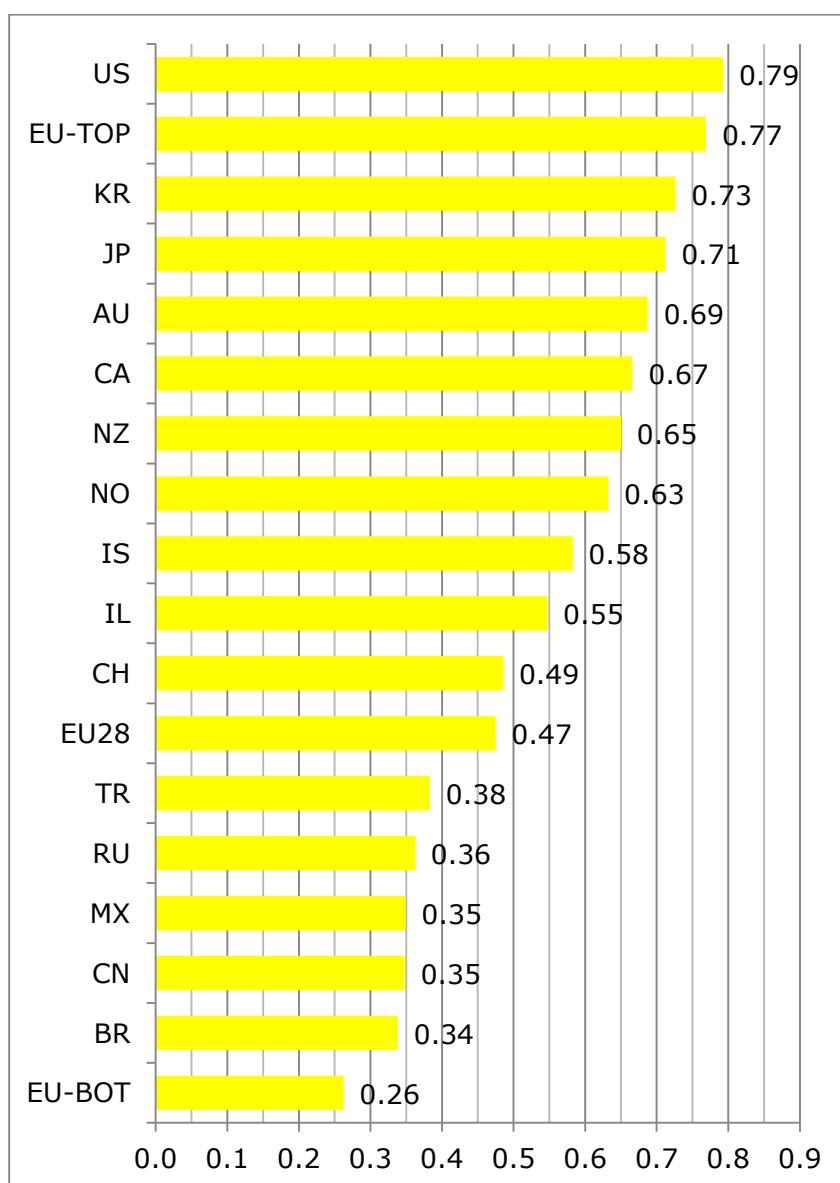
New Zealand is the world leader with regards to the integration of digital technologies by businesses (0.79), closely followed by Switzerland (0.78) and Australia (0.75). Iceland ranks fourth, followed by the top performing EU countries Denmark, Sweden and the Netherlands.

When zooming in further on the EU average, it appears that the United States, Japan and Canada are all performing above the EU average, taking the advantage of the opportunities that online selling offers to businesses. Korea, on the other hand, is below the EU average (0.47). Emerging economies such as Turkey (0.39), China (0.37) and Mexico (0.30) are lagging behind the EU average. However, Turkey and China are still ranking above the three worst performing EU member states, being Romania, Bulgaria and Latvia.

4.7 Digital Public Services

Business and citizen interaction with the Public Sector can be improved and made significantly more efficient through the use of digital technologies. Such efficiency gains materialise both on the side of the Public Administration as well as on the business side. Therefore, an efficient provision of public services enhances the competitiveness of Europe, whilst realizing significant cost reductions. Figure 4.6 presents the composite score per country of the Digital Public Services dimension.

Figure 4.6 Performance per country on dimension 5 Digital Public Services (Tier-2, I-DESI 2015)



The United States is in the lead regarding eGovernment (0.79), closely followed by the best performing EU member states (France, the United Kingdom, the Netherlands). Countries are assessed on four indicators in this dimension, being eGovernment users (percentage of population using the internet to interact with public authorities), Transactional services offered by the public authorities, Connected services offered by the public authorities, and the extent to which data is publicly available (open data). Korea (0.73) and Japan are just behind the best performing EU countries, followed by

Australia and Canada New Zealand is performing above the EU average as well, but Turkey, Russia, Mexico, China and Brazil are lagging behind as compared to the EU average. However, the European countries Malta, Croatia and Bulgaria have the lowest score of all countries on this dimension.

4.8 Tracking progress

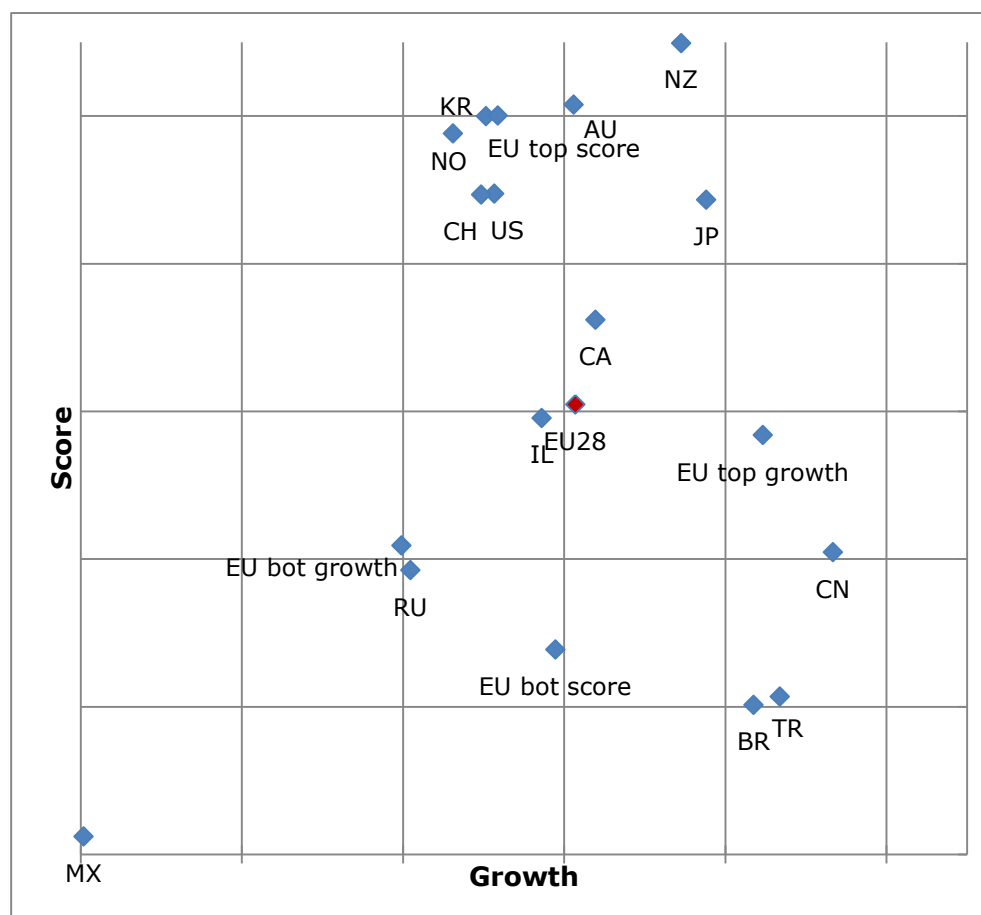
An annual update of the I-DESI allows for comparisons over time. Due to the availability of 2013 data, progress can be tracked over the 2013 - 2014 period (I-DESI2014 – I-DESI 2015). Table 4.4 presents the scores and ranking positions for all countries (and the average of the three best and worst performing EU countries) in the I-DESI 2014 and for the five main dimensions.

Table 4.4 Scores and rankings I-DESI 2014 (overall index and dimensions) Tier-2

	I-DESI		1. Connectivity		2. Human Capital		3. Use of Internet		4. Integration of Digital Technology		5. Digital Public Services	
	score	rank	score	rank	score	rank	score	rank	score	rank	score	rank
NZ	0,60	1	0,50	11	0,58	11	0,46	4	0,82	1	0,61	7
IS	0,59	2	0,63	5	0,65	4	0,56	1	0,55	4	0,53	10
KR	0,59	3	0,77	1	0,73	1	0,41	9	0,26	12	0,68	4
EU top 3	0,59	4	0,65	3	0,67	3	0,49	3	0,44	7	0,76	3
NO	0,59	5	0,60	7	0,64	6	0,49	2	0,45	6	0,76	2
AU	0,58	6	0,53	8	0,55	13	0,44	5	0,74	2	0,66	5
CH	0,56	7	0,65	4	0,59	9	0,37	14	0,57	3	0,53	11
US	0,56	8	0,60	6	0,55	14	0,41	8	0,47	5	0,76	1
JP	0,53	9	0,67	2	0,64	5	0,25	18	0,37	8	0,60	8
CA	0,49	10	0,52	9	0,60	8	0,43	7	0,28	10	0,64	6
EU28	0,46	11	0,52	10	0,58	12	0,40	11	0,26	11	0,51	12
IL	0,46	12	0,43	12	0,59	10	0,38	13	0,31	9	0,57	9
RU	0,41	13	0,41	13	0,60	7	0,38	12	0,24	13	0,39	15
CN	0,37	14	0,22	18	0,70	2	0,43	6	0,09	18	0,37	16
EU bottom3	0,36	15	0,35	14	0,49	16	0,32	16	0,12	16	0,34	17
MX	0,35	16	0,28	15	0,54	15	0,33	15	0,12	17	0,47	13
TR	0,32	17	0,27	17	0,48	17	0,40	10	0,14	15	0,29	18
BR	0,32	18	0,27	16	0,36	18	0,30	17	0,23	14	0,45	14

Figure 4.7 presents the performance and progress of countries over time (I-DESI 2014 vs. I-DESI 2015). In this figure, all Tier-2 countries are plotted based on their absolute performance in 2014 (vertical axis) and their growth in performance (horizontal axis). The EU average is plotted, as well as the EU top-three average regarding absolute performance ('EU top score') and growth ('EU top growth'). The average of the three worst performing EU countries regarding score ('EU bot growth') and progress ('EU bot growth') are also shown. From this graph, it can be observed how countries are performing and developing as compared to the EU28 average (displayed in red). To allow for a comparison over time, the I-DESI 2015 score on the vertical axis is recalculated with the same subset of indicators that is available for I-DESI 2014. EU scores are plotted in green, the EU average in red and other countries in blue.

Figure 4.7 Country performance and progress over years (Tier-2, I-DESI 2014 vs. I-DESI 2015)



In light of the scores and growth of the countries, countries can be clustered in four groups:

Countries scoring above and growing faster than EU average:

Canada, Japan and New Zealand.

Countries scoring above EU average, but growing slower:

Australia, Korea, Norway, Switzerland, the United States.

Countries scoring below EU average, but growing faster:

Brazil, China, Turkey.

Countries scoring below and growing slower than EU average:

Israel, Mexico, Russia.

Figure 4.8 – 4.11 are similar to figure 4.7, portraying the performance and progress of Tier 2 countries on four out of the five dimensions. No graph is made for the fourth dimension Integration of Digital Technologies, because in the I-DESI 2014 this dimension consists of only one indicator in Tier-2.

Korea is the Tier-2 country with the highest score on Connectivity, but it shows slow growth. Mexico has the lowest growth and the lowest score of all countries. Brazil, China, Turkey, Luxembourg and New Zealand are the countries with the highest growth: in particular Brazil is growing fast. But the first three of them still have a relatively low score.

On Human Capital China shows both the highest growth and the highest score. Mexico has the slowest growth of all Tier-2 countries and is, after Brazil, the country with the lowest score.

On the dimension Use of Internet Iceland is performing well on both score as growth. China is growing even faster, but has a lower score. Mexico, Korea, Switzerland and the United States have relatively low performances on both score and growth.

On the fifth dimension Digital Public Services Japan is the fastest growing country, before the best performing country on score: the United States. Top performing EU countries ('EU top score') are growing faster on average than amongst others the United States, Korea, Australia and Canada. The worst performing EU countries are way behind all non-EU countries, and report only slow growth.

Figure 4.8 Country performance and progress over years dimension 1. Connectivity
(Tier-2, I-DESI 2014 vs. I-DESI 2015)

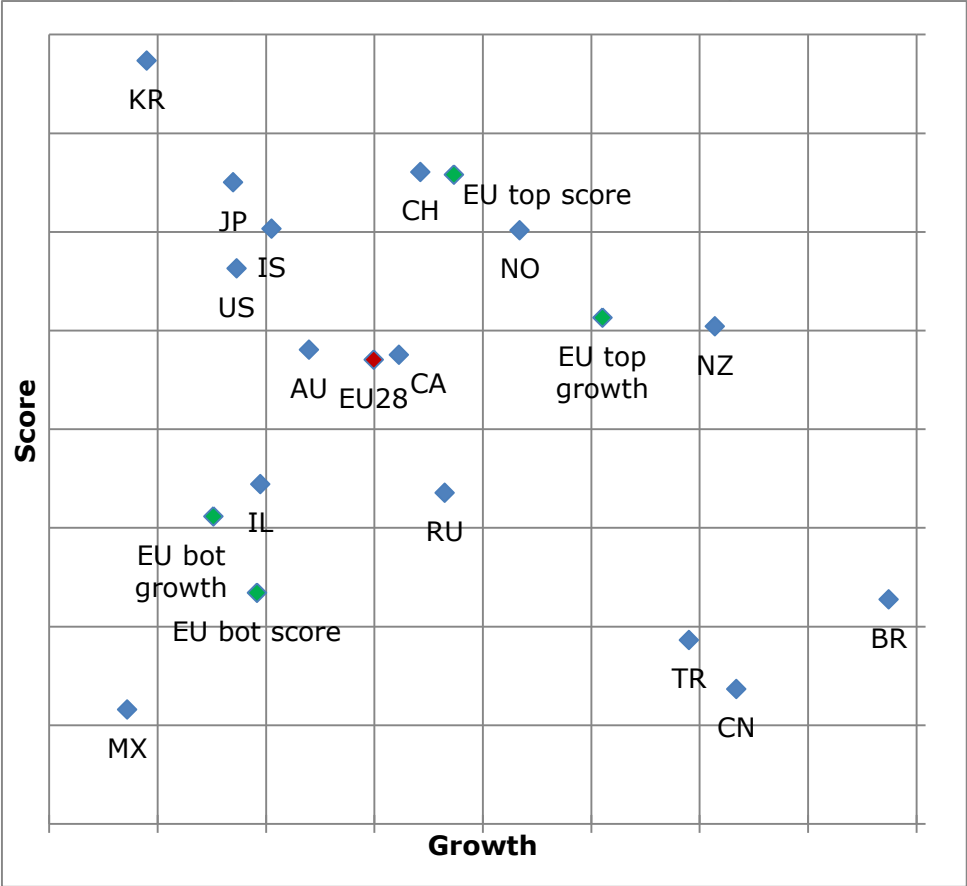


Figure 4.9 Country performance and progress over years dimension 2. Human Capital
(Tier-2, I-DESI 2014 vs. I-DESI 2015)

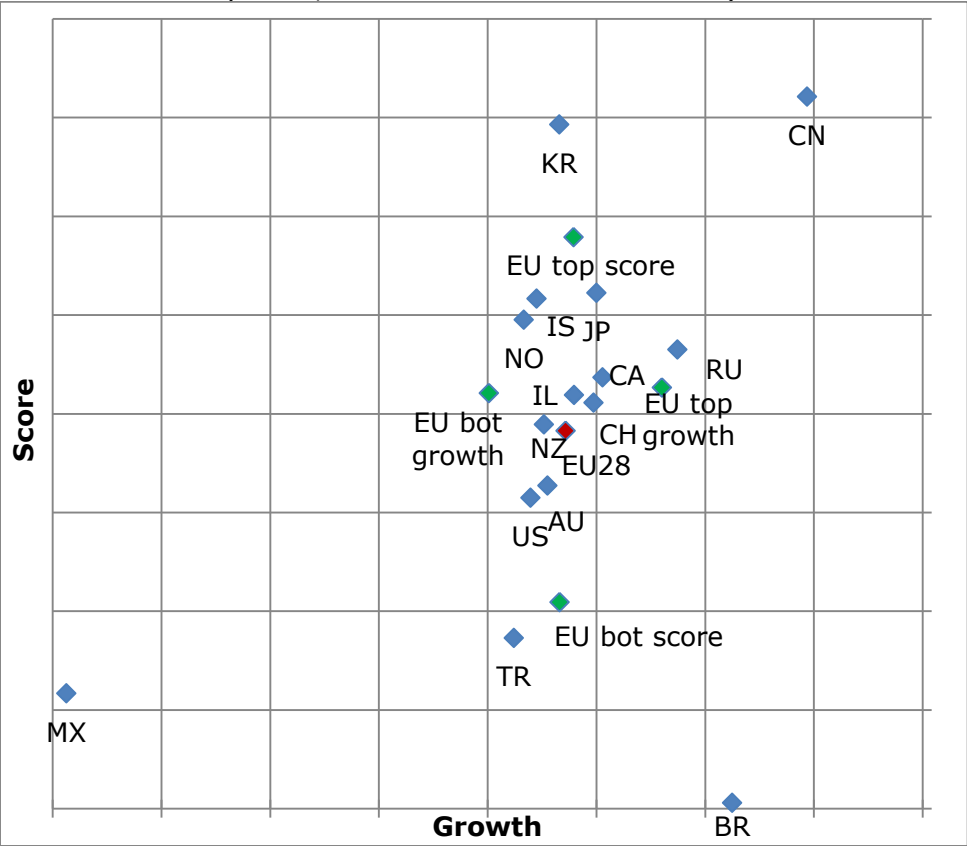


Figure 4.10 Country performance and progress over years dimension 3. Use of Internet (Tier-2, I-DESI 2014 vs. I-DESI 2015)

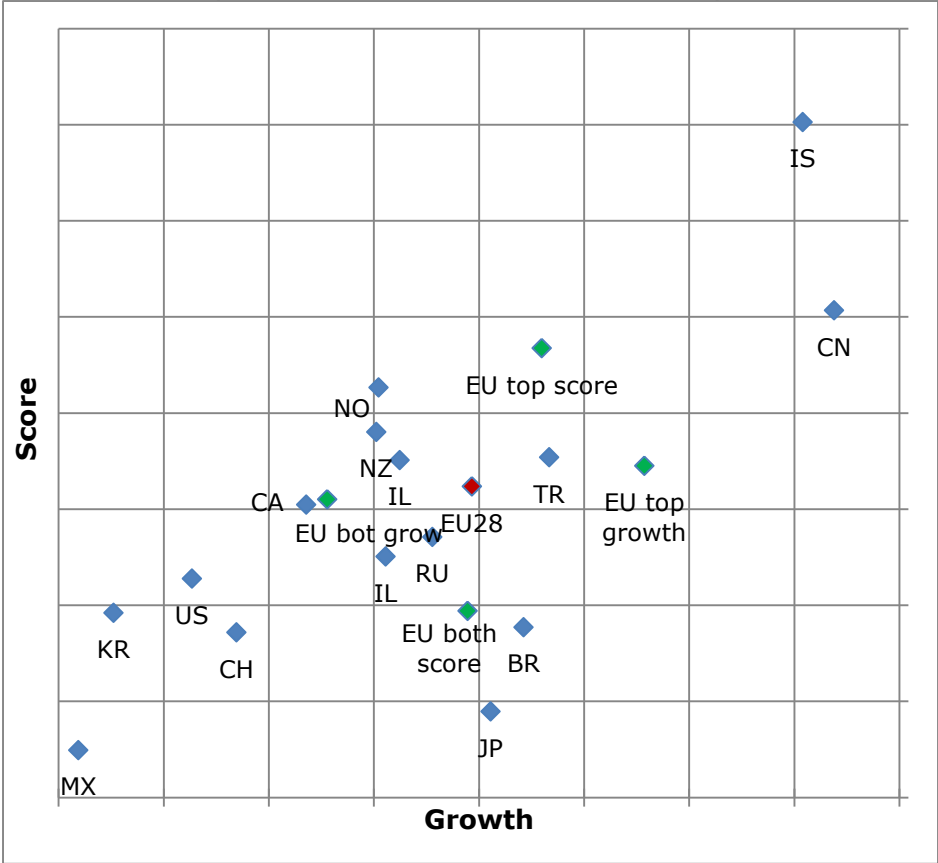
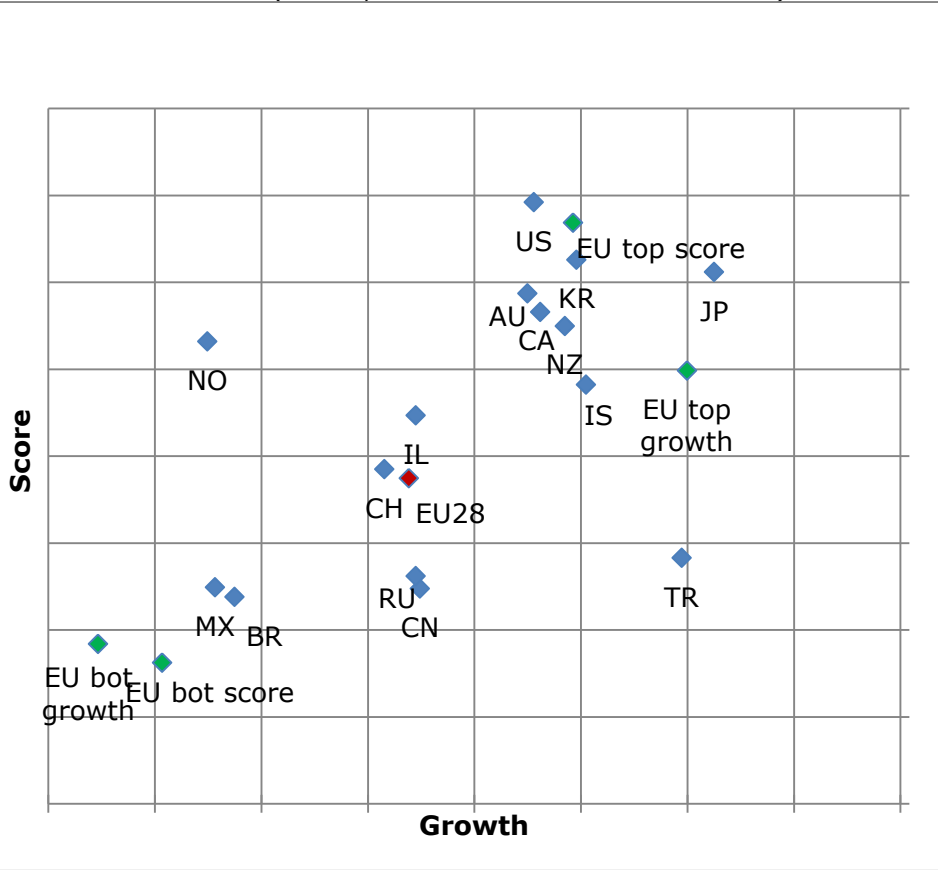


Figure 4.11 Country performance and progress over years dimension 5. Digital Public Services (Tier-2, I-DESI 2014 vs. I-DESI 2015)



5 Conclusion and insights

This chapter presents the key findings related to Europe's performance as a digital economy and society, in comparison with leading and emerging economies at a global stage. The I-DESI that has been developed to allow for such comparisons. It consists of two tiers: Tier-1 includes all the European Union member states plus Japan, Korea, the United States, Australia, Canada, Iceland, Norway and Switzerland. The second tier is computed using a reduced set of indicators for a second set of countries: all Tier-1 countries plus Brazil, China, Israel, Mexico, New Zealand, Russia and Turkey.

5.1 Europe's strengths

Top countries in Europe are also leading at a global stage. The top three of best performing European countries are also leading the I-DESI: Sweden, Denmark and Finland. They are closely followed by Korea, Iceland and the United States, whilst Japan comes in at a 6th place. Norway, Switzerland, Canada and Australia rank higher than the EU average. This means that in general, the selected non-EU countries are performing better than the EU as a whole. This is not surprising, as the EU average is based on all EU member states, including those that have lower performances, such as Bulgaria, Poland and Romania (being the worst three performers of the European Union). As the top players in Europe are also in the lead at a global level, it is important that the EU member states that are underperforming step up in order to come closer to the performance of countries such as Australia, Canada and Japan. In this respect, it is worrisome that the worst performing EU countries are falling behind: they are currently below the EU average and their development over the last year was slower than that of the EU as a whole. These countries are already less developed than the EU (and the other economies included in Tier-1 of the I-DESI), and by showing anemic growth they are distancing themselves further from the rest of the pack.

Europe leads the way with regards to Use of the Internet. Using the widespread availability of broadband, and in possession of the required skills to take the advantage of such connectivity, citizens can enjoy a wide range of online activities, such as listening to music online, playing games, reading online news, participate in online social networks such as Twitter and Facebook, purchasing products online and use internet banking. Overall, Europe is far ahead of all the other countries with regards to the use of these kinds of activities. Nine of the ten top performing countries in the Use of Internet dimension are European (seven of which are in the EU), with Iceland in the lead. On average, the EU is (far) ahead of the United States, Korea, and Japan on this dimension. The consumption of online content in Japan is very low.

Another area where Europe performs well is Human Capital: the appropriate knowledge and skills to take advantage of the possibilities offered by the internet and the digital society. Again, top performers in Europe excel on a global stage, with the top-four countries in this dimension being European countries followed by Korea. Japan, the United States and Australia are just above the European average. When less developed countries in this field (most notably Italy, Bulgaria and Romania) improve their digital skills base, it is reasonable to assume that the EU will pass Australia, the United States and Japan.

Although the United States are the undisputable world leader with regards to the adoption of Digital Technologies by businesses, nine out of the first ten countries on this dimension are European countries. Businesses in these countries take advantage of the opportunities offered by online sales and digital technologies such as cloud services, Electronic Information sharing and RFID. Korea and Japan are average performers, being just ahead of the EU average. Canada is performing behind the EU average.

When adding the Tier-2 countries Brazil, China, Mexico, Israel, Russia and Turkey to the analysis, we see that these countries are consistently performing below the EU average across all dimensions. However, there are a few exceptions. On the dimension Human Capital Israel, Russia and China are performing above the EU average. China is also scoring better than EU average on the Use of Internet and Israel on Digital Public Services.

Another important exception is New Zealand, who is a top-ten performer in Tier-2. New Zealand is consistently performing above the EU average, and is even leading the dimension Integration of Digital Technology.

5.2 Areas for improvement

Europe is lagging behind with regards to Connectivity. Connectivity refers to availability and take-up of mobile and fixed broadband, as well as the average connection speed and affordability of fixed broadband. Korea leads the way with regards to connectivity, being far ahead of followers Japan, Switzerland and the top-three of best performing EU countries. Korea is among the top-performers on all sub-dimensions, and is the guiding light for the other countries with regards to speed: the average connection speed of broadband is unparalleled at a global stage. The United States is an average performer, being just ahead of Canada and the EU average, which are on a equal level. Australia is lagging behind as compared to the EU average, but is still ahead of European countries such as Poland, Cyprus and Slovakia. For the EU, it might be a concern that countries such as Croatia and Slovakia did not show any progress in the 2013-2014 period, not on the overall ranking and neither on the ranking of the connectivity dimension.

There is some room for improvement for the EU with regards to Digital Public Services: the provision of public services online, which makes business and citizen interaction with public authorities more efficient through the use of digital technologies. Five out of the first ten countries in this dimension's ranking are non-European: the United States are in the lead, performing slightly better than the EU top performers (France, the United Kingdom, the Netherlands). They are followed by Korea, Japan, Australia and Canada, all being way ahead of the EU average. Quick wins for the EU could be realized by improving the state of online public services in countries lagging behind, most notably the top-three worst performing EU countries (Bulgaria, Malta, Croatia): they are way behind all the others, in particular with regards to the transactionality of public services, how public administrations are connected and offer services in a citizen-centred way, and the usage of online public services. Malta, Croatia and Bulgaria are the three lowest performing countries on this dimension, and their situation has not improved as compared to the I-DESI 2014: both their score and their ranking have deteriorated.

Annexes

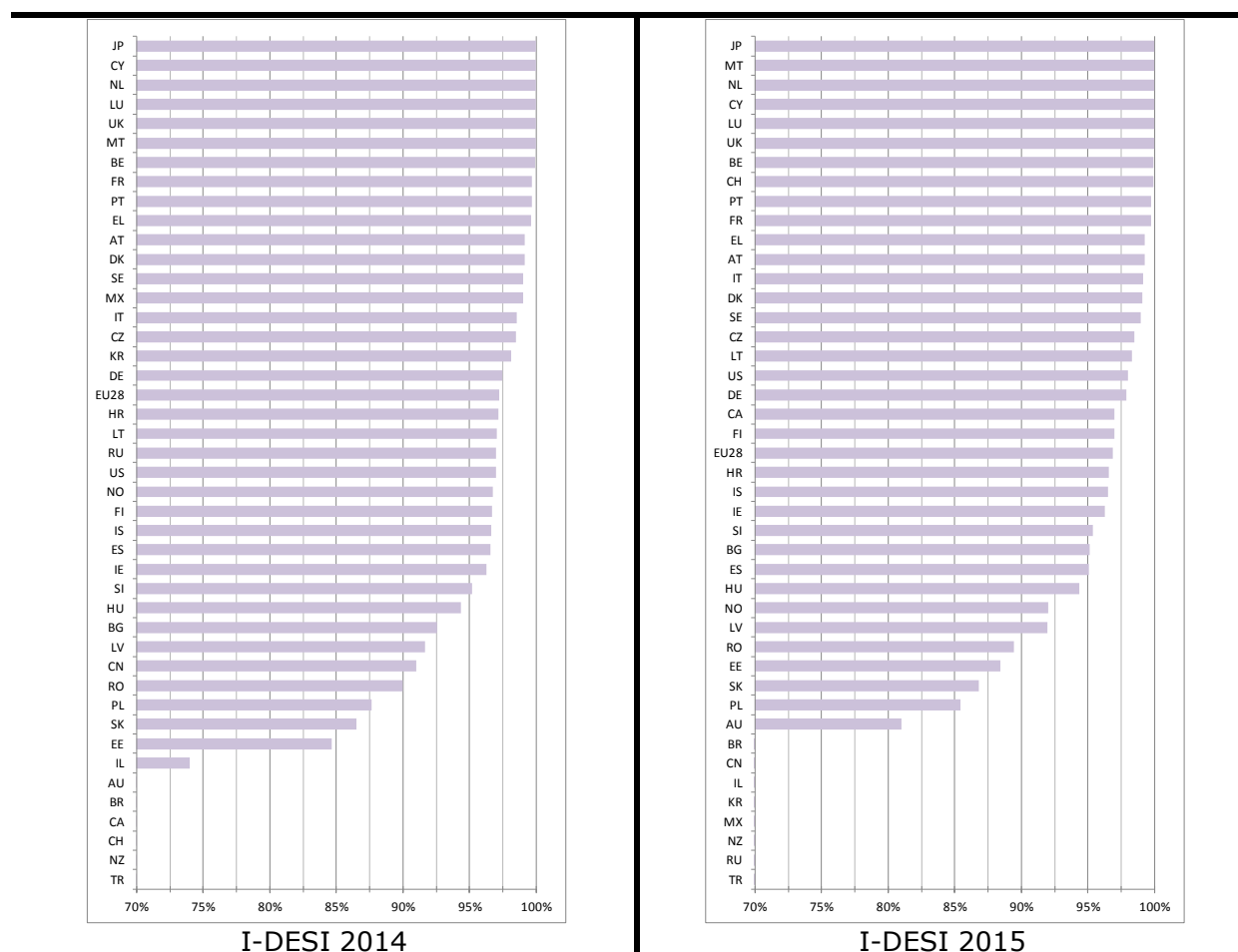
Annex 1 List of country acronyms

Code	Country
AT	Austria
AU	Australia
BE	Belgium
BG	Bulgaria
BR	Brazil
CA	Canada
CH	Switzerland
CN	China
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
EU28	The average of the 28 EU Member States
EU28 bot	The average of the three worst performing countries of the EU
EU28 top	The average of the three best performing countries of the EU
FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IL	Israel
IS	Iceland
IT	Italy
JP	Japan
KR	Korea Republic
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
MX	Mexico
NL	The Netherlands
NO	Norway
NZ	New Zealand
PL	Poland
PT	Portugal

RO	Romania
RU	Russia
SE	Sweden
SI	Slovenia
SK	Slovakia
TR	Turkey
UK	The United Kingdom
US	The United States

Annex 2 Detailed description of the indicators comprised in the I-DESI

1.1.1. Fixed BB Coverage¹⁷



Description:	Standard fixed broadband coverage
Breakdown:	All households
Unit:	% households
Main source:	EU Digital Economy and Society Index 2014 & 2015, Australian Communications and Media Authority – Communications report 2013-2014 ¹⁸ , Canadian Radio-television and Telecommunications Commission – Communications Monitoring Report 2015, China Statistical Yearbook 2014 ¹⁹ , Ministry of Communications Israel – Telecommunications in Israel 2013, Ministry of Internal Affairs and Communications Japan – White paper 2015, Korea Yearbook of Information Society Statistics 2014 ²⁰ , Federal Communications Commission USA – 5 th International Broadband Data Report
Calculation:	EU28 average is weighted in the original data source
I-DESI 2014:	2013
N.a.:	Switzerland
I-DESI 2015:	2014 (2013: Korea (Rep.))
N.a.:	-

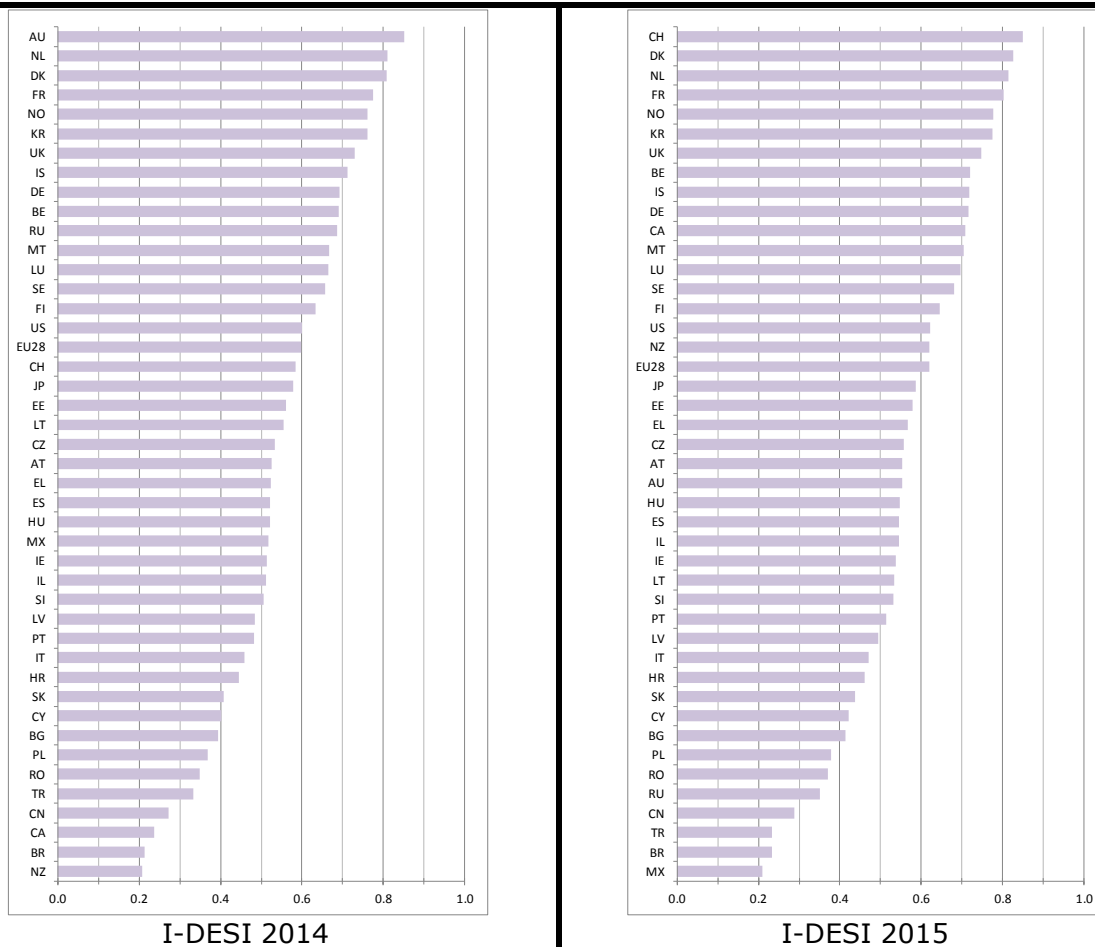
¹⁷ Indicators are numbered based on the tier-1 structure.

¹⁸ Percentage of total population aged 18 years and over.

¹⁹ Percentage of Administrative Village with access to the Internet by Broadband

²⁰ Including access to mobile internet

1.1.2. Fixed BB Subscriptions



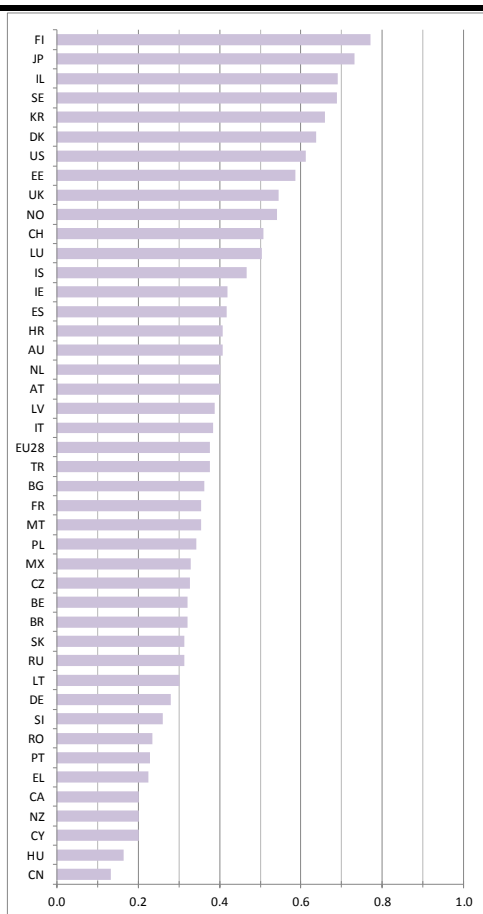
Description: The number of fixed broadband subscriptions per 100 inhabitants
Breakdown: Total population
Unit: Subscribers per 100 inhabitants
Main source: ITU World Telecommunication/ICT Indicators database 2015²¹
Calculation: EU28 average is weighted by the total population per member state

I-DESI 2014: 2013

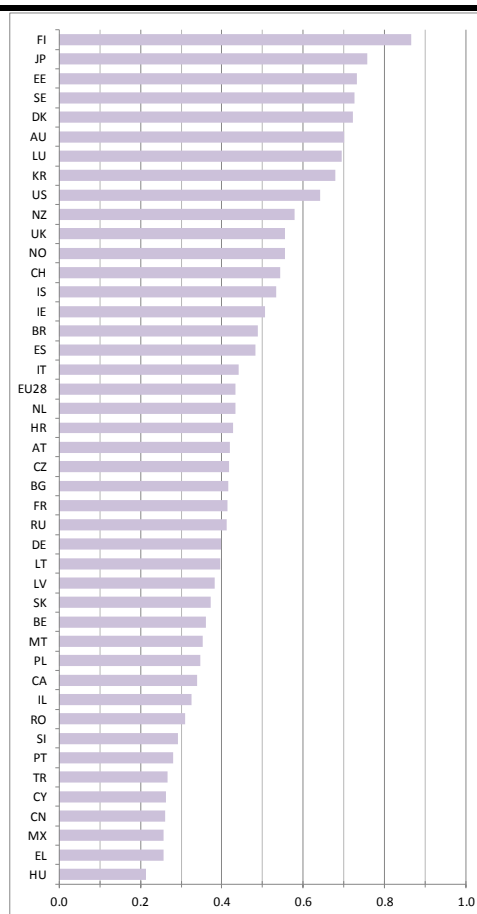
I-DESI 2015: 2014

²¹ For all data originating from ITU: due to data restrictions, we could not publish the original values, but normalized scores. This applies to indicators 1.1.2, 1.2.1, 1.2.2, 1.3.2 and 2.1.2.

1.2.1. Mobile BB Subscriptions



I-DESI 2014



I-DESI 2015

Description: The number of active mobile broadband subscriptions per 100 inhabitants

Breakdown: Total population

Unit: Subscribers per 100 inhabitants

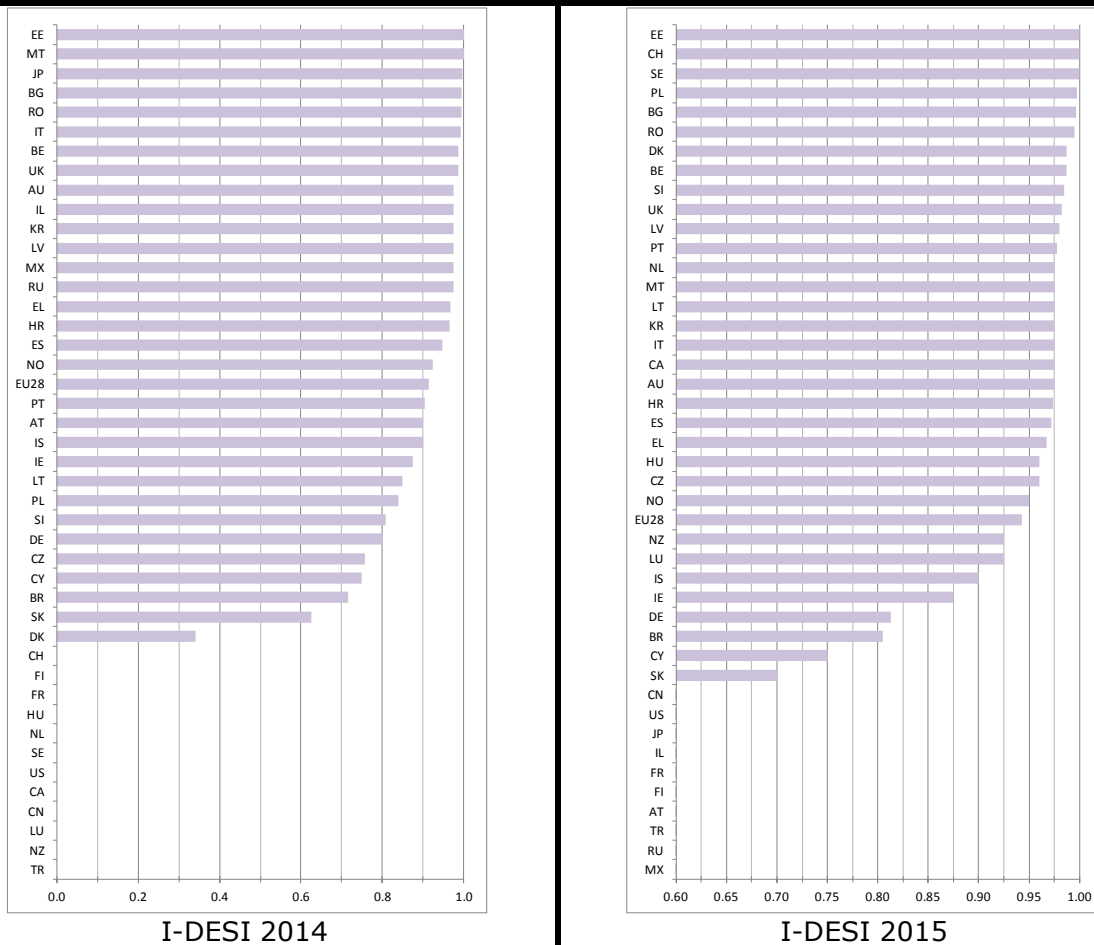
Main source: ITU World Telecommunication/ICT Indicators database 2015

Calculation: EU28 average is weighted by the total population per member state

I-DESI 2014: 2013

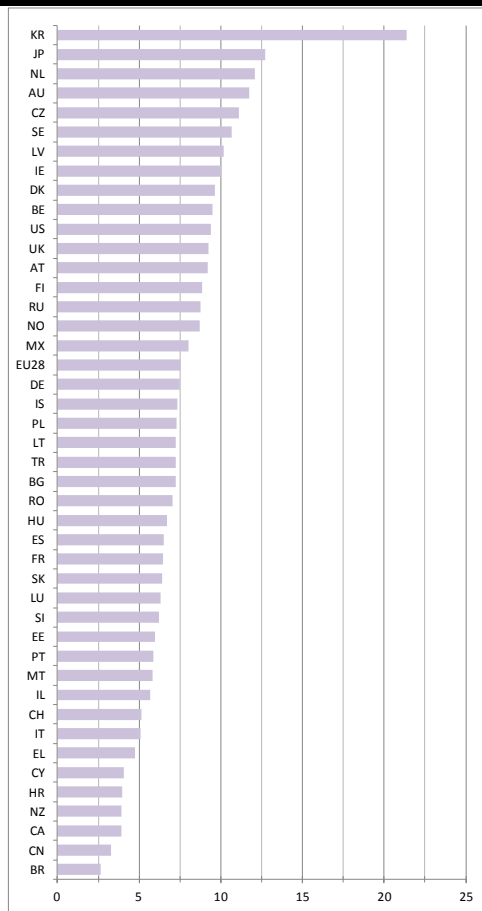
I-DESI 2015: 2014

1.2.2. 3G Coverage

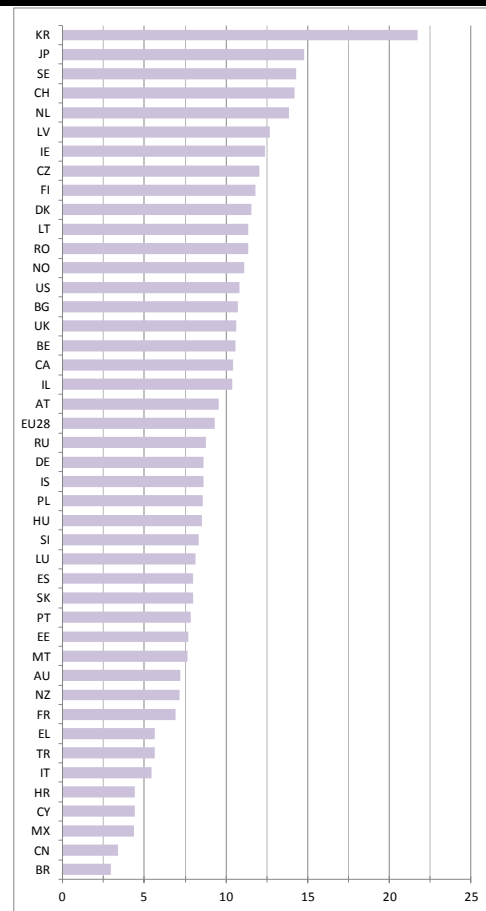


Description:	Percentage of the population covered by at least a 3G mobile network
Breakdown:	Total population
Unit:	% population
Main source:	ITU World Telecommunication/ICT Indicators database 2015, EU Study on Broadband Coverage in Europe 2013 & 2014
Calculation:	EU28 average is weighted by the total population per member state
I-DESI 2014:	2013 (2012: France, Hungary, the Netherlands, New Zealand, Sweden, United States, 2011: Finland)
N.a.:	Luxembourg
I-DESI 2015:	2014 (2013: Austria, Israel, Japan, 2012: France, United States, 2011: Finland)
N.a.:	Mexico, Russia, Turkey

1.3.1. Average Connection Speed



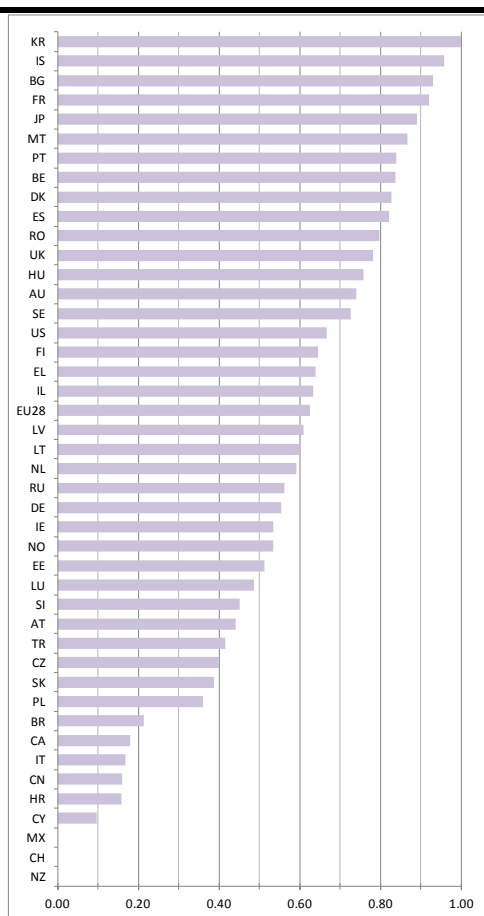
I-DESI 2014



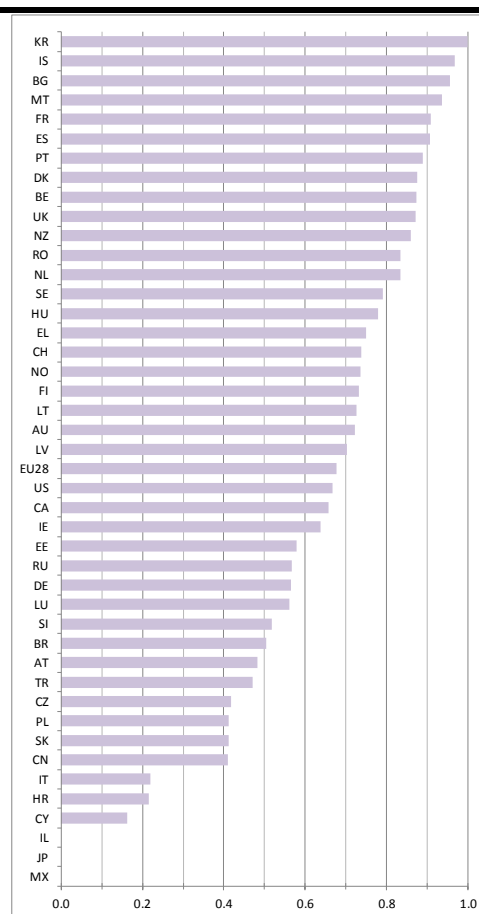
I-DESI 2015

Description:	Average connection speed in Mbps
Breakdown:	Total number of unique IP addresses
Unit:	Average connection speed in Mbps normalized between 0 and 30 Mbps
Main source:	Akamai - quarterly analysis of the broadband adoption and speed across the World
Calculation:	EU28 average is calculated as the simple average of member states
I-DESI 2014:	2013 Q4
I-DESI 2015:	2014 Q4

1.3.2. Fast BB subscriptions



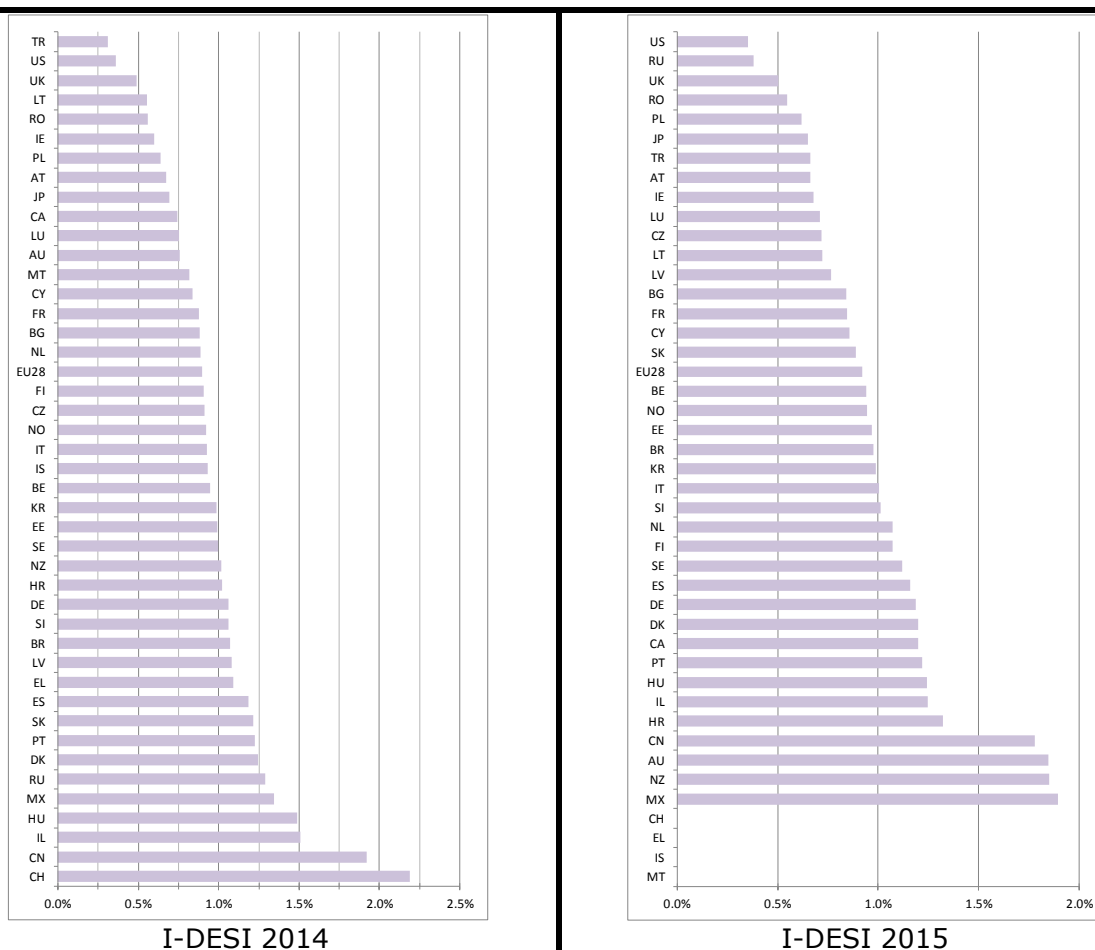
I-DESI 2014



I-DESI 2015

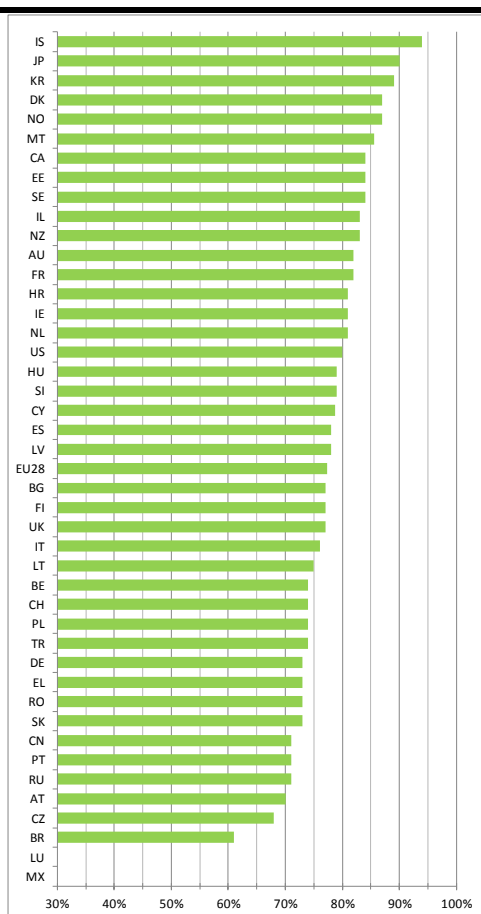
Description:	Percentage of fixed broadband subscriptions equal to or above 10 Mbps
Breakdown:	All fixed BB subscriptions
Unit:	% of subscriptions equal to or above 10 Mbps
Main source:	ITU World Telecommunication/ICT Indicators database 2015
Calculation:	EU28 average is weighted by the total number of households per member state Australia: number of Fibre subscriptions / all fixed BB subscriptions
I-DESI 2014:	2013 (2012: China, the Netherlands, 2011: Israel)
N.a.:	New Zealand, Mexico
I-DESI 2015:	2014 (2013: Japan, 2011: Israel)
N.a.	Mexico

1.4.1. Fixed BB Subscription Charge

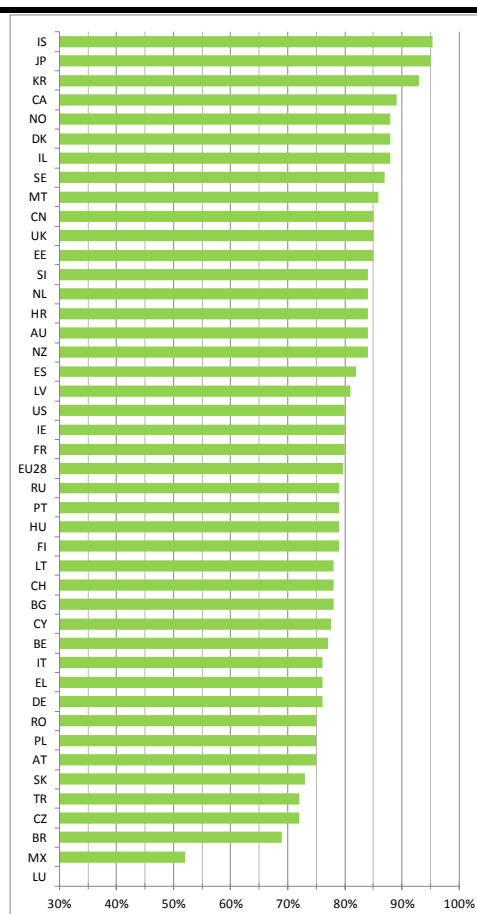


Description:	Monthly subscription charge for fixed broadband Internet service offered by the Internet Service Provider with the largest market share (i.e. fixed broadband is considered to be any dedicated connection to the Internet at downstream speeds equal to, or greater than, 256 kbit/s)
Breakdown:	All standalone Fixed Broadband Internet Access Offers by the Internet Service Provider with the largest market share
Unit:	Percentage of individual gross income (USD PPP)
Main source:	Access cost (A): Broadband access costs from the ITU World Telecommunication/ICT Indicators database 2015 Income (B): GNI per capita, PPP from The World Bank WDI
Calculation:	Indicator = (A*12) / B EU28 average is weighted by the total number of households per member state
I-DESI 2014:	2013
I-DESI 2015:	2014 (2013: Greece, Iceland, Malta, Switzerland)

2.1.1. Daily Internet Users



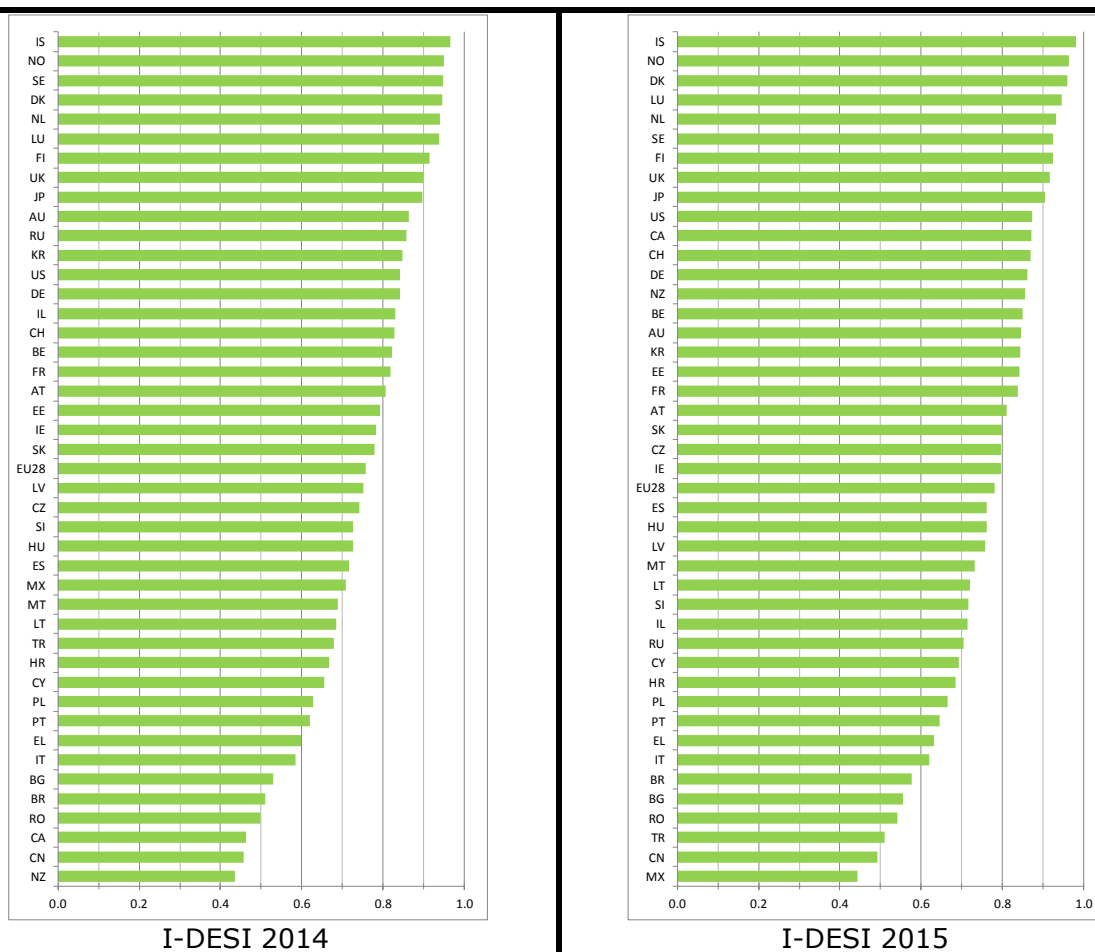
I-DESI 2014



I-DESI 2015

Description:	Individuals whose frequency of Internet access is at least daily
Breakdown:	All Internet users
Unit:	% of internet users
Main source:	Google Consumer Barometer 2014 & 2015 administered by TNS Infratest, Statistical Service of Cyprus (CYSTAT), Statistics Iceland, National Statistics Office Malta
Calculation:	EU27 average is calculated as the simple average of member states
I-DESI 2014:	2013
N.a.:	Luxembourg, Mexico
I-DESI 2015:	2014
N.a.:	Luxembourg

2.1.2. Regular Internet Users



Description: Percentage of individuals using the Internet in the last 3 months²²
Breakdown: Total population (16-74 years)²³
Unit: % of individuals who used Internet in the last 3 months
Main source: ITU World Telecommunication/ICT Indicators database 2015
Calculation: EU28 average is weighted by the total population per member state

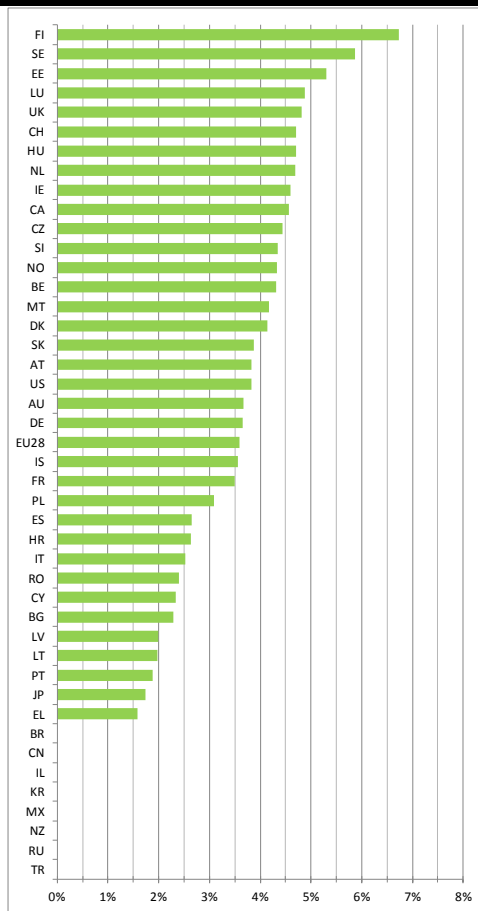
I-DESI 2014: 2013

I-DESI 2015: 2014

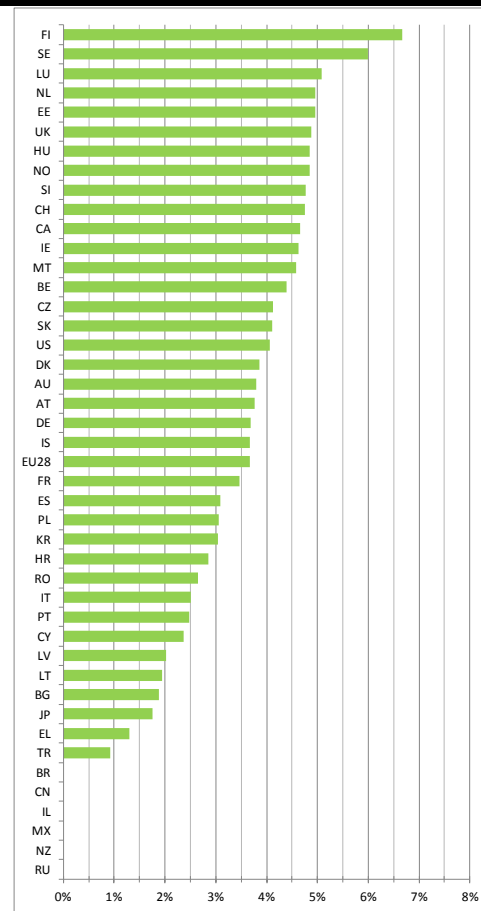
²² China and Switzerland: in the last 6 months. Turkey & New Zealand: in the last 12 months.

²³ United States & Japan: Age 3 +. China, Mexico & Korea (Rep.): Age 6 +. Brazil: Age 10 +. Switzerland: Age 14 +. Australia: Age 15 +. Russia: Age 15-72 years. New Zealand: Age 15 +. Canada: Age 16 +. Israel: Age 20 +.

2.2.1. ICT Specialists



I-DESI 2014



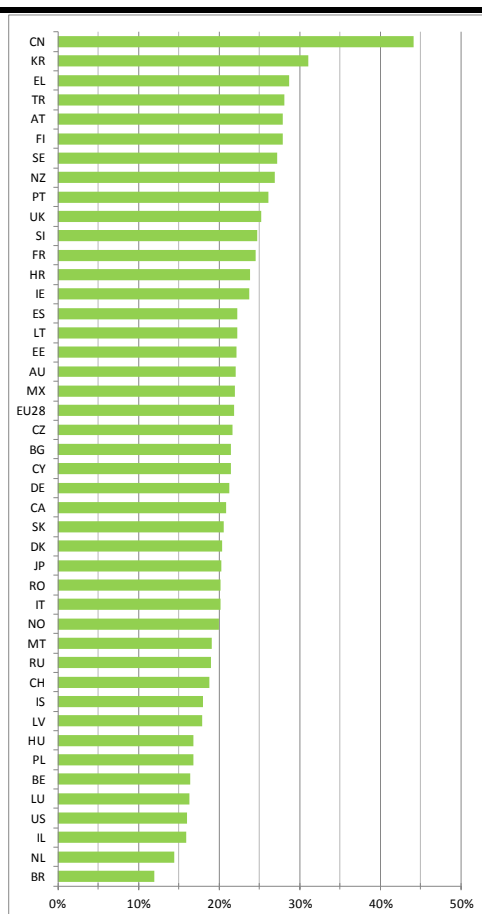
I-DESI 2015

Description: Employment of ICT specialists across the economy
Breakdown: Total employment
Unit: % of total employment
Main source: EU Digital Economy and Society Index 2014 & 2015, OECD Measuring the Digital Economy: A New Perspective 2014, OECD Science, Technology and Industry Scoreboard 2015, Japan Statistics Bureau
Calculation: EU28 average is weighted in the original data source

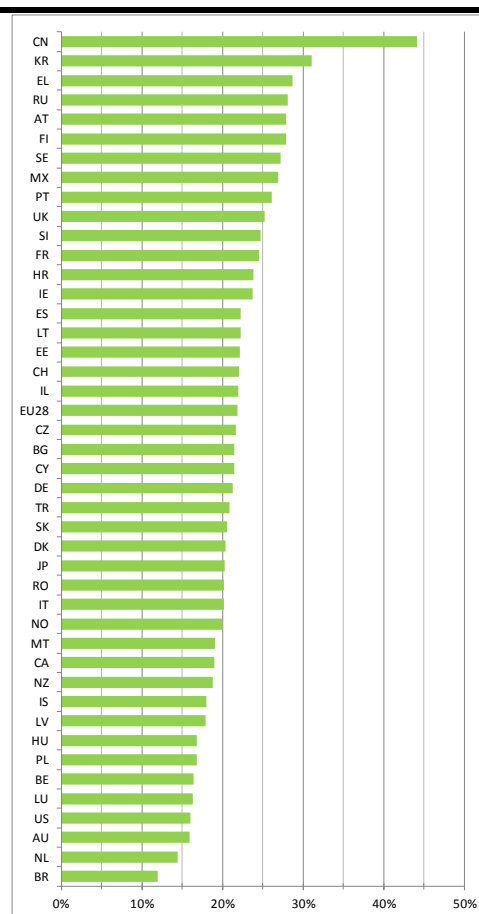
I-DESI 2014: 2013
N.a.: Korea (Rep.)

I-DESI 2015: 2014
N.a.: -

2.2.2. STEM Graduates



I-DESI 2014



I-DESI 2015

Description: Science and technology graduates

Breakdown: Total number of graduates

Unit: % of graduates in STEM subjects

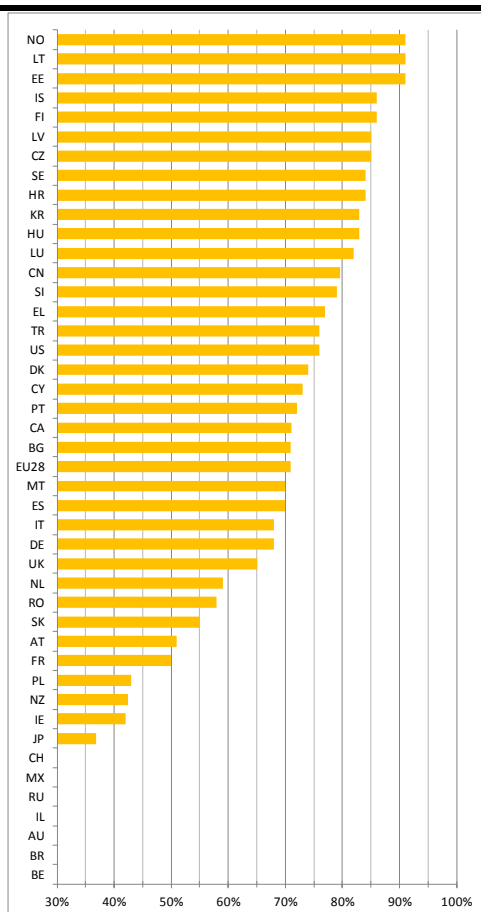
Main source: OECD World Indicators of Skills for Employment (WISE) database, Federal Statistical Office of Germany (DESTATIS), China Statistical Yearbook 2014, Statistics Canada, Central Bureau of Statistics Israel

Calculation: EU28 average is calculated as the simple average of member states

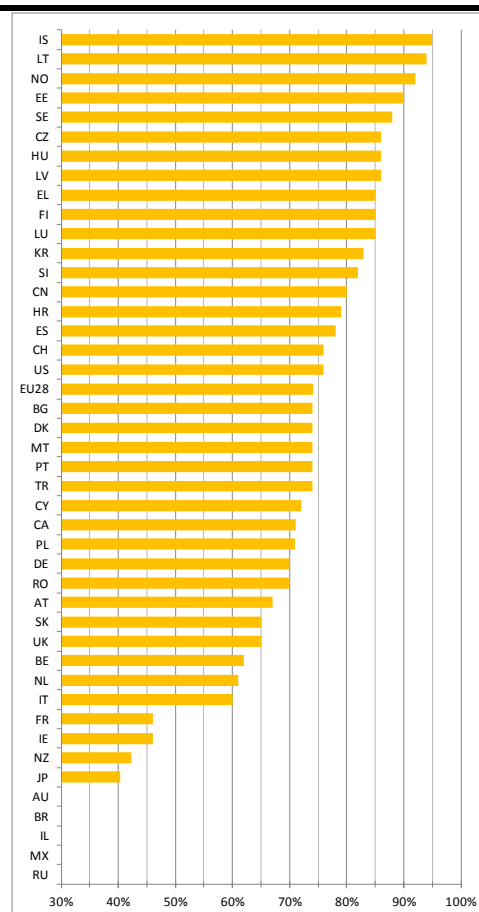
I-DESI 2014: 2013 (2012: Belgium, Brazil, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Iceland Ireland, Italy, Japan, Malta, Mexico, Netherlands, New Zealand, Poland, Slovenia, Spain, Sweden, Turkey, United States, 2011: Australia, Germany, Romania, 2010: Israel, 2009: Russia)

I-DESI 2015: 2013 (2012: Belgium, Brazil, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Iceland Ireland, Italy, Japan, Malta, Mexico, Netherlands, New Zealand, Poland, Slovenia, Spain, Sweden, Turkey, United States, 2011: Australia, Germany, Romania, 2010: Israel, 2009: Russia)

3.1.1. Reading News Online



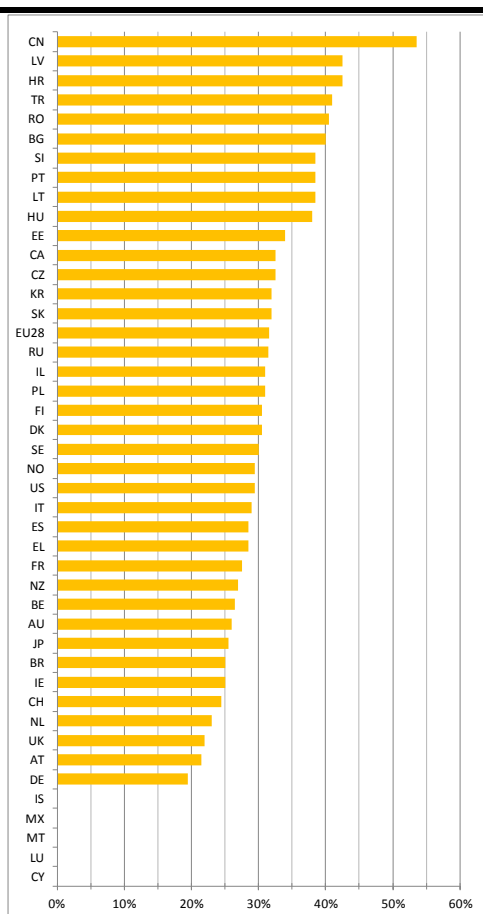
I-DESI 2014



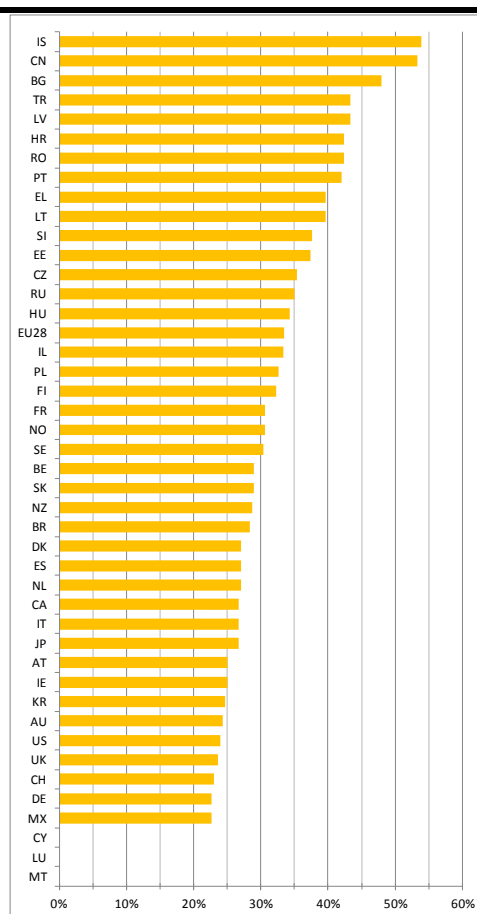
I-DESI 2015

Description:	Individuals who used the Internet to read online news sites, newspapers or news magazines
Breakdown:	Total number of internet users
Unit:	% of internet users
Main source:	Eurostat - Community survey on ICT usage in Households and by Individuals, OECD Science, Technology and Industry Scoreboard 2015, Pew Research Center for United States data, Statistical Office Japan, China Internet Development Research and Statistics 2014
Calculation:	EU28 average is calculated as the simple average of member states
I-DESI 2014:	2013
N.a.:	Australia, Belgium, Switzerland
I-DESI 2015:	2014
N.a.:	Australia

3.1.2. Games, Videos and Music



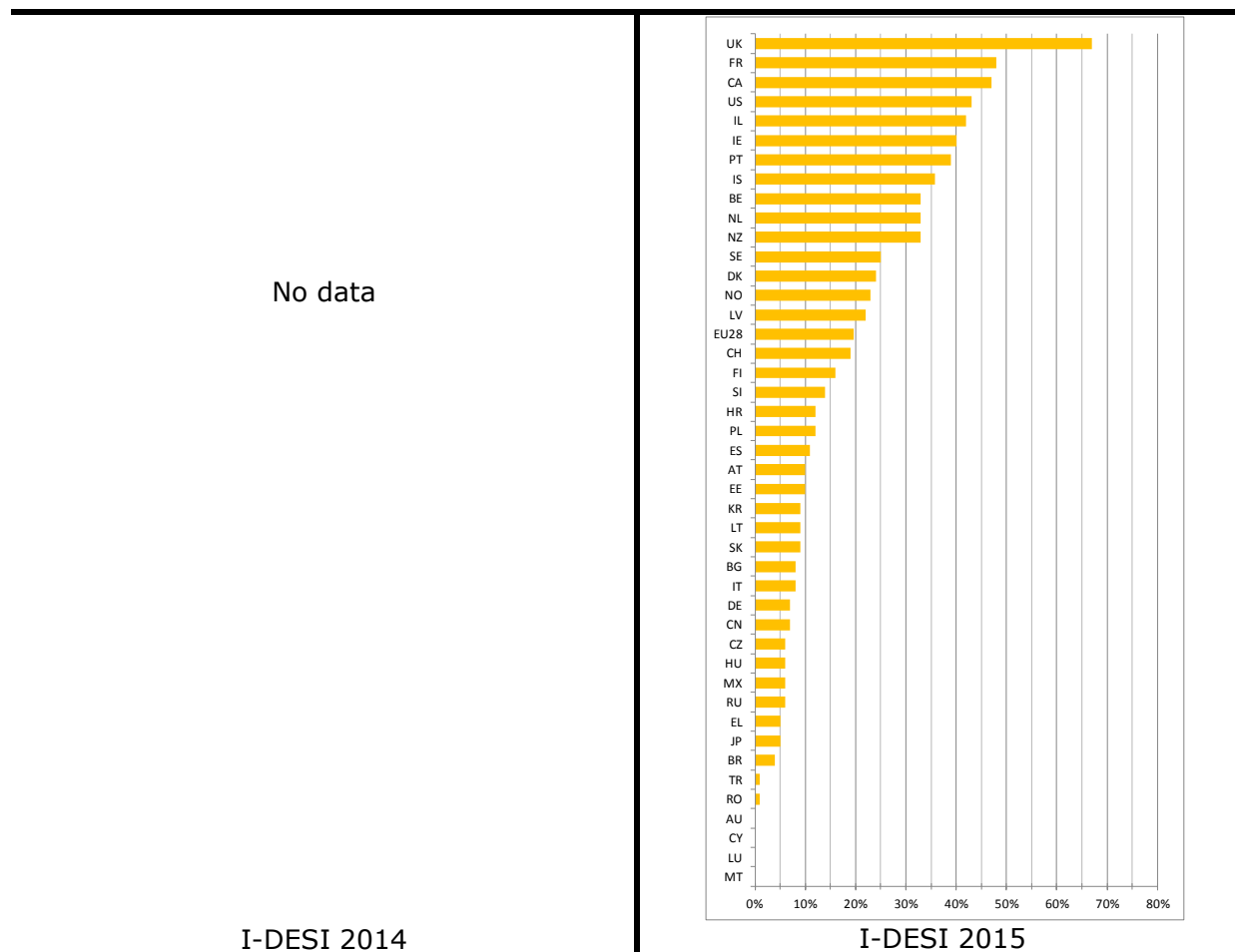
I-DESI 2014



I-DESI 2015

Description:	Individuals who used the Internet to play games, watch online videos or listen to music at least once a week
Breakdown:	Total number of internet users
Unit:	% of internet users
Main source:	Google Consumer Barometer 2014 & 2015 administered by TNS Infratest, Statistics Iceland
Calculation:	Indicator is calculated by taking the simple average of the percentage of individuals that use the Internet to (i) play games, (ii) watch online videos, and (iii) listen to music. For 2013 Greece and Bulgaria the average excl. Listen to music EU25 average is calculated as the simple average of member states
I-DESI 2014:	2013
N.a.:	Cyprus, Iceland, Luxembourg, Malta, Mexico
I-DESI 2015:	2014
N.a.:	Cyprus, Luxembourg, Malta

3.1.3. Video on Demand



Description: Individuals who used the Internet for video-on-demand or streaming services at least once a week

Breakdown: Total number of internet users

Unit: % of internet users

Main source: Google Consumer Barometer 2015 administered by TNS Infratest

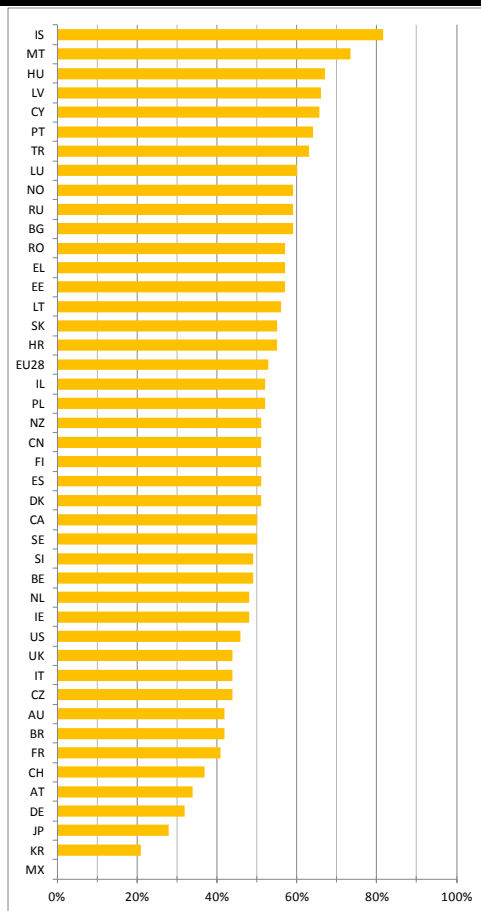
Calculation: EU24 average is calculated as the simple average of member states

I-DESI 2014: Indicator not in I-DESI 2014

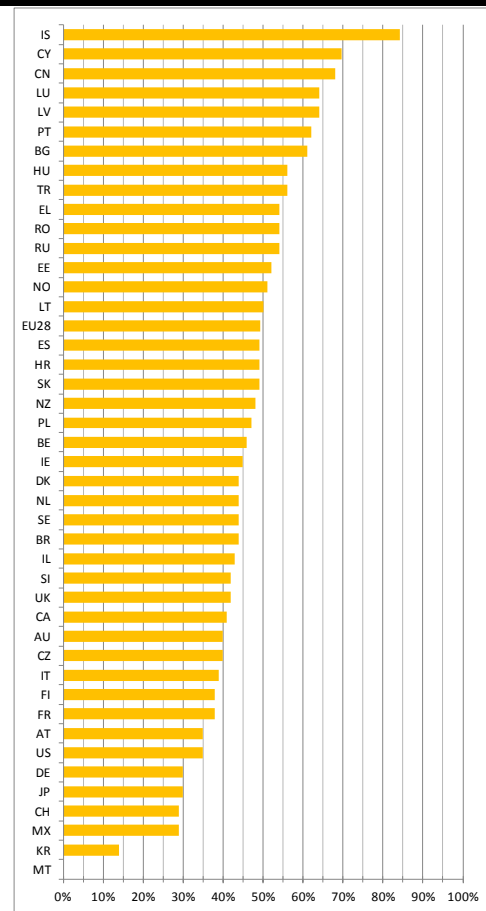
I-DESI 2015: 2014

N.a. Cyprus, Iceland, Luxembourg, Malta

3.2.1. Social Networks



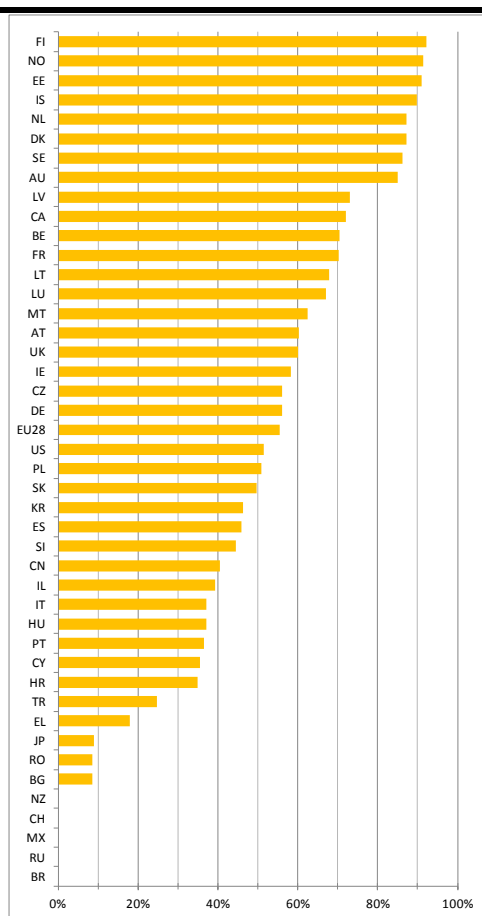
I-DESI 2014



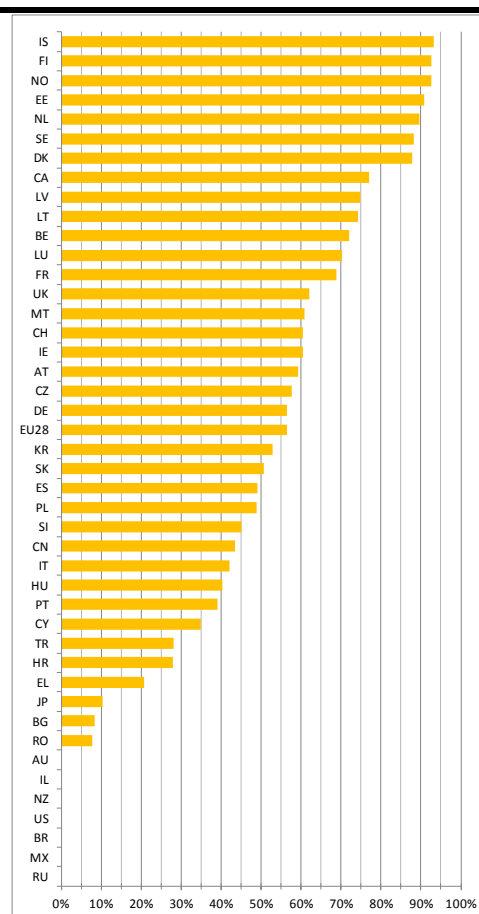
I-DESI 2015

Description:	Individuals who used the Internet to visit social networks at least once a week
Breakdown:	Total number of internet users
Unit:	% of internet users
Main source:	Google Consumer Barometer 2014 & 2015 administered by TNS Infratest, Statistical Service of Cyprus (CYSTAT), Statistics Iceland, STATEC Luxembourg, National Statistics Office Malta
Calculation:	EU28 average is calculated as the simple average of member states
I-DESI 2014:	2013
N.a.:	Mexico
I-DESI 2015:	2014 (2013: Malta)
N.a.:	-

3.3.1. Banking



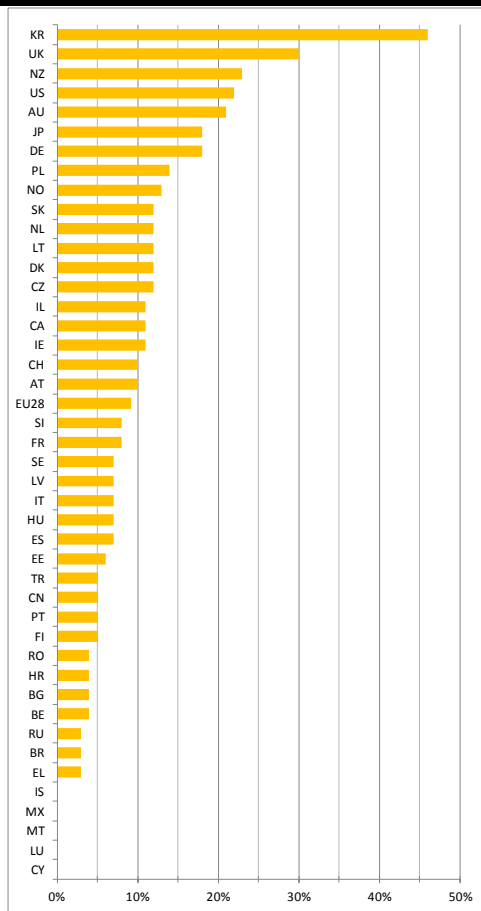
I-DESI 2014



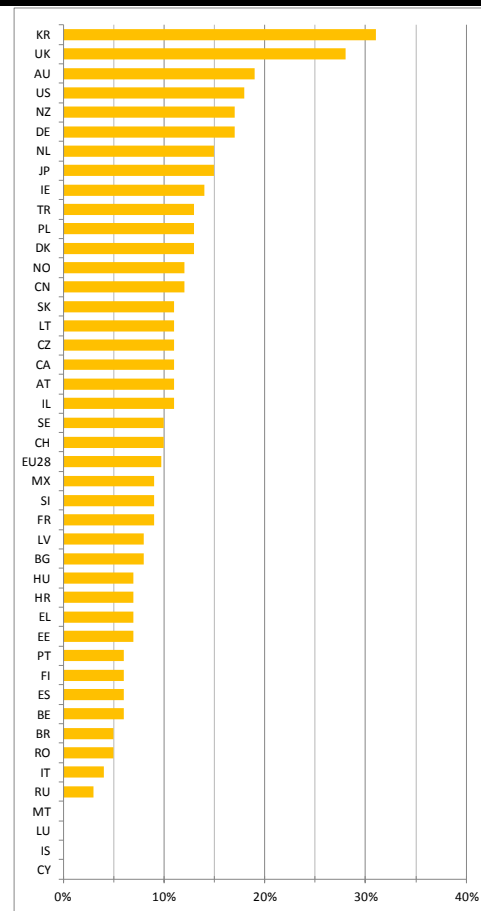
I-DESI 2015

Description:	Individuals who used the Internet to use online banking
Breakdown:	Total number of internet users
Unit:	% of internet users
Main source:	EU Digital Economy and Society Index 2014 & 2015, OECD Measuring the Digital Economy: A New Perspective 2014, OECD Science, Technology and Industry Scoreboard 2015, Canadian Bankers Association, China Internet Development Research and Statistics 2014, Ministry of Internal Affairs and Communications Japan
Calculation:	EU27 average is weighted in the original data source
I-DESI 2014:	2013 (2012: New Zealand)
N.a.:	Brazil, Mexico, Russia, Switzerland
I-DESI 2015:	2014 (2013: Australia, United States, Israel, 2012: New Zealand)
N.a.	Brazil, Mexico, Russia

3.3.2. Purchase online products



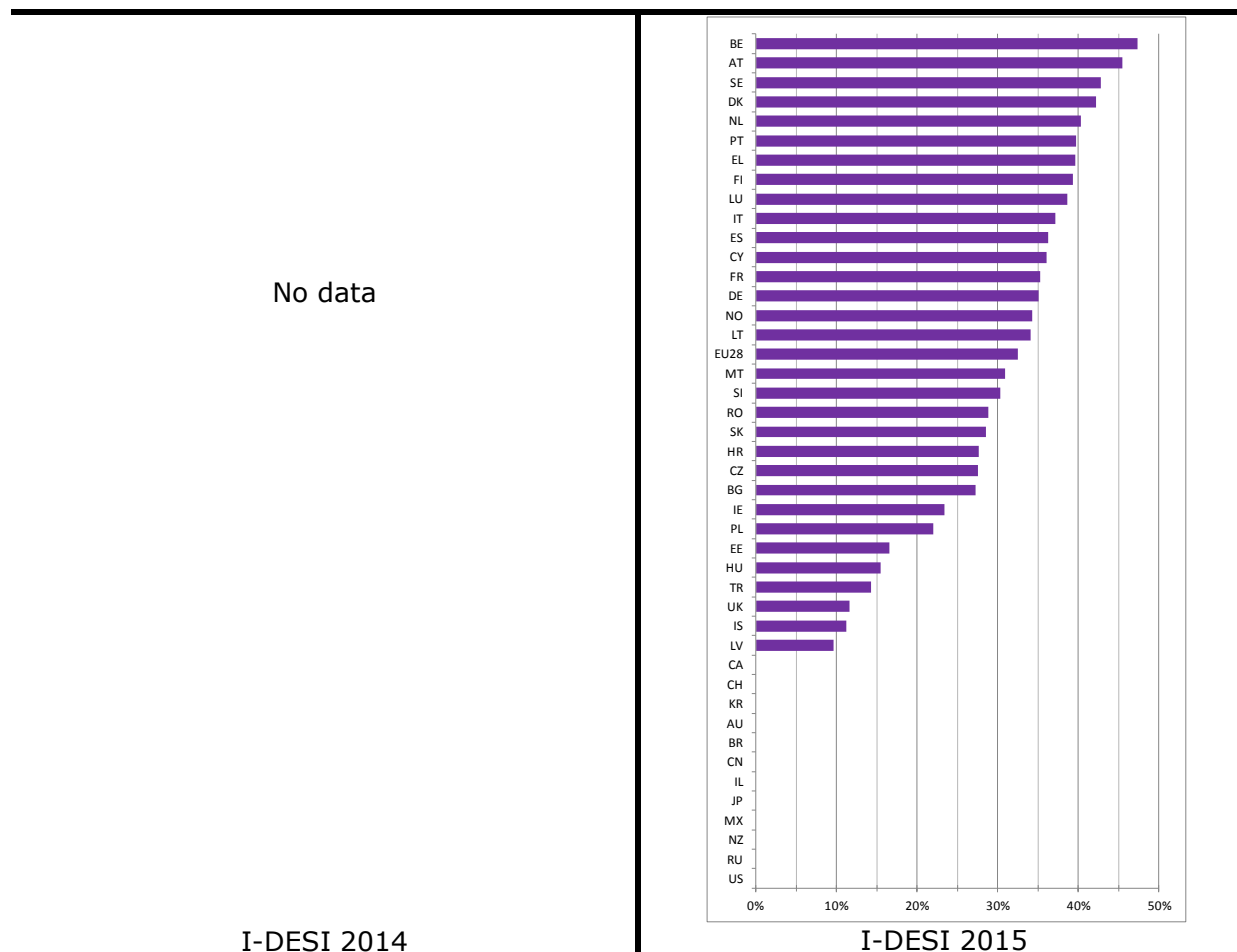
I-DESI 2014



I-DESI 2015

Description:	Individuals who used the Internet to purchase products at least once a week
Breakdown:	Total number of internet users
Unit:	% of internet users
Main source:	Google Consumer Barometer 2014 & 2015 administered by TNS Infratest
Calculation:	EU24 average is calculated as the simple average of member states
I-DESI 2014:	2013
N.a.:	Mexico, Cyprus, Iceland, Luxembourg, Malta
I-DESI 2015:	2014
N.a.	Cyprus, Iceland, Luxembourg, Malta

4.1.1. Electronic Information Sharing



Description: Enterprises who have ERP software package to share information between different functional areas

Breakdown: Enterprises with ten or more persons employed

Unit: % enterprises

Main source: OECD Science, Technology and Industry Scoreboard 2015, EU Digital Economy and Society Index 2015

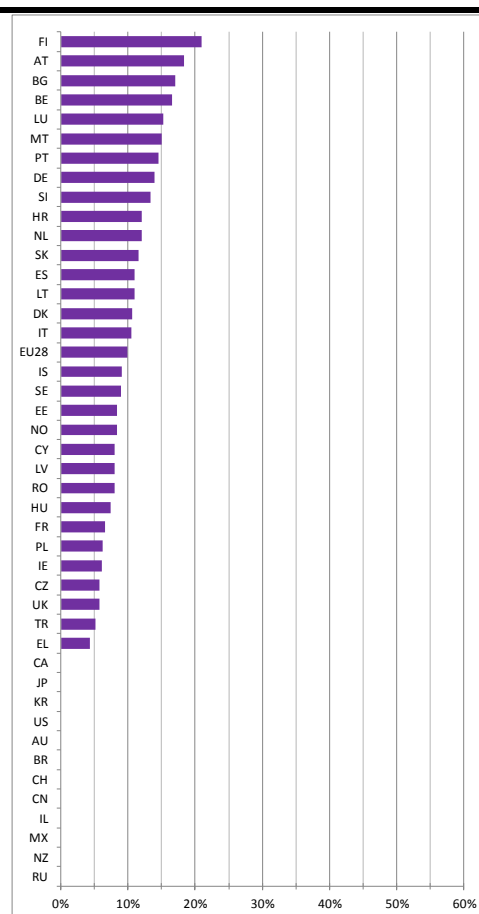
Calculation: EU28 average is weighted by the total number of enterprises per member state

I-DESI 2014: Indicator not in I-DESI 2014

I-DESI 2015: 2014 (2013: Canada, Korea (Rep.), 2011: Switzerland)
N.a. Australia, Japan, United States

4.1.2. RFID

No data



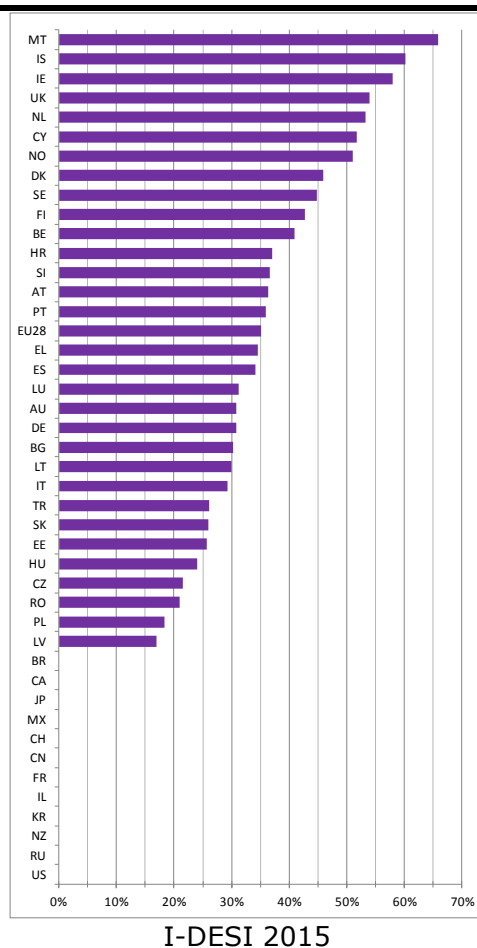
I-DESI 2014

I-DESI 2015

Description:	Enterprises using Radio Frequency Identification (RFID) technologies for after sales product identification or as part of the production and service delivery
Breakdown:	Enterprises with ten or more persons employed
Unit:	% enterprises
Main source:	OECD Science, Technology and Industry Scoreboard 2015, Eurostat – Community survey on ICT usage and eCommerce in Enterprises, VILRI Report on Item-level RFID in the USA
Calculation:	EU28 average is weighted by the total number of enterprises per member state
I-DESI 2014:	Indicator not in I-DESI 2014
I-DESI 2015:	2014 (2013: Canada, Japan, Korea (Rep.), 2012: United States)
N.a.	Australia, Switzerland

4.1.3. Social Media

No data

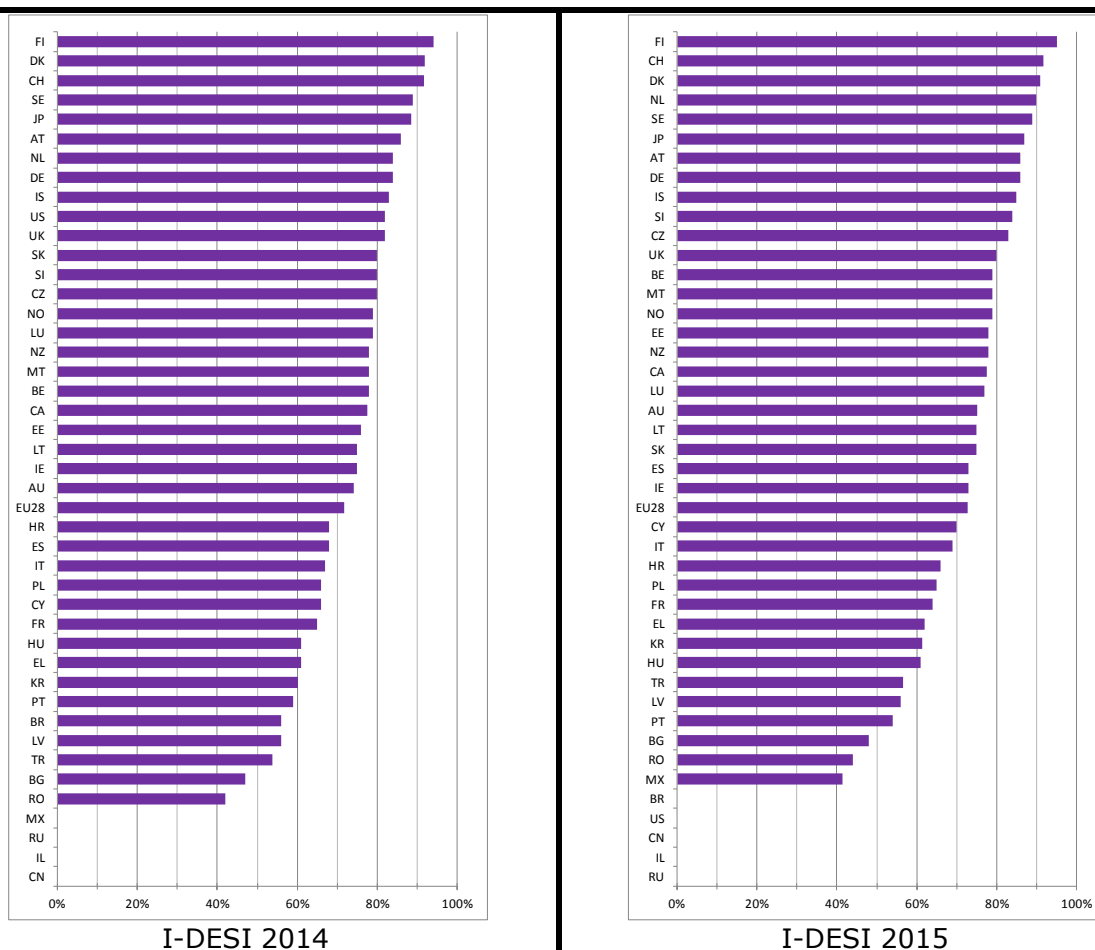


I-DESI 2014

I-DESI 2015

Description:	Enterprises that use social media
Breakdown:	Enterprises with ten or more persons employed
Unit:	% enterprises
Main source:	OECD Science, Technology and Industry Scoreboard 2015, Australian Bureau of Statistics, Bulgaria National Statistical Institute, Brazilian Internet Steering Committee (CGI.BR) – ICT Households and Enterprises 2012, Croatian Bureau of Statistics, Statistical Service of Cyprus (CYSTAT), Central Statistical Bureau of Latvia, National Statistics Office Malta, United Kingdom Office for National Statistics
Calculation:	EU28 average is weighted by the total number of enterprises per member state
I-DESI 2014:	Indicator not in I-DESI 2014
I-DESI 2015:	2014 (2013: Canada, Japan)
N.a.	France, Korea (Rep.), Switzerland, United States

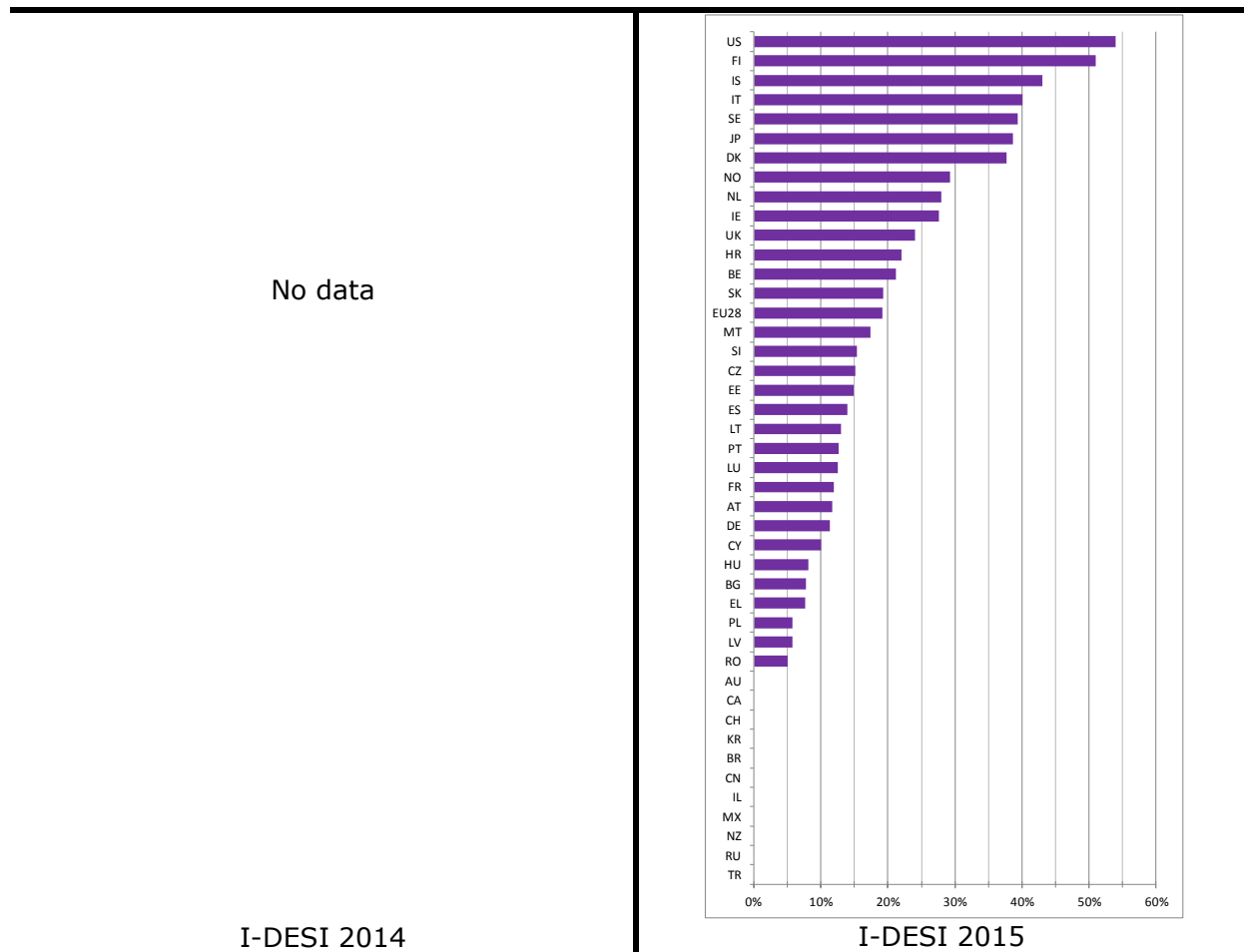
4.1.4. Online Presence



Description:	Enterprises using
Breakdown:	Total number of internet users
Unit:	% of enterprises
Main source:	OECD Measuring the Digital Economy: A New Perspective 2014, OECD Digital Economy Outlook 2015, Eurostat – Community survey on ICT usage and eCommerce in Enterprises, Brazilian Internet Steering Committee (CGI.BR) – ICT Households and Enterprises 2012, National Small Business Association USA ²⁴
Calculation:	EU28 average is weighted by the total number of enterprises per member state
I-DESI 2014:	2013
N.a.:	-
I-DESI 2015:	2014 (2013: United States, Brazil)
N.a.	China, Israel, Russia

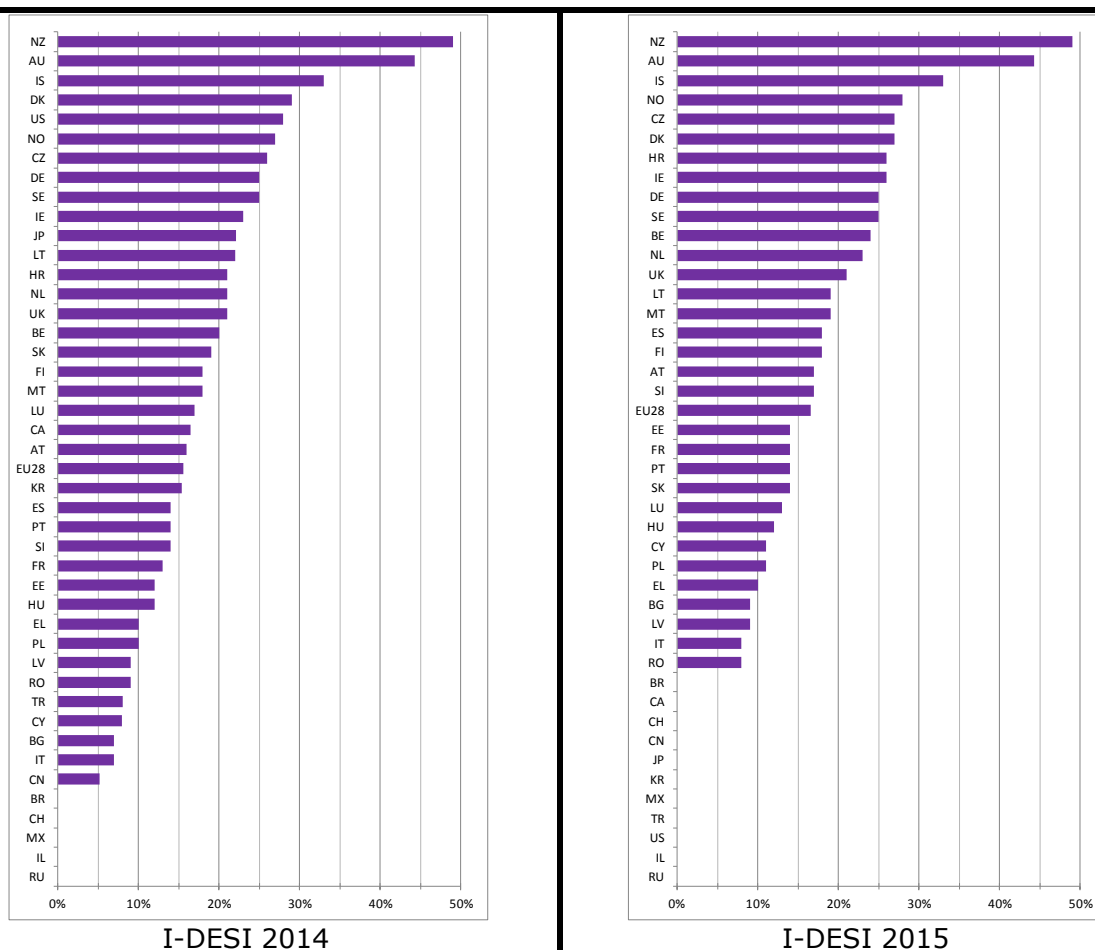
²⁴ Survey among small business (less than 500 employees)

4.1.5. Cloud Services



Description:	Enterprises using cloud computing services
Breakdown:	Enterprises with ten or more persons employed
Unit:	% enterprises
Main source:	OECD Science, Technology and Industry Scoreboard 2015, Eurostat – Community survey on ICT usage and eCommerce in Enterprises, Australian Bureau of Statistics, Bulgaria National Statistical Institute, Croatian Bureau of Statistics, Statistics Finland, Ministry of Internal Affairs and Communications Japan – White paper 2015, Korea Yearbook of Information Society Statistics 2014, Central Statistical Bureau of Latvia, National Statistics Office Malta, Statistics Netherlands, Neovise report “Enterprise Cloud Essentials: Multiple Clouds, Hybrid Environments and Support for Mission-Critical Applications” 2013
Calculation:	EU28 average is weighted by the total number of enterprises per member state
I-DESI 2014:	Indicator not in I-DESI 2014
I-DESI 2015:	2014 (2013: Korea (Rep.), Australia, 2012: Canada, 2011: Switzerland)
N.a.	-

4.2.1. SMEs Selling Online

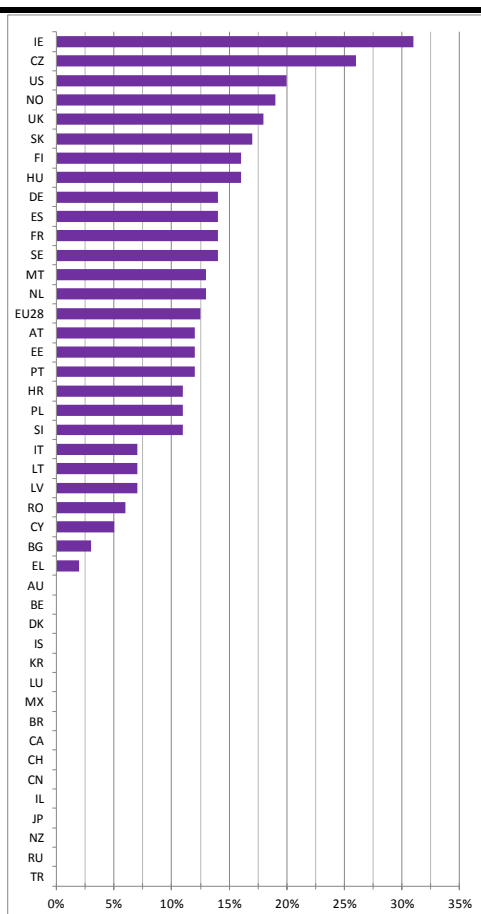


Description:	SMEs (10-249 employees) engaged in sales via e-commerce
Breakdown:	Total number of SMEs (10-249 employees)
Unit:	% SMEs
Main source:	Eurostat – Community survey on ICT usage and eCommerce in Enterprises, OECD Science, Technology and Industry Scoreboard 2015 ²⁵ , Brazilian Internet Steering Committee (CGI.BR) – ICT Households and Enterprises 2012, China Statistical Yearbook 2014, National Small Business Association USA ²⁶
Calculation:	EU28 average is weighted by the total number of enterprises by member state
I-DESI 2014:	2013 (2012: Brazil, Mexico, 2011: Switzerland)
N.a.:	Israel, Russia
I-DESI 2015:	2014 (2013: Canada, China, Iceland, Japan, Korea (Rep.), Turkey, United States, 2012: Brazil, Mexico, 2011: Switzerland)
N.a.	Israel, Russia

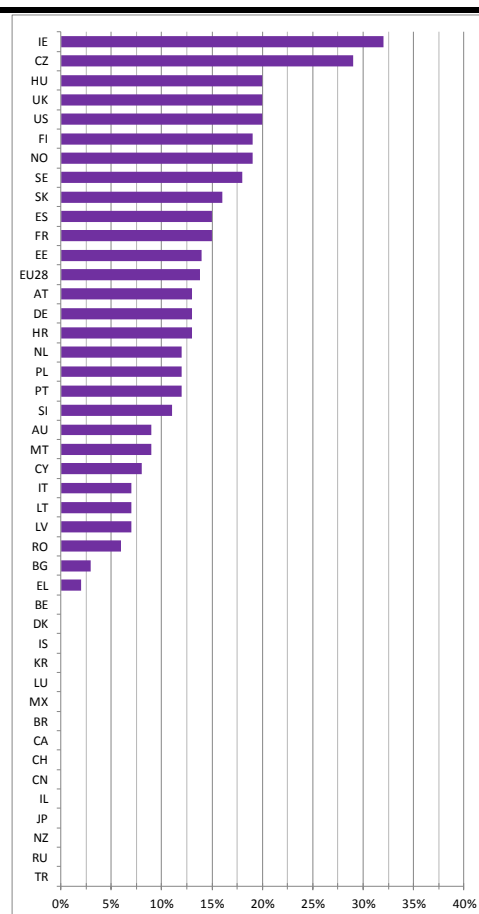
²⁵ For Canada and Turkey, data refer to small businesses. For Japan and China, data refer to all firms.

²⁶ For the USA, small business imply less than 500 employees

4.2.2. eCommerce Turnover



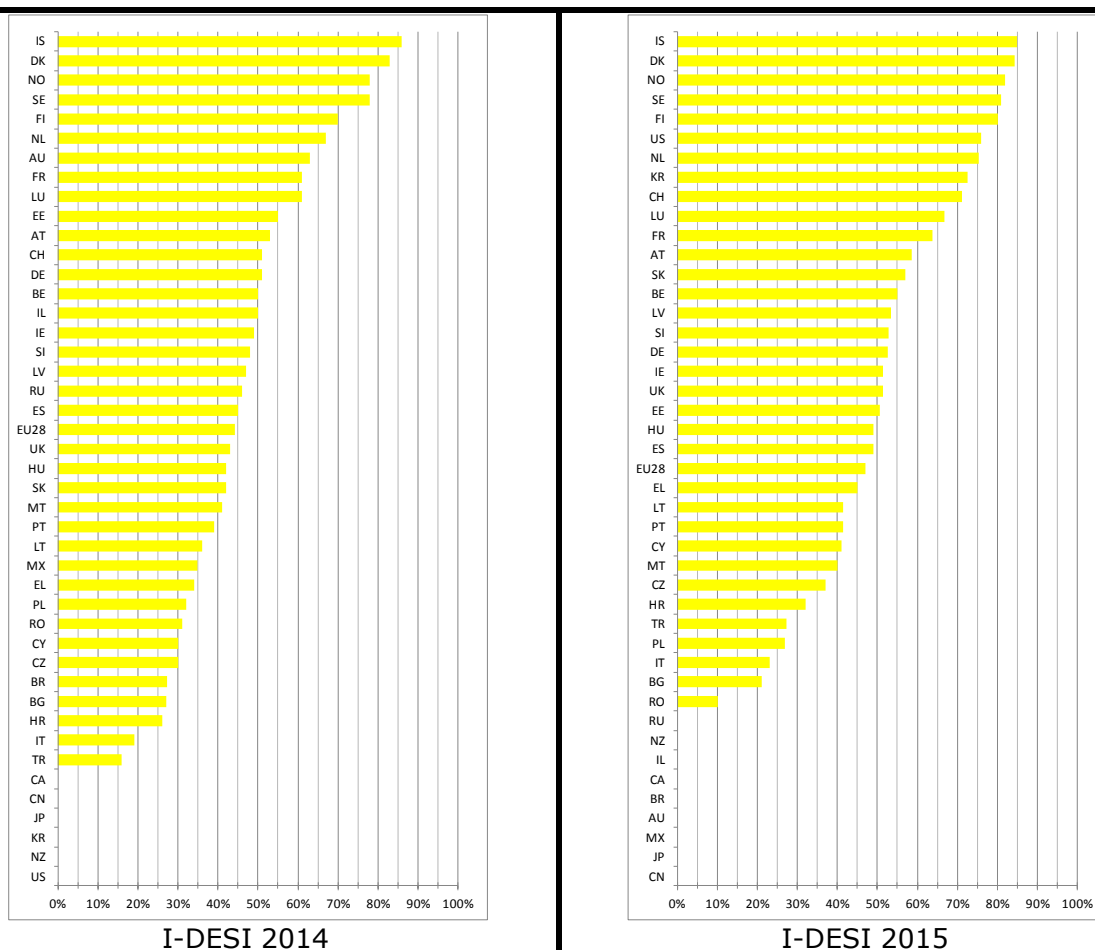
I-DESI 2014



I-DESI 2015

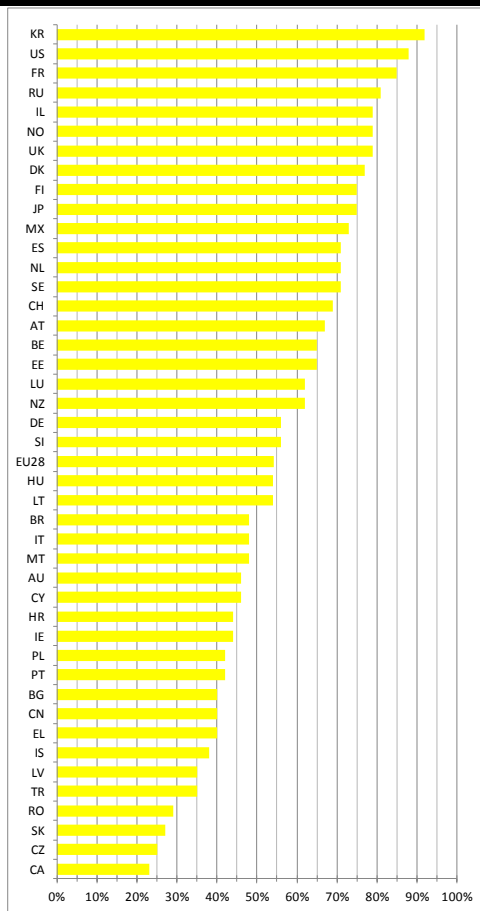
Description:	Enterprises' total turnover from e-commerce
Breakdown:	All enterprises, without financial sector (10 persons employed or more)
Unit:	% turnover
Main source:	Eurostat – Community survey on ICT usage and eCommerce in Enterprises, OECD Science, Technology and Industry Scoreboard 2013, OECD Measuring the Digital Economy 2014, US Census Bureau 2013
Calculation:	EU28 average is calculated as the simple average of member states
I-DESI 2014:	2013 (2012: Belgium, Iceland, Korea (Rep.), Luxembourg, Australia, 2010: Denmark)
N.a.:	Canada, Japan, Switzerland
I-DESI 2015:	2014 (2013: Portugal, Slovenia, United States, 2012: Belgium, Iceland, Korea (Rep.), Luxembourg, Australia)
N.a.	Canada, Japan, Switzerland

5.1.1. eGovernment Users

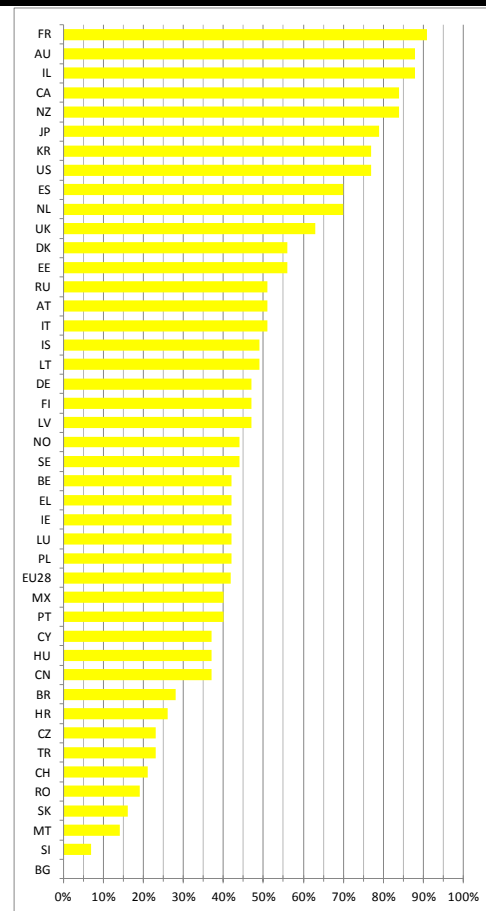


Description:	Individuals using the Internet to interact with public authorities
Breakdown:	Total population
Unit:	% population
Main source:	OECD Government at a Glance 2013, OECD Science, Technology and Industry Scoreboard 2015, Eurostat – Community survey on ICT usage in Households and by Individuals, Pew Research Center for US data
Calculation:	EU28 average is weighted by the total population per member state
I-DESI 2014:	2012 (2013: Australia, Israel, Russia, Brazil)
N.a.:	Korea (Rep.), Turkey, United States, Japan, China, Mexico
I-DESI 2015:	2014 (2013: Australia, Brazil, Israel, Russia, 2012: Canada, New Zealand)
N.a.:	Japan, China, Mexico

5.1.2. Transactional Services



I-DESI 2014



I-DESI 2015

Description: The extent to which government websites offer transactional services (including electronic authentication of the citizen's identity). Government websites process non-financial transactions, e.g. filing taxes online or applying for certificates, licenses and permits.

Breakdown: Services assessed in the UN eGovernment Survey

Unit: % of services

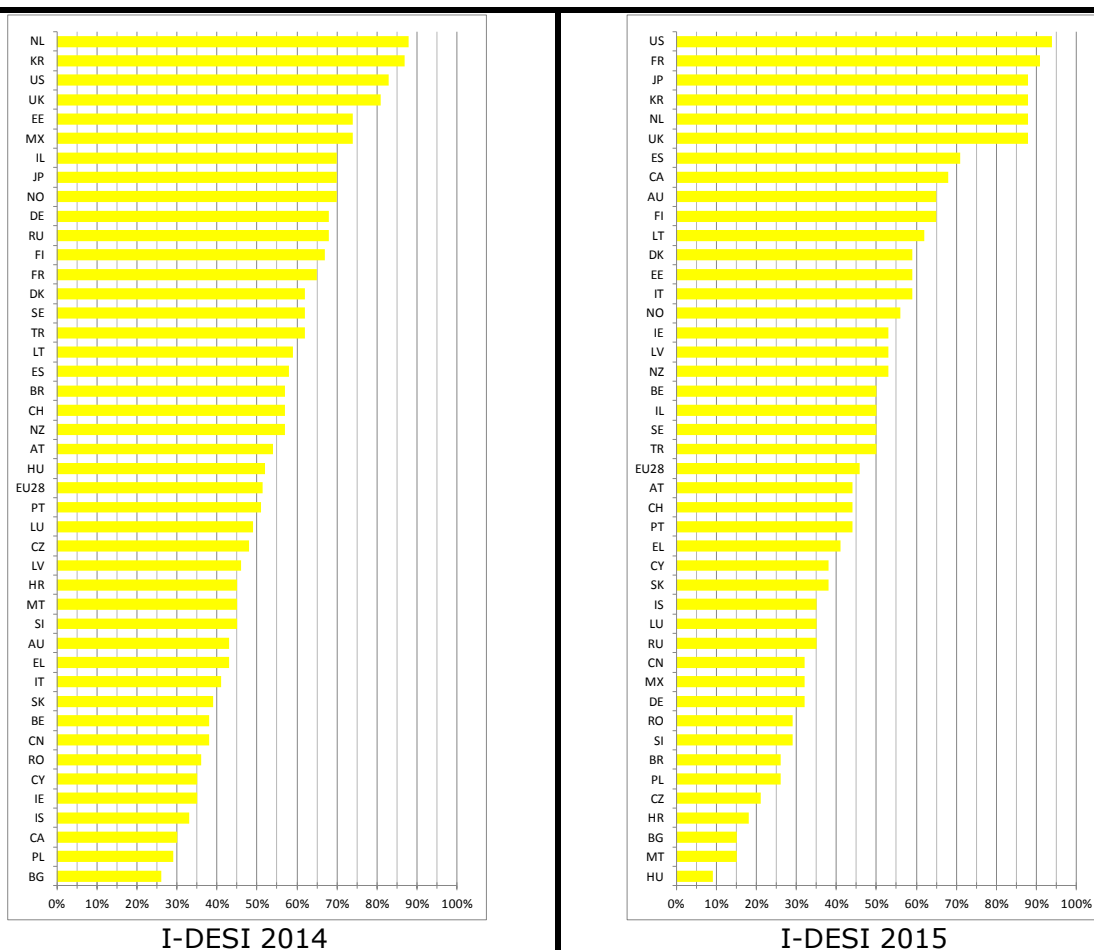
Main source: UN eGovernment Survey 2012 and 2014

Calculation: The EU28 average is calculated as the simple average of member states

I-DESI 2014: 2012

I-DESI 2015: 2014

5.1.3. Connected Services



Description: The extent to which government websites offer connected services (including a citizen-centric approach, where-services are targeted to citizens through life cycle events and segmented groups to provide tailor-made services). E-services and e-solutions cut across the departments and ministries in a seamless manner, information, data and knowledge is transferred from government agencies through integrated applications.

Breakdown: Services assessed in the eGovernment Survey

Unit: % of services

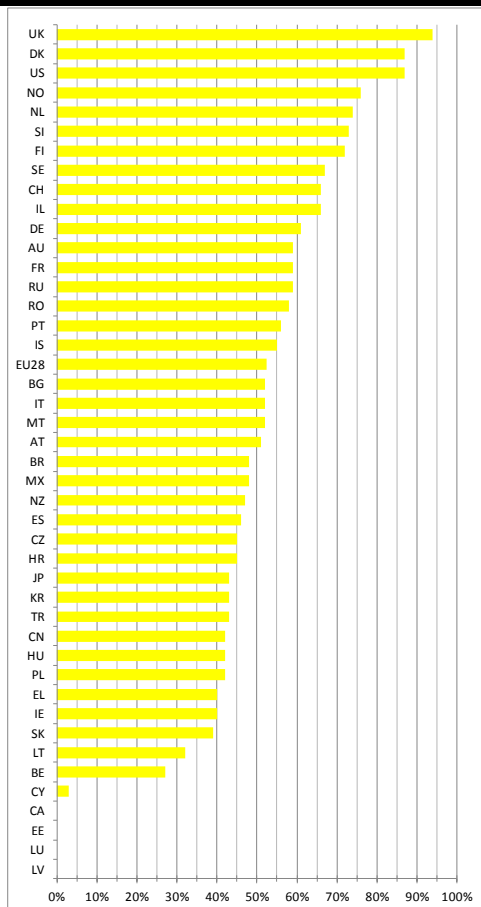
Main source: UN eGovernment Survey 2012 and 2014

Calculation: The EU28 average is calculated as the simple average of member states

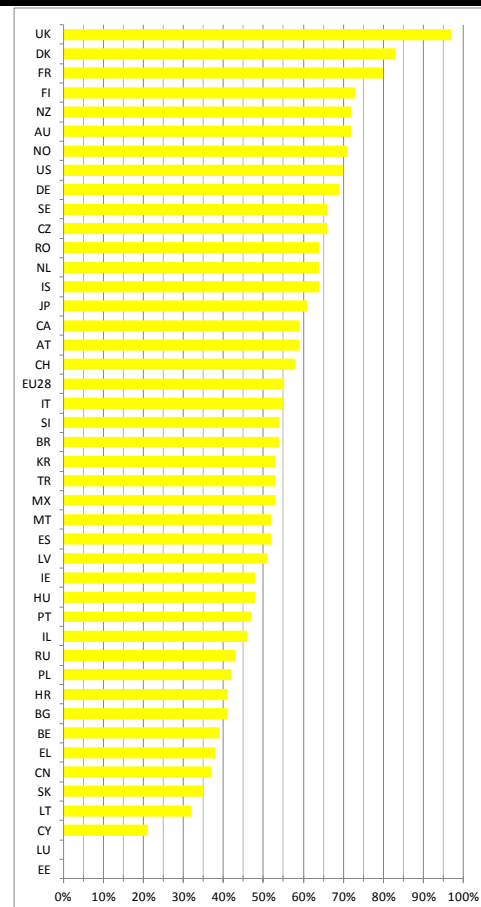
I-DESI 2014: 2012

I-DESI 2015: 2014

5.1.4. Open Data



I-DESI 2014



I-DESI 2015

Description: Index evaluating the openness of government datasets
Breakdown: Total number of pre-selected government datasets
Unit: % datasets
Main source: Global Open Data Index
Calculation: EU28 average is calculated as the simple average of member states

I-DESI 2014: 2013
N.a.: Estonia, Luxembourg, Latvia, Turkey

I-DESI 2015: 2014
N.a.: Estonia, Luxembourg

European Commission

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