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DIGITAL COMPETITIVENESS

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RANKING 2019



# Preface

How prepared are economies to productively use the transformative technologies of our time? Do countries have a feasible framework to facilitate the adoption and use of digitalization? And how ready are they to embrace the implications of digital disruption?

Questions like the above were the trigger to construct the IMD World Digital Competitiveness Ranking (WDCR) in 2017. We are excited to present its 3<sup>rd</sup> edition!

Technology and its rapid changing nature not only affect how businesses perform, but also how countries function and prepare for the future. Governments around the world are investing heavily in their digital economy to enhance value creation and prosperity. The WDCR assesses the capacity of 63 economies to adopt and explore digital technologies leading to transformation in government practices, business models and society in general.

To evaluate an economy, WDCR examines three factors: knowledge, which measures the know-how necessary to discover, understand and build new technologies; technology, which evaluates the overall context that enables the development of digital technologies; and future readiness, which assesses the level of preparedness to exploit digital transformations.

The latest ranking corroborates a trend that we have acknowledged before: economies based on individuals who adapt new technologies and industries, and show flexibility to innovations, are the ones that perform well in the digital ranking. An additional observation is that there is a correlation between those economies which advance the frontiers of knowledge and those that exhibit high digital competitiveness. An important driver for digital competitiveness is related to the strength of the institutional environment. The aspect of political stability is explored further in the accompanying essay.

Like our other publications, the IMD World Digital Competitiveness Ranking is the beneficiary of the support of many stakeholders. Our Partner Institutes, the IMD Alumni community and our Panel of Experts all generously offer data, insights and time to help materialize such a report. We are indebted and grateful for their support.



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# The IMD World Competitiveness Center

*For thirty years, the IMD World Competitiveness Center has pioneered research on how countries and companies compete to lay the foundations for sustainable value creation. The competitiveness of nations is probably one of the most significant developments in modern management and IMD is committed to leading the field. The World Competitiveness Center conducts its mission in cooperation with a network of 56 Partner Institutes worldwide to provide the government, business and academic communities with the following services:*

- Competitiveness Special Reports
- Competitiveness Prognostic Reports
- Workshops/Mega Dives on competitiveness
- IMD World Competitiveness Yearbook
- IMD World Digital Competitiveness Ranking
- IMD World Talent Ranking

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We also have the privilege of collaborating with a unique network of Partner Institutes, and other organizations, which guarantees the relevance of the data gathered.

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We would like to express our deep appreciation for the contribution of our Partner Institutes, enabling an extensive coverage of competitiveness in their home countries. The following Institutes and people supplied data from national sources and helped distribute the survey questionnaires:

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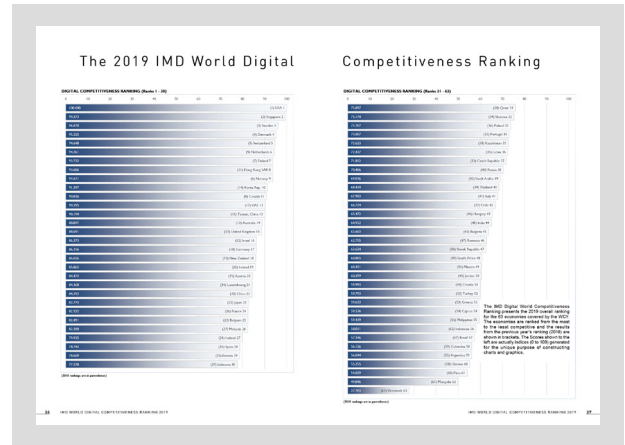
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# User's Guide to the IMD World Digital Competitiveness Ranking

## Overall and Breakdown Digital Rankings

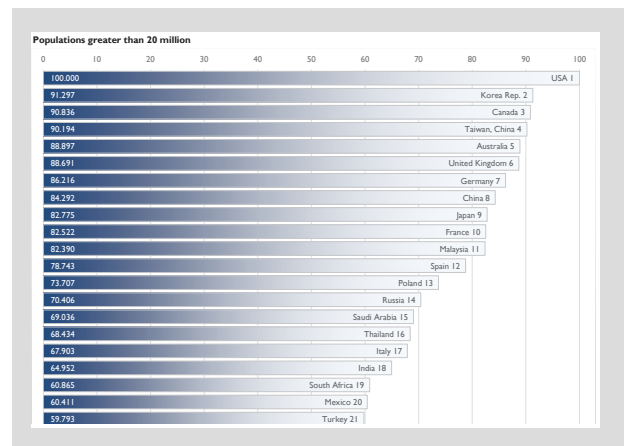
### The IMD World Digital Competitiveness Ranking

The IMD World Digital Competitiveness Ranking presents the 2019 overall rankings for the 63 economies covered by the WCY. The rankings are calculated on the basis of the 51 ranked criteria: 31 Hard and 20 Survey data. The countries are ranked from the most to the least digital competitive and the results from the previous year's scoreboard (2018) are shown in brackets. The index value or "score" is also indicated for each country.



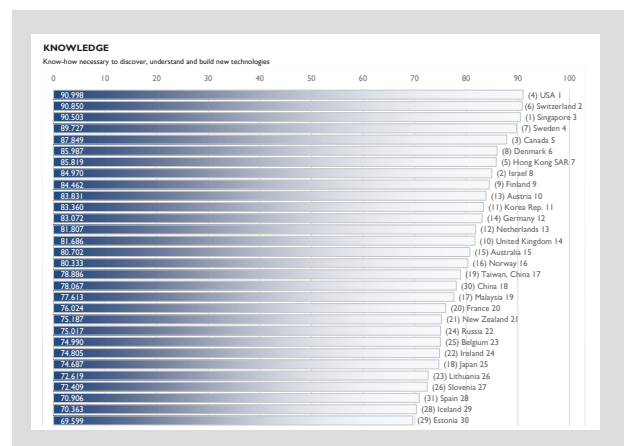
### Selected breakdowns of the IMD World Digital Competitiveness Ranking

In addition to global digital rankings, other rankings are provided to show comparisons based on different perspectives. These digital rankings include countries split by population size (populations above and below 20 million), by GDP per capita to reflect different peer groups (above and below \$20,000) and three regional rankings drawn from different geographical areas (Europe-Middle East-Africa, Asia-Pacific and the Americas).



### Digital Competitiveness Factor Rankings

The global rankings for each of the Digital Competitiveness Factors are then shown as individual ranking tables. Again, the economies are ranked from the most to the least digital competitive and the previous year's rankings (2018) are shown in brackets. Similar to the Overall Digital Ranking, the values or "scores" are indicated for each Factor. However, there is only one economy that has a score of 100 and one economy with a score of 0 across all four Factors.



## Overall Ranking and Digital Competitiveness Factors

This section presents the overall rankings and the 5-year trends for each of the three Digital Competitiveness Factors: Knowledge, Technology and Future Readiness. Thus, the reader is able to analyze the digital evolution of an economy over the past few years relative to the others on a global basis.

	OVERALL					Knowledge					Technology					Future readiness					
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
Argentina	58	55	57	51	59	57	53	56	58	57	59	56	58	54	56	45	46	49	45	56	Argentina
Australia	3	14	15	13	14	13	16	18	19	17	12	15	16	14	14	8	9	14	11	14	Australia
Austria	24	19	16	15	20	16	12	12	13	15	29	28	28	26	33	19	19	15	14	23	Austria
Belgium	15	18	21	21	22	17	20	22	22	19	24	24	24	21	21	15	16	22	23	25	Belgium
Brazil	54	54	55	57	57	55	54	55	62	55	55	54	55	55	55	55	54	55	55	55	Brazil
Bulgaria	44	47	45	42	42	41	42	42	42	42	38	42	42	42	42	59	58	57	55	48	Bulgaria
Canada	4	5	9	9	11	7	7	7	7	7	17	13	12	12	3	3	3	9	18	Canada	
China	33	35	31	30	22	22	24	23	20	17	31	34	34	35	41	32	33	33	31	37	China
Colombia	23	26	26	28	28	22	26	27	28	22	37	39	36	34	26	39	38	34	28	21	Colombia
Croatia	46	44	48	44	51	46	45	45	43	45	56	59	60	60	60	43	44	53	54	55	Croatia
Cyprus	52	51	51	54	54	51	51	51	51	51	41	43	47	49	50	52	50	54	54	60	Cyprus
Czech Republic	31	32	32	33	27	36	34	36	28	27	27	27	27	27	27	33	34	37	34	39	Czech Republic
Denmark	2	4	4	4	4	7	9	9	9	9	13	12	10	10	11	6	6	1	1	2	Denmark
Estonia	27	27	26	25	29	30	30	28	29	25	26	26	26	31	34	24	24	24	30	30	Estonia
France	20	22	25	24	24	20	21	19	20	15	19	19	20	22	24	4	5	4	8	7	France
Germany	17	15	17	16	17	10	10	13	14	15	7	7	7	7	7	7	7	7	7	7	Germany
Greece	40	45	50	53	53	34	46	51	53	53	26	26	26	31	34	33	34	37	34	39	Greece
Hong Kong SAR	44	42	44	44	43	44	43	48	48	45	25	25	21	21	31	13	14	18	20	16	Hong Kong SAR
Hungary	35	35	35	35	37	35	35	35	35	35	51	52	52	51	54	26	26	46	46	53	Hungary
India	50	53	53	49	44	37	39	37	46	45	5	5	3	6	4	5	5	5	5	5	India
Indonesia	43	46	50	52	52	40	40	40	41	41	39	37	38	40	36	47	45	55	58	57	Indonesia
Israel	38	38	37	37	37	36	35	35	33	33	20	20	20	18	20	17	18	19	24	26	Israel
Italy	34	34	39	41	41	42	40	42	42	42	58	57	59	53	49	53	54	51	48	46	Italy
Japan	10	13	13	12	12	11	11	11	11	11	57	58	56	59	47	58	60	62	62	58	Japan
Jordan	29	48	51	51	55	24	33	29	38	38	27	27	25	29	28	12	12	10	13	5	Jordan
Kuwait	20	43	38	39	35	41	47	46	35	35	22	24	27	25	30	7	9	11	7	9	Kuwait
Korea Rep.	16	17	19	14	15	13	13	14	14	14	46	46	45	41	46	30	29	30	34	31	Korea Rep.
Latvia	34	33	35	35	36	32	33	34	34	34	21	19	23	23	24	22	23	25	25	24	Latvia
Lithuania	28	29	29	29	29	31	31	31	32	32	49	45	50	48	33	38	37	46	41	52	Lithuania
Luxembourg	14	11	20	21	21	21	22	22	27	32	34	42	35	39	39	35	41	38	40	35	Luxembourg
Malaysia	48	52	49	51	49	51	52	54	54	54	16	13	17	17	17	24	25	24	17	4	Malaysia
Malta	51	51	51	51	51	51	51	51	51	51	32	32	32	32	32	37	39	41	39	45	Malta
Netherlands	4	4	4	4	4	14	13	11	12	12	28	29	29	30	25	34	33	33	33	32	Netherlands
New Zealand	51	51	51	51	51	51	51	51	51	51	2	13	12	15	12	23	24	23	21	17	New Zealand
Norway	11	9	10	14	9	17	17	15	16	16	14	16	18	22	19	27	28	27	29	28	Norway
Poland	32	38	42	42	42	38	42	40	38	38	47	48	46	46	52	54	54	50	49	49	Poland
Philippines	40	46	46	54	55	49	50	53	50	50	54	55	61	62	62	46	52	50	59	61	Philippines
Portugal	29	31	33	33	34	29	31	31	27	27	15	10	9	8	6	1	2	3	4	3	Portugal
Qatar	22	28	28	28	31	39	37	35	37	37	8	8	8	11	16	14	15	16	18	20	Qatar
Romania	51	49	54	47	46	39	48	47	48	48	3	3	2	2	3	14	13	12	6	8	Romania
Russia	41	40	42	40	38	27	28	24	24	24	27	28	24	24	24	27	28	28	28	28	Russia

## Digital Sub-factor Rankings

A summary of the rankings for all nine sub-factors is presented for the 63 economies for 2019. It is possible, at a glance, to determine in what areas of digital competitiveness an economy excels or has particular weaknesses and to make comparisons between countries. These rankings provide a more detailed examination of specific aspects of the digital transformation and can be used to, for example, evaluate the technological framework of a country or support international investment decisions.

We view the rankings as a tool for managers or policy makers to use when they analyze the above questions. Of course, each company must take into consideration the logic of its own economic sector, economic forecasts and its own traditions as well as governments should consider the national identity and value system of their economy.

	Knowledge			Technology			Future readiness			
	Talent	Training & education	Scientific concentration	Regulatory framework	Capital	Technological framework	Adaptive attitudes	Business agility	IT migration	
Argentina	51	62	50	49	51	57	57	48	52	Argentina
Australia	7	29	13	7	19	17	7	35	11	Australia
Austria	12	8	14	25	34	31	29	25	15	Austria
Belgium	18	26	24	22	25	26	23	33	23	Belgium
Brazil	61	59	44	57	61	47	33	58	49	Brazil
Bulgaria	50	46	37	46	42	44	43	56	47	Bulgaria
Canada	13	7	2	17	10	27	17	16	13	Canada
Chile	36	55	57	36	44	42	27	50	39	Chile
China	19	37	9	20	32	32	24	1	41	China
Colombia	56	49	58	61	55	52	56	55	45	Colombia
Croatia	58	31	33	59	50	41	51	62	57	Croatia
Cyprus	62	33	53	56	60	48	34	57	38	Cyprus
Czech Republic	35	44	30	43	28	28	46	37	35	Czech Republic
Denmark	6	6	17	10	27	8	1	10	1	Denmark
Estonia	37	10	46	31	24	16	26	43	26	Estonia
Finland	9	16	10	9	11	13	6	27	2	Finland
France	24	28	12	8	18	22	36	39	19	France
Germany	25	14	4	27	17	40	16	11	17	Germany
Greece	53	60	34	52	52	49	41	60	50	Greece

## Digital Competitiveness Country Profiles

Each two page profile analyses the performance of one of the 63 economies that are included in the IMD World Digital Competitiveness Ranking. The economies are presented in alphabetical order. The term economy signifies an economic entity and does not imply any political independence.

It is possible, in one glimpse, to evaluate the digital evolution of each economy over time and its relative strengths and weaknesses. However, each economy's particular situation is influenced by its development level, political restraints and social value system.

This page shows the overall, factors and sub-factors ranking performances of the country in 2019, their 5-years trends and a comparison of between competitiveness and digital competitiveness rankings. The following indicators are presented:

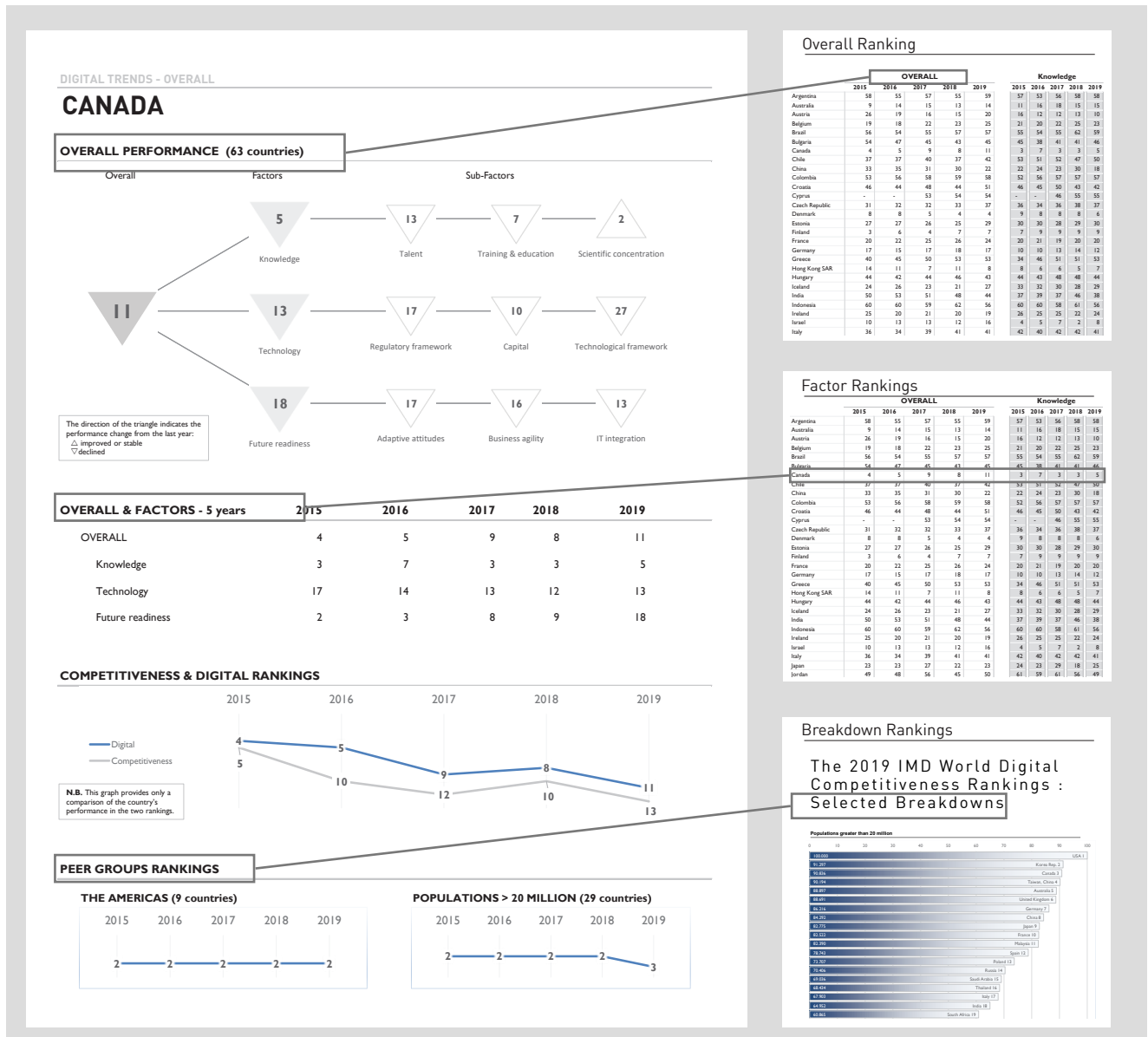
**Overall Performance:** Overall, factors and sub-factors digital ranking performances of the country in 2019. The direction of the triangles indicates whether there has been an improvement or a decline with respect to the previous year.

**Overall & Factors – 5 years:** The evolution of the overall and factors digital rankings in the past 5 years.

**Competitiveness and Digital Rankings:** Comparison of the country's performances in the World Competitiveness

Ranking and World Digital Competitiveness Ranking in the last 5 years.

**Peer Group Rankings:** Based on geographical region and population size.



**Page 2: Factors breakdown & Strengths and Weaknesses**

This page shows the country's performance over time for each of the nine sub-factors composing the three Digital Competitiveness Factors (Knowledge, Technology and Future Readiness) and their 51 criteria rankings for 2019.

**Factors Breakdown:** shows the 5-years evolution of the sub-factors rankings composing the three factors of Knowledge, Technology and Future Readiness.

**Strengths and Weaknesses:** this section highlights the economy's strongest and weakest criteria included in the World Digital Competitiveness Ranking. The triangles (▶) identify the five top criteria in which the economy ranks best (strengths – filled triangle) and the five criteria in which its performance is the worst (weaknesses – empty triangle) compared to the other countries included in the WCY sample. The selection of indicators is determined by the standard deviation values (STD) of the country for that specific criteria. In other words, the criteria selected represent the highest STD values and the lowest STD values among the 51 indicators

composing the World Digital Competitiveness Ranking and can thus be considered the digital competitive advantages and disadvantages of the economy.

The full criteria names can be found in the Appendix and the statistical tables are available for subscribers of the [IMD World Competitiveness Online](#).

It is important to note that what constitutes a strength or weakness is relative to each economy's circumstances or development. Also, the ranking position of a country may not necessarily improve or decline as a consequence of its own evolution since it is always relative to the performance of the other economies. Therefore, an improvement may not be reflected by a higher ranking position if other economies have performed better for the criterion in question. The same can be said for any declines in performance – the economy's ranking position relative to the others may or may not fall, depending on how the other economies have performed.

### FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

CANADA

▶ Overall top strengths

▷ Overall top weaknesses

**KNOWLEDGE**

Subfactors	2015	2016	2017	2018	2019
Talent	8	10	9	7	13
Training & education	12	13	10	4	7
Scientific concentration	4	4	4	4	2

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	9	Employee training	22	Total expenditure on R&D (%)	23
▶ International experience	40	▷ Total public expenditure on education	35	Total R&D personnel per capita	20
Foreign highly-skilled personnel	13	▶ Higher education achievement	5	Female researchers	-
Management of cities	22	▷ Pupil-teacher ratio (tertiary education)	6	R&D productivity by publication	13
Digital/Technological skills	19	▷ Graduates in Sciences	39	▶ Scientific and technical employment	5
Net flow of international students	11	▷ Women with degrees	2	High-tech patent grants	11
				Robots in Education and R&D	9

**TECHNOLOGY**

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	12	17	21	11	17
Capital	8	5	1	5	10
Technological framework	26	24	27	24	27

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
▶ Starting a business	2	IT & media stock market capitalization	19	Communications technology	35
▷ Enforcing contracts	48	Funding for technological development	16	Mobile Broadband subscribers	38
Immigration laws	11	▶ Banking and financial services	15	▶ Wireless broadband	54
Development and application of technol	19	▶ Country credit rating	1	Internet users	17
Scientific research legislation	17	Venture capital	14	Internet bandwidth speed	12
Intellectual property rights	18	Investment in Telecommunications	13	High-tech exports (%)	27

**FUTURE READINESS**

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	16	16	13	15	17
Business agility	1	1	5	4	16
IT integration	3	7	15	12	13

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	26	Opportunities and threats	23	E-Government	23
Internet retailing	12	World robots distribution	14	Public-private partnerships	8
Tablet possession	22	Agility of companies	21	Cyber security	18
Smartphone possession	32	Use of big data and analytics	13	Software piracy	13
Attitudes toward globalization	12	Knowledge transfer	11		

**Factor Rankings**

	OVERALL					Knowledge				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Argentina	18	24	15	17	15	54	57	53	54	58
Austria	12	11	11	11	12	14	14	12	12	13
Australia	24	24	19	14	15	14	14	12	12	13
Belgium	21	21	21	21	22	26	26	22	22	22
Brazil	55	54	54	55	57	53	55	54	55	53
Bulgaria	62	64	47	45	42	47	46	44	44	45
Canada	8	7	5	8	8	3	3	3	3	3
China	24	24	27	26	27	15	14	14	14	15
China Mainland	18	20	15	11	20	27	22	24	23	20
Colombia	49	52	34	38	39	51	52	52	52	52
Croatia	45	46	44	46	44	49	46	45	45	43
Cyprus	61	61	61	61	64	61	61	61	61	65
Czech Republic	31	31	32	31	31	38	34	34	34	38
Denmark	7	8	8	8	7	5	7	8	8	8
Estonia	13	17	17	14	15	31	30	30	30	30
Finland	4	4	4	4	4	5	7	8	8	8
France	13	17	17	14	15	31	30	30	30	30
Germany	21	20	15	15	16	15	20	19	19	20
Greece	44	47	42	33	26	34	30	30	31	34
Hong Kong SAR	13	14	11	7	11	16	14	14	15	15
India	48	44	45	45	46	42	44	43	43	45
Indonesia	27	24	24	23	21	24	23	23	23	28
Israel	24	24	23	21	24	21	21	21	21	26
Italy	38	38	37	37	40	39	37	37	37	40
Japan	17	16	16	19	12	17	16	16	16	11
Jordan	11	10	13	13	13	7	4	5	7	7
Kazakhstan	46	40	40	36	42	46	42	42	42	42
Korea Rep.	26	26	27	27	25	20	24	23	23	18
Kuwait	35	35	43	38	38	43	41	41	40	35
Kuwait Rep.	32	32	32	31	34	32	32	32	32	32
Latvia	33	34	33	35	35	33	32	33	34	34
Lithuania	32	32	32	32	34	30	29	29	29	32
Luxembourg	19	14	11	10	10	19	20	21	21	22
Malaysia	15	16	16	16	17	19	20	20	20	22
Malta	51	46	52	49	51	51	52	54	54	54
Mexico	4	4	4	4	4	1	1	1	1	1
Morocco	18	18	18	14	19	18	18	14	14	20
Netherlands	4	4	4	4	4	1	1	1	1	1
New Zealand	18	18	18	14	19	18	18	14	14	20
Norway	9	11	9	10	6	17	17	17	15	16
Poland	19	19	19	19	20	24	24	24	24	24
Portugal	43	46	46	46	56	46	46	46	46	46
Romania	39	40	39	39	40	39	39	39	39	39
Russia	49	46	46	46	56	46	46	46	46	46
Saudi Arabia	28	28	28	28	28	28	28	28	28	28
Singapore	20	20	21	21	22	21	21	21	21	22
South Africa	50	50	50	50	50	50	50	50	50	50
Spain	29	29	29	29	29	29	29	29	29	29
Sweden	13	13	13	13	13	13	13	13	13	13
Switzerland	5	7	7	8	5	4	5	5	5	4
Taiwan	14	14	14	14	14	14	14	14	14	14
Tanzania	44	42	39	41	29	50	48	42	44	44
Turkey	62	62	62	62	62	62	62	62	62	62
UAE	24	23	25	18	17	27	28	28	28	24
UK	60	60	60	60	60	60	60	60	60	60
USA	12	12	12	11	10	13	12	11	10	10
Vietnam	5	5	5	5	5	5	5	5	5	5
Yemen	61	61	61	61	61	61	61	61	61	61

**Sub-factor Rankings**

	Talent	Training & education	Scientific concentration	Regulatory framework	Capital	Technological framework	Adaptive attitudes	Business agility	IT integration
Argentina	47	63	41	46	48	53	49	37	52
Australia	8	42	11	6	18	19	2	28	6
Austria	12	7	18	24	38	21	25	5	10
Belgium	17	30	29	17	23	33	19	21	21
Brazil	61	57	54	59	54	47	38	52	51
Bulgaria	53	42	33	52	50	36	48	59	54
Canada	7	4	4	11	5	24	15	4	12
China	31	49	41	33	26	41	27	39	38
China Mainland	18	46	21	26	30	40	23	19	41
Colombia	37	45	37	62	57	35	57	54	48
Croatia	59	36	32	55	52	43	37	63	49
Cyprus	62	29	52	51	60	49	45	45	46
Czech Republic	29	55	36	46	19	18	34	25	34
Denmark	6	3	14	8	22	5	5	6	5
Estonia	34	17	39	25	21	15	24	29	22
Finland	13	5	9	4	9	6	6	32	11
France	21	33	17	5	25	28	32	36	19
Germany	22	19	10	23	16	27	22	20	18
Greece	50	38	37	47	54	48	50	49	47
Hong Kong SAR	5	13	5	14	6	11	11	26	25
India	46	48	51	35	51	46	62	56	36
Indonesia	37	18	35	18	40	12	18	11	28
Israel	14	34	24	20	53	13	10	3	24
Italy	19	2	2	30	20	17	2	4	1
Japan	41	56	28	41	49	44	26	41	28
Jordan	36	14	12	40	33	4	13	55	15
Japan	39	41	63	43	39	54	58	23	42
Kazakhstan	44	41	55	22	59	42	43	57	31
Korea Rep.	26	8	7	27	44	2	3	47	20
Latvia	28	28	46	31	36	26	52	41	37
Lithuania	37	16	31	28	35	32	41	24	31
Luxembourg	33	26	44	9	4	35	29	17	13
Malaysia	24	10	30	29	12	32	30	15	35
Mexico	52	51	53	45	42	50	40	57	53
Mongolia	60	24	60	58	55	61	31	61	62
Malta	3	31	16	10	7	14	7	12	7
New Zealand	18	17	15	13	14	14	15	17	17
Norway	20	11	20	1	2	3	8	14	9
Poland	58	43	62	49	47	39	58	50	39
Philippines	48	52	50	61	43	52	60	31	57

IMD WORLD DIGITAL COMPETITIVENESS RANKING 2019

15



# Digital Competitiveness, political stability and investments in technology

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## Introduction

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Now in its third year, the IMD World Digital Competitiveness Ranking (WDCR) measures the capacity and readiness of 63 economies to adopt and explore digital technologies as a key driver for economic transformation in business, government and wider society.

The structure of the WDCR is built on three factors. The first factor, knowledge, refers to the intangible infrastructure, which underlines the process of digital transformation through the discovery, understanding and learning of new technologies. The technology factor assesses the overall context through which the development of digital technologies is enabled. Finally, the future readiness factor which examines the level of preparedness of an economy to assume its digital transformation.

In this edition of the WDCR, we introduce two new variables related to robotics in the calculation of the digital ranking: “industrial robots” which measures the total number of robots in operation, and “robots in education and R&D” worldwide. The first is included among the indicators used to calculate the business agility sub-factor (under the future readiness factor). The latter is incorporated as part of the scientific concentration sub-factor, within the knowledge factor. The International Federation of Robotics is the provider of the robotics data.

In 2019, the United States held on to the number one spot in the WDCR, with all top five economies in the

index unchanged: USA, Singapore, Sweden, Denmark and Switzerland. The Top 5 share a common thread in terms of their focus on knowledge generation, but they each approach digital competitiveness differently. The United States and Sweden follow a balanced approach between knowledge generation, the creation of a supportive environment for technology development and a readiness to adopt innovation. Singapore, Denmark and Switzerland give priority to one or two factors. In the Top 10, the Netherlands, Hong Kong SAR and Republic of Korea moved up (to 6th, 8th and 10th, respectively), while Norway dropped to 9th and Canada fell from 8th to 11th.

Several Asian economies advanced significantly in the ranking compared to 2018. Hong Kong SAR and the Republic of Korea entered the top ten while China and Taiwan, China moved up to 22nd and 13th respectively. All these countries experienced marked progress in their technological infrastructure and the agility of their businesses. Further down the ranking, India and Indonesia jumped four and six positions respectively, supported by positive results in talent, training and education as well as the enhancement of technological infrastructure.

In the following sections, we review the main facts and trends in digital competitiveness at sub-regional and country level. We then explore the role of political stability in the context of the WDCR, examining how it affects enterprises’ access to capital to finance technological development.

## Main facts in Digital Competitiveness

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The WDCR studies 63 economies most of which have a high or middle level of income per capita. Figure 1 provides a visualization of the changes in the ranking between 2018 and 2019. Most of the economies in the study (27) progressed in the ranking, 24 experienced a decline while 12 confirmed their position compared to last year.

The largest improvements in the ranking have been experienced by Asian economies such as China, Indonesia, Korea and India. These changes had a marked effect on the digital performance of their sub-regions.

Figure 1: Changes in ranking positions between 2018-2019

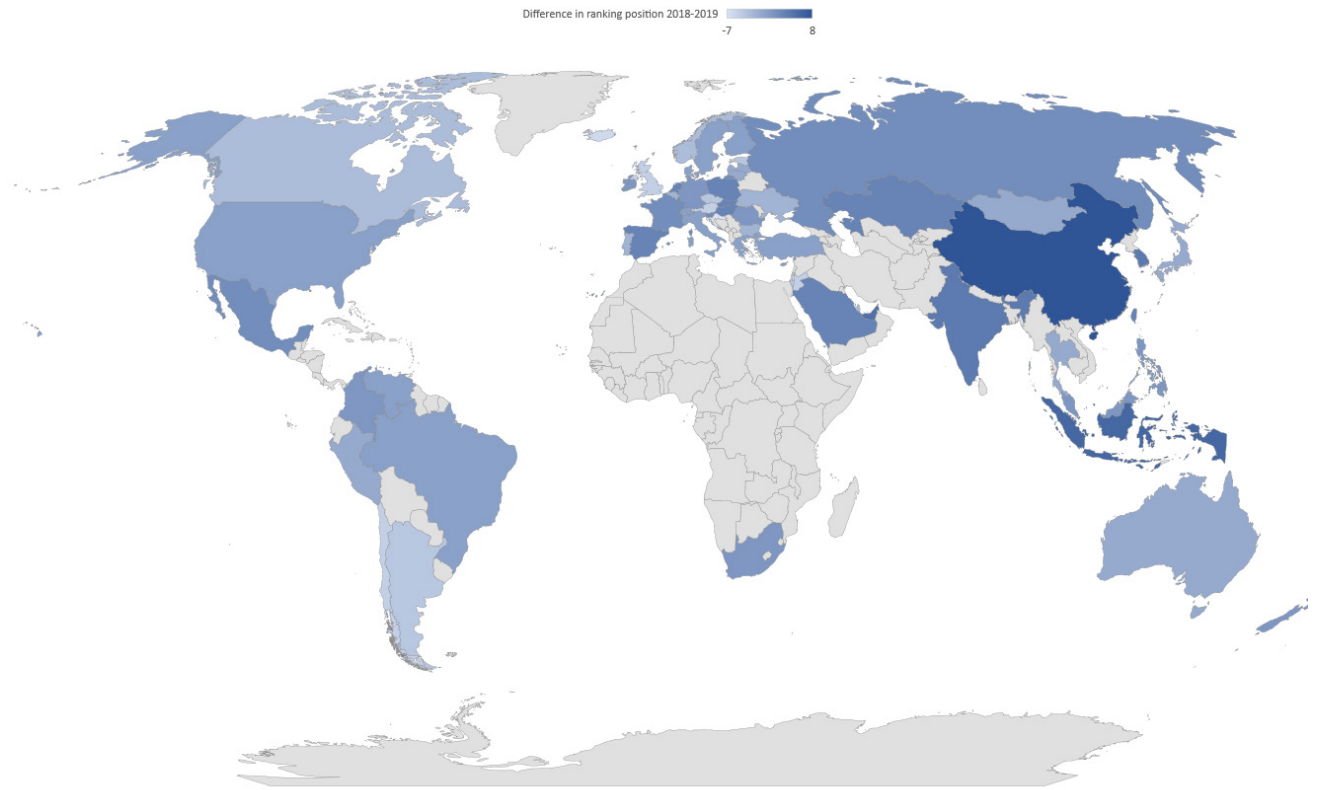
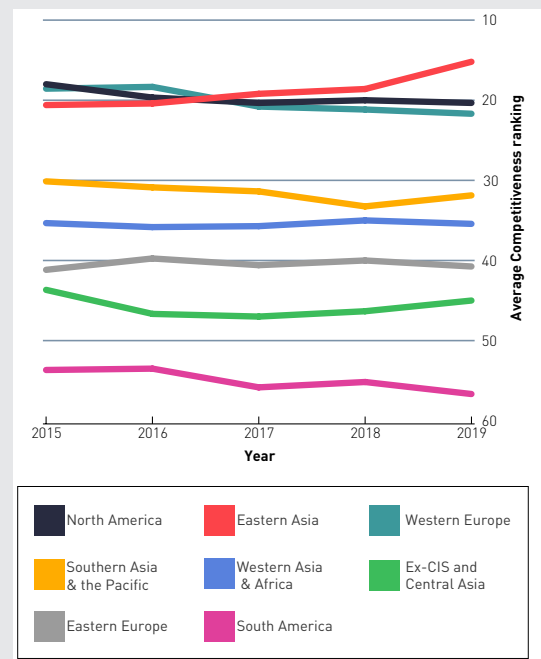


Figure 2 presents the evolution of the average digital competitiveness ranks at sub-regional level for the last six years. In 2019, countries in Eastern Asia, North America and Western Europe keep their leadership in the development, adoption and exploration of digital technologies. However, while North America and Western Europe averages remain stable around 20, Eastern Asia increased its advantage reaching an average rank of 15.2, up from an average of 18.6 in 2018.

Digital competitiveness average performances increase also in Southern Asia and the Pacific (which scores an average of 31.9, up from 33.3 in 2018) and Ex-CIS and Central Asia (average moves from 46.3 to 45 in 2019). Western Asia and Africa and Eastern Europe averages instead are in line with last year. Finally, South American economies continue to lag behind the other sub-regions, experiencing a further, albeit small, decline in digitalization compared to 2018.

In the following subsections, we describe the most significant shifts in the ranking within each sub-region.

Figure 2: Overall Digital Competitiveness trends at sub-regional level 2015-2019.



Source: IMD World Competitiveness Center (2019)

## *Eastern Asia*

Hong Kong SAR moves up to 8th from 11th in 2018. Hong Kong ranked the highest in technology (4th) and placed 7th in knowledge. Under knowledge, its highest spot was in talent - 4th - and its lowest in scientific concentration, 16th. In technology, Hong Kong ranked 3rd in the technological framework sub-factor and 12th in the regulatory framework.

Republic of Korea broke into and rounded up the top 10, rising from 14th in 2018. Its strongest performance was in the future readiness factor (4th) in which it ranked 4th in the adaptive attitudes sub-factor and 5th in business agility but placed at 21st in IT integration.

For Taiwan, China there was a positive trend in executive perceptions about talent availability and access to capital. Taiwan also experienced improvements in the future readiness factor (22nd to 12th) particularly in terms of business agility (13th to 3rd).

The largest increase in the overall ranking was experienced by China, moving from 30th to 22nd. The improvement originated mainly in the knowledge factor (18th) in which it progressed in the training & education sub-factor (from 46th to 37th) and in scientific concentration (21st to 9th).

## *North America*

The USA ranks 1st in the overall digital ranking, while topping the knowledge and future readiness factors, it reaches the 5th position in the technology factor. At the sub-factor level, under knowledge, the USA is 1st in scientific concentration but in talent is 14th and in training and education 25th (its lowest sub-factor ranking). In technology, the USA tops the capital sub-factor only reaching the 19th place in the regulatory framework sub-factor and 11th in the technological framework. Future readiness offers the USA's strongest performance at the sub-factor level ranking 2nd in adaptive attitudes and business agility, and 5th in IT integration.

Canada's slide out of the top ten originated mainly in the executive perceptions about the availability of the relevant talent and the effectiveness of the regulatory framework. It was negatively affected by the prioritization assigned to the training of employees and issues related to the technological framework such as high-tech exports.

Mexico moved up by two places to 49th. The country ranks 11th worldwide both in terms of operative robots in industry and in R&D. However, several indicators related to the quality of education (e.g., pupil teacher ratio in tertiary education), technological infrastructure and executives' perceptions on the agility of firms all showed a decline compared to last year.

## *Western Europe*

Sweden ranked 3rd overall, placing 4th, 7th and 6th for knowledge, technology and future readiness (respectively). The country's highest ranking at the sub-factor level was in training and education (2nd). It performed strongly in scientific concentration (3rd), capital (4th) and regulatory

framework (5th) Sweden's lowest sub-factor ranking is in business agility (13th).

Denmark ranked 4th. At the factor level, it placed at 6th, 11th and 2nd in knowledge, technology and future readiness, respectively. Its strongest performance among the sub-factor was in adaptive attitudes and IT integration (1st in both). It also performed well in talent, and training & education (6th in both).

Switzerland held on to 5th place. In the knowledge factor, it placed 2nd, in technology it ranked 10th, and in future readiness 10th. At the sub-factor level. Switzerland's highest ranking was in talent (2nd) and it performed well in scientific concentration and IT integration (7th in both). Switzerland's weakest ranking among sub-factors was for capital (16th), and training and education (15th).

The Netherlands rose from 9th in 2018 to 6th. Its strongest performance came in the future readiness factor (3rd) in which it ranks 3rd in IT integration, 7th in business agility and 9th in adaptive attitudes. In the technology factor, it ranked 6th reaching 5th in capital, 6th in regulatory framework and 10th in the technological framework sub-factor.

Finland ranked 7th. In knowledge, it came 9th, 8th in technology, and 7th in future readiness. Its highest ranking at the sub-factor level was in IT integration (2nd) and adaptive attitudes (6th). Finland's lowest sub-factor ranking was 27th in business agility.

Norway dropped from 6th to 9th. Its strengths were in the technology factor (3rd), in which it ranked 3rd in regulatory framework, 6th in technological framework and 7th in capital. Norway came 8th in the future readiness factor, placing 5th in adaptive attitudes and 9th for IT integration. Norway's weakest sub-factor ranking was 23rd in business agility.

France progressed from 26th to 24th. Its strengths originated in a supportive regulatory environment (Regulatory Framework sub-factor, 8th) and focus on R&D (scientific concentration sub-factor, 12th). France is in the top 10 for utilisation of robots in industry (8th), and in robots employed in education and R&D (5th).

Germany rose to 17th. Despite important declines in executive's perceptions about companies' agility and flexibility to changing market conditions, the country strengthened its leadership in scientific concentration (4th), training and education (14th) and in the adoption of digital technologies by its citizens (adaptive attitudes, 16th).

Ireland advanced from 20th to 19th. This result stemmed from improvements in e-government indicators as well as positive executives' perceptions on aspects related to supportive legislation for innovation, talent and capital availability. Investments in R&D as well as average internet bandwidth speed and wireless broadband penetration experienced a decline compared to 2018.

Austria slipped from 15th to 20th. The country experienced a decline in the technological framework sub-factor, particularly in high-tech exports. In addition, its performance in business agility was affected by negative

executive perceptions in terms of how well enterprises manage opportunities and threats, and the use of big data and analytics.

The United Kingdom declined from 10th to 15th. Its performance was affected by negative perceptions about access to relevant talent; specifically, the attractiveness of the country for overseas highly-skilled personnel, the availability of managers with international experience and digital/technological skills. Business agility and IT integration also experienced a decline.

#### *Western Asia and South Africa*

Israel ranked 16th, losing four positions. However, the country remained a key regional player in digital competitiveness. While business agility and e-government indicators experienced a decline, the country topped the ranking in areas such as talent development (training and education sub-factor, 3rd) and R&D intensity (scientific concentration, 5th).

The UAE progress was due to an improvement in the training & education sub-factor. It also improved in aspects of the regulatory framework such as starting a business (from 29th to 15th) and the effectiveness of the scientific legislation (12th to 7th). There was a positive shift in IT integration (14th to 8th) mainly as a result of improvement in e-government (28th to 21st).

Saudi Arabia advanced by three places to 39th. This result was driven by increasing positive perceptions of the business community in areas such as regulatory support for technology adoption and capital availability for investments. R&D intensity and e-government indicators showed an opposite trend experiencing a decline this year.

#### *Southern Asia and the Pacific*

Singapore came 2nd, securing top place in the technology factor, 3rd in knowledge and 11th in future readiness. Singapore's strongest performance at the sub-factor level was in talent and technological framework, ranking 1st in both. It also ranked highly in training and education and IT integration (4th in both).

Thailand dropped one place to 40th as a result of a mixed performance across the three digital factors. future readiness (50th) declined while knowledge (43rd) and technology (27th) factors improved compared to 2018. Several indicators related public investments in education, agility of companies and use of big data and analytics in firms declined.

India advanced by four places from 48th to 44th. The country's performance was supported by positive results in the Talent sub-factor (38th), training and education sub-factor (improved from 59th in 2018 to 47th) and e-participation (15th).

Indonesia experienced an important progress from 62nd to 56th. This result was driven largely by the technology factor (47th) with improvement in executive perceptions about the effectiveness of the regulatory framework (57th to 51st) and about the availability of capital for technology development (34th to 26th).

#### *Eastern Europe*

Estonia slipped from 25th to 29th in 2019. On the one hand, several indicators related to education and technological infrastructure (e.g., internet bandwidth speed 26th, up from 37th) show positive figures. On the other, such progress was offset by negative executives' perceptions about the support from relevant regulation paired with a decline in e-participation and e-government indicators.

Slovak Republic advanced in the ranking from 50th to 47th. The country experienced improvements across all three factors, particularly in future readiness (47th, up from 53rd) thanks to positive shifts in adoption and utilisation of online services (i.e., e-government and e-participation).

Croatia dropped from 44th to 51st. This decline was mainly the result of a drop in the regulatory framework particularly in terms of the process of starting a business. It also declined in adaptive attitudes where it experienced a decrease in e-participation and in IT integration specifically in regard to e-government.

#### *Ex-CIS and Central Asia*

Kazakhstan moved up by three places, reaching the 35th position. The improved performance is the result of positive shifts in several sub-factors such as training and education (1st), regulatory framework (16th), adaptive attitudes (39th) and business agility (15th).

Russia advanced from 40th to 38th. This progress was driven by improvements in future readiness (42nd) as well as in scientific concentration (18th) and training and education (9th). On the contrary, the Talent sub-factor (45th) showed a significant decline.

#### *South America*

Chile dropped by five places from 37th to 42nd. Negative executives' perceptions about supportive regulation for innovation, agility of firms, employees training, talent and capital availability explain this result.

Colombia is the only country in the region that progresses in the ranking this year (from 59th to 58th). This result stemmed from an increase in business confidence on talent and capital availability paired with improvements in technological indicators (i.e., increase in mobile broadband subscribers).

Brazil remained 57th in 2019. Indicators related to education and R&D (knowledge factor increases from 62nd to 59th) and technology adoption (adaptive attitudes sub-factor, 33rd) showed improvements. The technology factor experienced a decline.

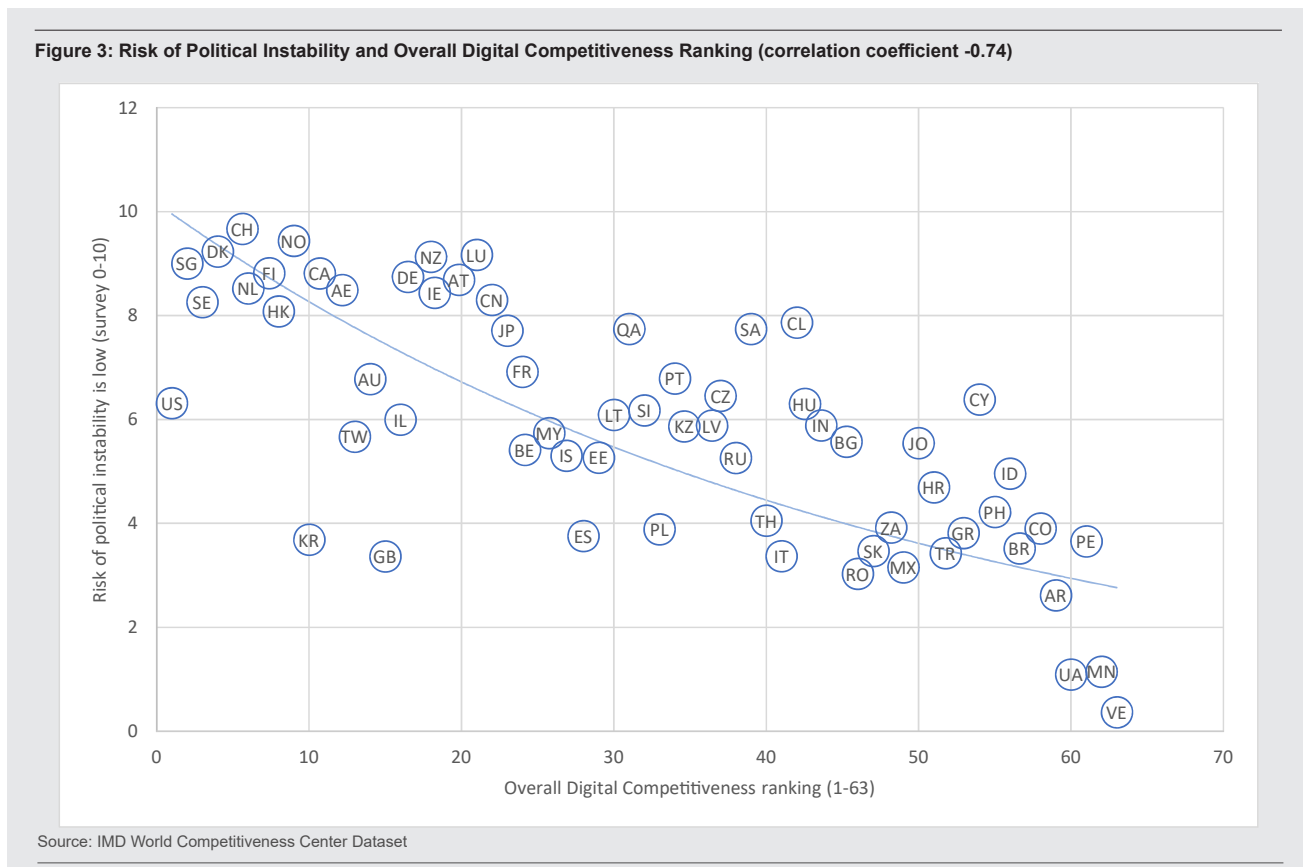
Peru declined by one position (61st). However, it displayed significant improvements in technology adoption by citizens (adaptive attitudes up from 59th to 49th) and education (public expenditure in education and the share of graduates in sciences increased).

## Political stability, capital for innovation and firms' size

Strong and high-quality institutions are a driver for competitiveness performance. This relationship has been supported by our data. In the 2019 edition of the IMD World Competitiveness Yearbook we argued that economies with low risk of political instability, among other criteria associated with institutional aspects, are the economies that perform well in the overall competitiveness ranking. In the 2018 edition of the WDCR, we demonstrated that countries with an effective rule of law, are the economies that perform strongly in developing local talent as well as attracting talent from the international pool. In other words, we show that political stability and predictability, are associated with countries that attract physical and human capital.

In this section we explore the role of political stability within the context of the digital competitiveness ranking.

In the IMD Executive Opinion Survey high level managers are asked to evaluate the risk of political instability in their country. In Figure 3, the vertical axis captures such a risk with low figures reflecting a high level of political instability. The horizontal axis depicts the overall digital competitiveness ranking with low numbers reflecting stronger economies. The association is strongly negative with a correlation coefficient equal to  $-0.74$ . The economies that are characterized by political stability are the ones that perform well in the digital competitiveness as well.



A different way to interpret Figure 3 is that on average, countries that are perceived by high level executives to be politically stable are the ones that are most advanced in terms of adopting and developing digital technology.

The association above is in accordance with the literature studying political instability and economic growth and finding a deteriorating effect of the former on the latter (Alesina et al., 1996). Furthermore, it has been shown that political instability negatively affects investments (Alesina and Perotti, 1996; Aisen and Veiga, 2011). The element of investments is of particular importance in technology due to the capital intensive and high uncertainty nature of the industry.

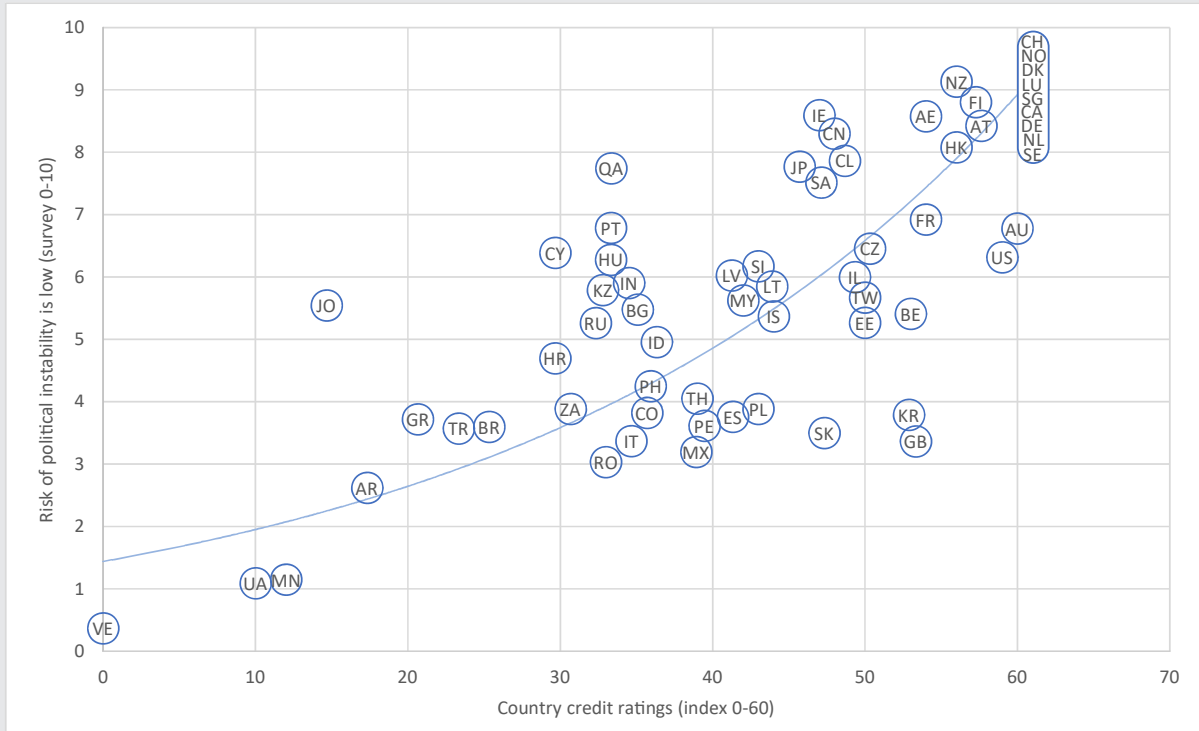
The IMD World Competitiveness data are in line with the results of the literature. Figure 4 captures the relationship

between the Risk of Political Instability in the vertical axis and the Country Credit Ratings in the horizontal. The latter is a composite index of the three country credit ratings provided by Fitch, Moody's and S&P with the higher value reflecting the higher credit rating. The relationship is positive with a correlation coefficient equal to  $0.76$ .

This strong association between countries that are politically stable and financially reliable is revealed when we study the financing specifically for technological development. Figure 5 captures the relationship between the Risk of Political Instability and the perception of high-level managers to the availability of funds for technological development where the higher value reflects more availability. Economies with a political stable environment enjoy higher availability of capital for technological development.



**Figure 4: Risk of Political Instability and Country Credit Ratings (correlation coefficient 0.76)**

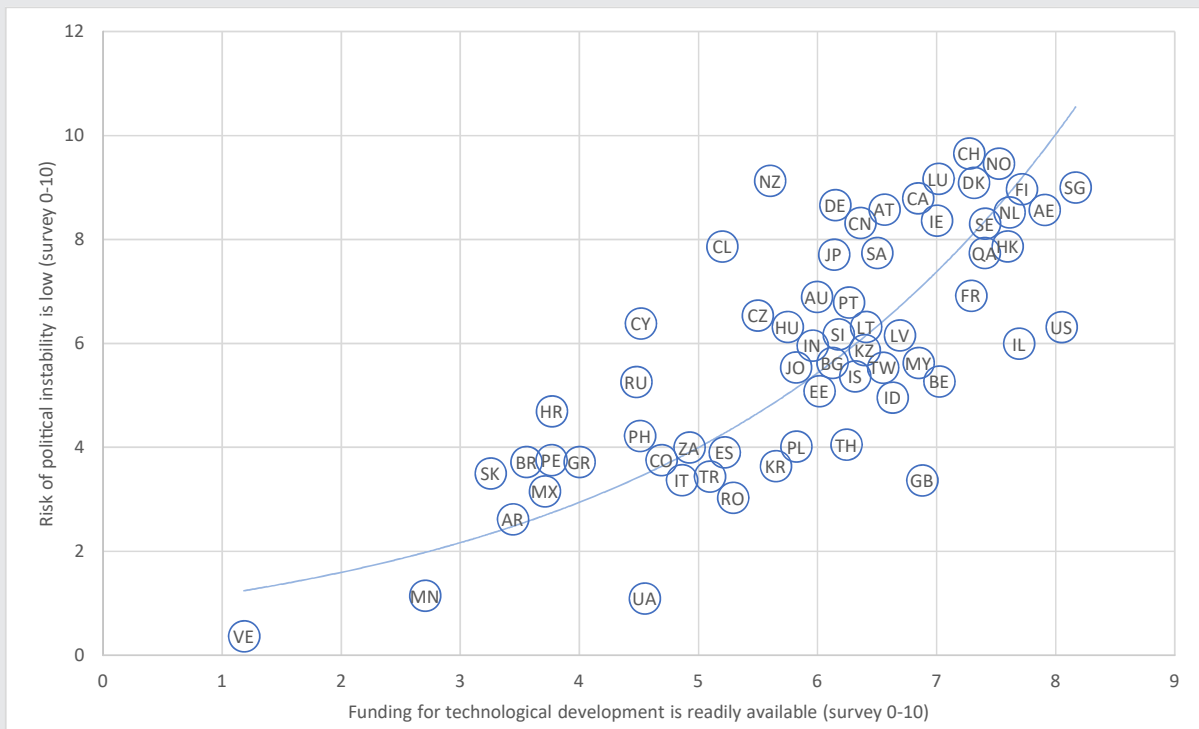


Source: IMD World Competitiveness Center Dataset

A natural concern, especially for policy decision makers, is the extent to which SMEs have access to the available funding for technological development. SMEs are very important for the economic growth of both developed and developing economies. According to the OECD (2017)

almost 99% of all firms are SMEs accounting for 70% of the available jobs and generating 60% of value added. Having the appropriate access to funding will allow SMEs to ride the technology wagon and not be left behind.

**Figure 5: Risk of Political Instability and Funding for Technological Development (correlation coefficient 0.77)**



Source: IMD World Competitiveness Center Dataset

Figure 6 provides some interesting insights from our dataset. The two columns of the graph represent the perceptions of the approximate 6,400 respondents in 63 economies with respect to the political instability of their country. Those who perceive the country to be politically stable (by responding between 6 and 10 in the scale) are recorded in the right part. Those who believe that they operate in politically unstable economy (responding 1-5 in the scale) are captured in the left part. Then we group the responses by the size of the firm: small enterprises are those with less than 50 employees; medium size firms with 51 to 250 employees; and large size that depicts the enterprises with more than 250 employees.

Each panel provides the percentage of the people who agree or not to the statement that funding for technological development is readily available. A very interesting insight is projected in Figure 6. In economies perceived to be politically stable, financing for technology is generally available irrespective of the size of the firm. About 80% of

the respondents will agree that funding is available while the remaining disagree.

This is not the case for those who perceive that their economy is characterized by political instability. In the upper panel of the left side, only about 55% of the executives employed in large firms feel that funding is readily available. Importantly, the difference of 10% with those who disagree with the statement is statistically significant.

Interestingly this is exactly the opposite with the perceptions of the executives employed in medium and small size enterprises. In the lower panel almost 60% of the respondents feel that funding is not readily available.

Therefore, in countries that are perceived to be politically unstable, the small size firms are constrained from accessing important funding for technological development.

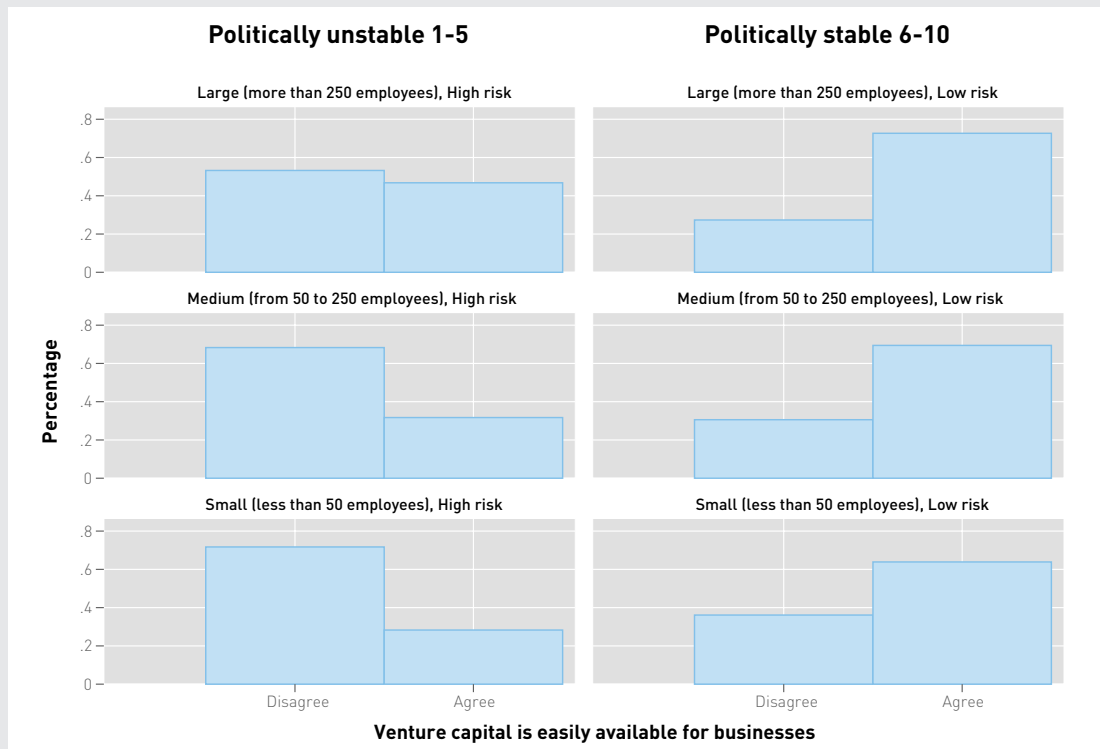


An important source of funding for technology is venture capital. We ask high-level executives about their perception on the availability of such funds in their economy. Figure 7 presents an outline of their responses. Again, executives who perceive their economy as politically stable feel that venture capital is easily available. Note, however, that this time the difference between those who agree with the statement and those who disagree is much smaller than before with the least difference being recorded in the small size firms. Similarly to the funding for technological development question, also in this case SMEs executives tend to have higher concerns compared to top managers

in large companies about venture capital availability in politically unstable countries.

Political stability of a country is an important driver of technological advancement. With respect to financing technological development, in politically stable economies the availability of funds and venture capital is attainable irrespective of the size of the firms with respect to people employed. In contrast, in economies that are high in political instability, financing is more challenging especially for small size firms.

Figure 7: Survey question: “Venture capital is easily available” for different size SMEs



Source: IMD World Competitiveness Center Dataset

## Concluding remarks

The results of the 2019 IMD World Digital Competitiveness Ranking show that top performing countries largely focused on the factors that contribute to the generation of knowledge. Western economies remain as the main digital hubs and leaders as global knowledge centers. Several Asian economies improved this year reducing the digital gap mainly through an advancement in the technology and future readiness factors. However, it seems that they

remain dependent of western economies for the generation of knowledge.

In addition, the data show that factors related to political stability affect the availability of funding technological development. This is particularly relevant for SMEs in countries with limited political stability.



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## Appendices

### Composition of sub-regions and regions.

Western Europe	<ul style="list-style-type: none"> <li>▪ Austria</li> <li>▪ Belgium</li> <li>▪ Cyprus</li> <li>▪ Denmark</li> <li>▪ Finland</li> <li>▪ France</li> <li>▪ Germany</li> <li>▪ Greece</li> <li>▪ Iceland</li> <li>▪ Ireland</li> </ul>	<ul style="list-style-type: none"> <li>▪ Italy</li> <li>▪ Luxembourg</li> <li>▪ Netherlands</li> <li>▪ Norway</li> <li>▪ Portugal</li> <li>▪ Spain</li> <li>▪ Sweden</li> <li>▪ Switzerland</li> <li>▪ United Kingdom</li> </ul>	Europe, Middle East & Africa
Eastern Europe	<ul style="list-style-type: none"> <li>▪ Bulgaria</li> <li>▪ Czech Republic</li> <li>▪ Estonia</li> <li>▪ Croatia</li> <li>▪ Hungary</li> <li>▪ Lithuania</li> </ul>	<ul style="list-style-type: none"> <li>▪ Latvia</li> <li>▪ Poland</li> <li>▪ Romania</li> <li>▪ Slovenia</li> <li>▪ Slovak Republic</li> <li>▪ Ukraine</li> </ul>	
Western Asia & Africa	<ul style="list-style-type: none"> <li>▪ Israel</li> <li>▪ Jordan</li> <li>▪ Qatar</li> <li>▪ Saudi Arabia</li> </ul>	<ul style="list-style-type: none"> <li>▪ South Africa</li> <li>▪ Turkey</li> <li>▪ UAE</li> </ul>	
Ex-CIS & Central Asia	<ul style="list-style-type: none"> <li>▪ Kazakhstan</li> <li>▪ Mongolia</li> </ul>	<ul style="list-style-type: none"> <li>▪ Russia</li> </ul>	
Eastern Asia	<ul style="list-style-type: none"> <li>▪ China Mainland</li> <li>▪ Hong Kong SAR</li> <li>▪ Japan</li> </ul>	<ul style="list-style-type: none"> <li>▪ Korea Rep.</li> <li>▪ Taiwan</li> </ul>	Asia & Pacific
Southern Asia & The Pacific	<ul style="list-style-type: none"> <li>▪ Australia</li> <li>▪ India</li> <li>▪ Indonesia</li> <li>▪ Malaysia</li> </ul>	<ul style="list-style-type: none"> <li>▪ New Zealand</li> <li>▪ Philippines</li> <li>▪ Singapore</li> <li>▪ Thailand</li> </ul>	
North America	<ul style="list-style-type: none"> <li>▪ Canada</li> <li>▪ Mexico</li> </ul>	<ul style="list-style-type: none"> <li>▪ USA</li> </ul>	The Americas
South America	<ul style="list-style-type: none"> <li>▪ Argentina</li> <li>▪ Brazil</li> <li>▪ Chile</li> </ul>	<ul style="list-style-type: none"> <li>▪ Colombia</li> <li>▪ Peru</li> <li>▪ Venezuela</li> </ul>	

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# IMD WORLD DIGITAL COMPETITIVENESS RANKING 2019

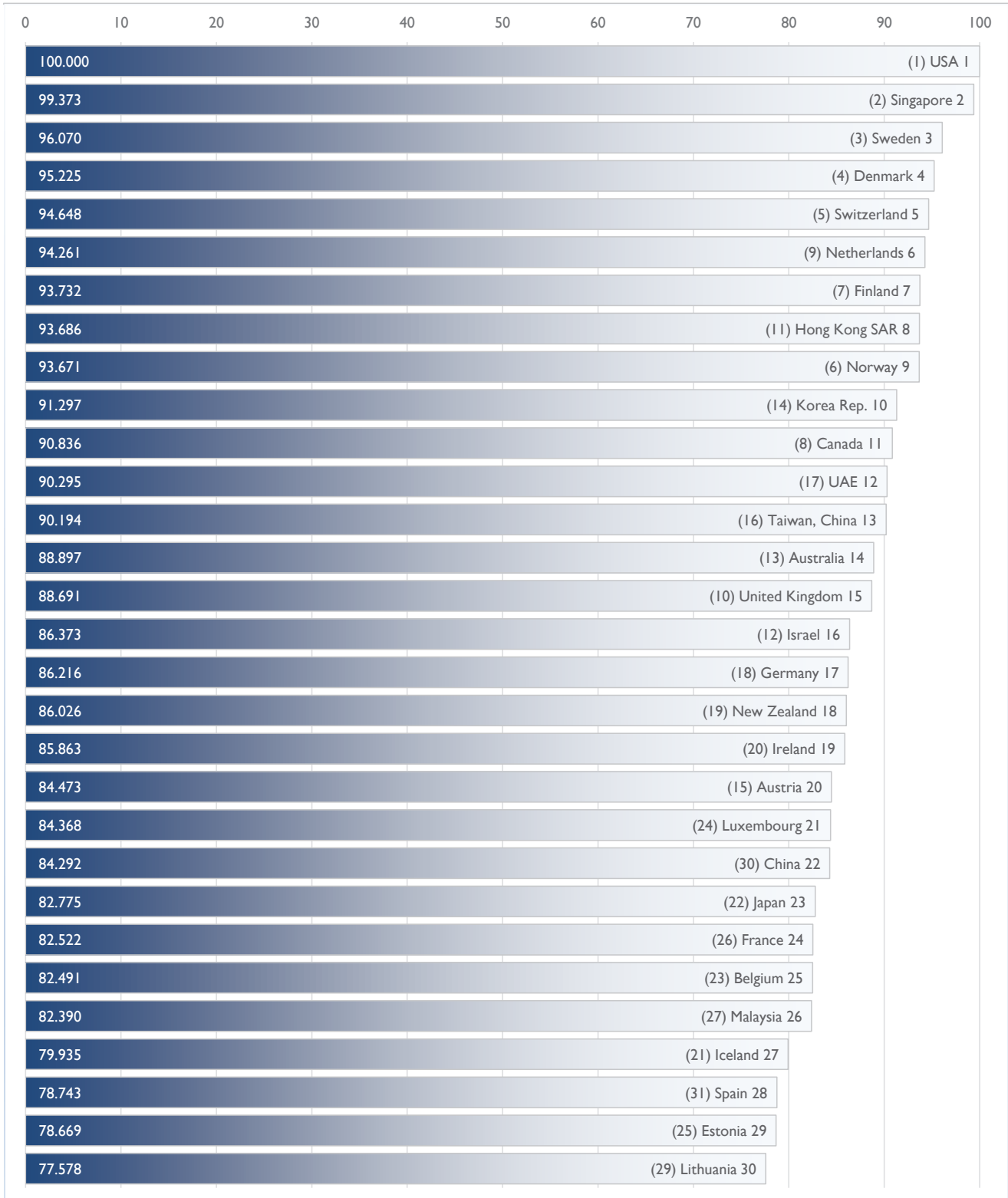
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The statistical tables are available for subscribers of the  
IMD World Competitiveness Online.

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# The 2019 IMD World Digital

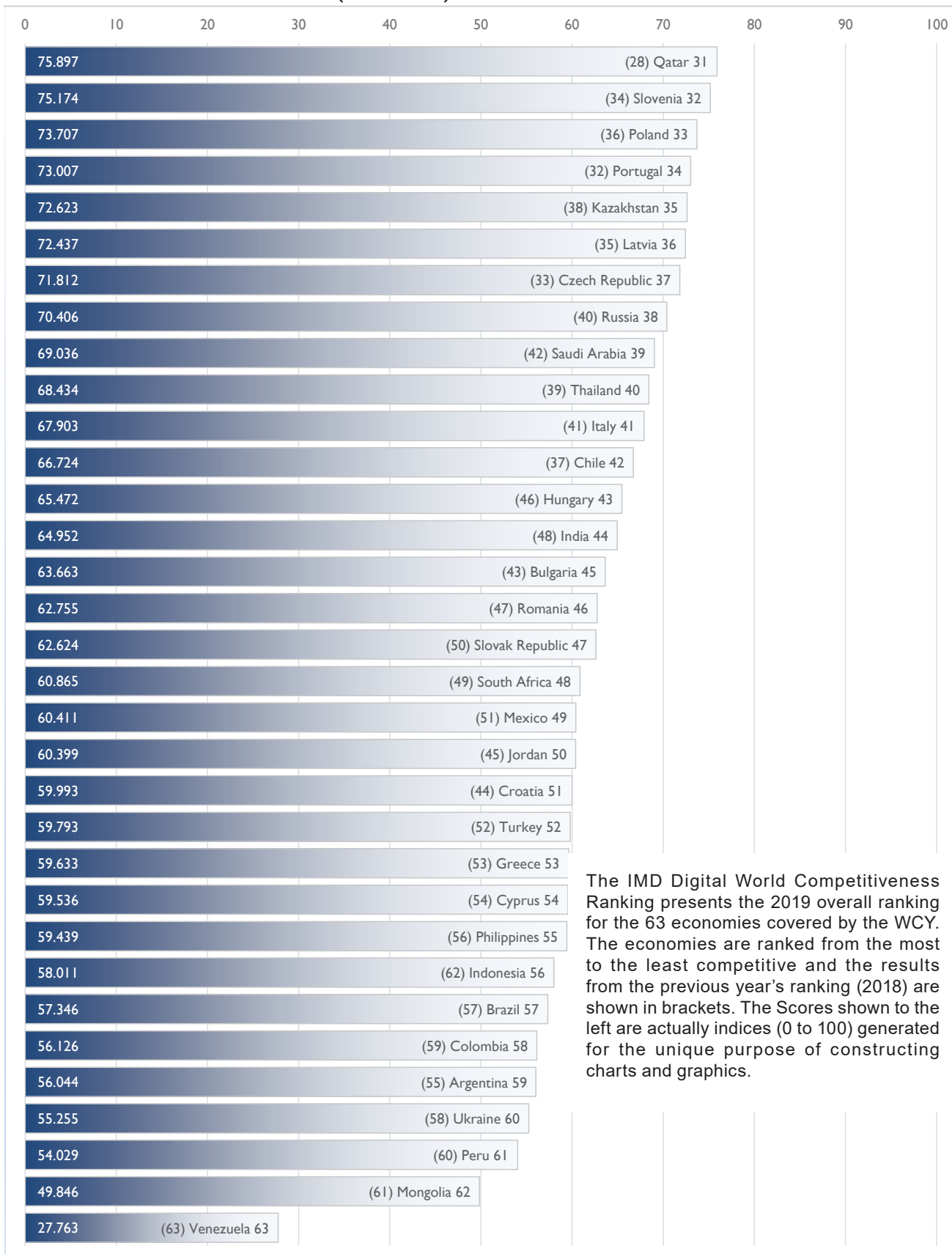
## DIGITAL COMPETITIVENESS RANKING (Ranks 1 - 30)



(2018 rankings are in parentheses)

# Competitiveness Ranking

## DIGITAL COMPETITIVENESS RANKING (Ranks 31 - 63)



The IMD Digital World Competitiveness Ranking presents the 2019 overall ranking for the 63 economies covered by the WCY. The economies are ranked from the most to the least competitive and the results from the previous year's ranking (2018) are shown in brackets. The Scores shown to the left are actually indices (0 to 100) generated for the unique purpose of constructing charts and graphics.

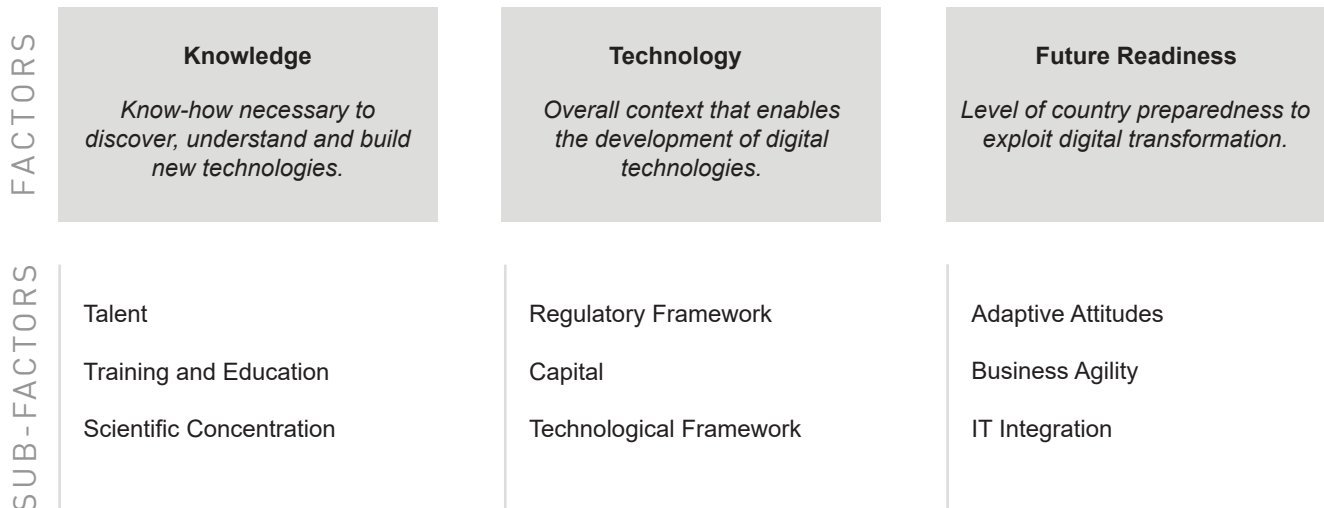
(2018 rankings are in parentheses)

# Methodology in a Nutshell

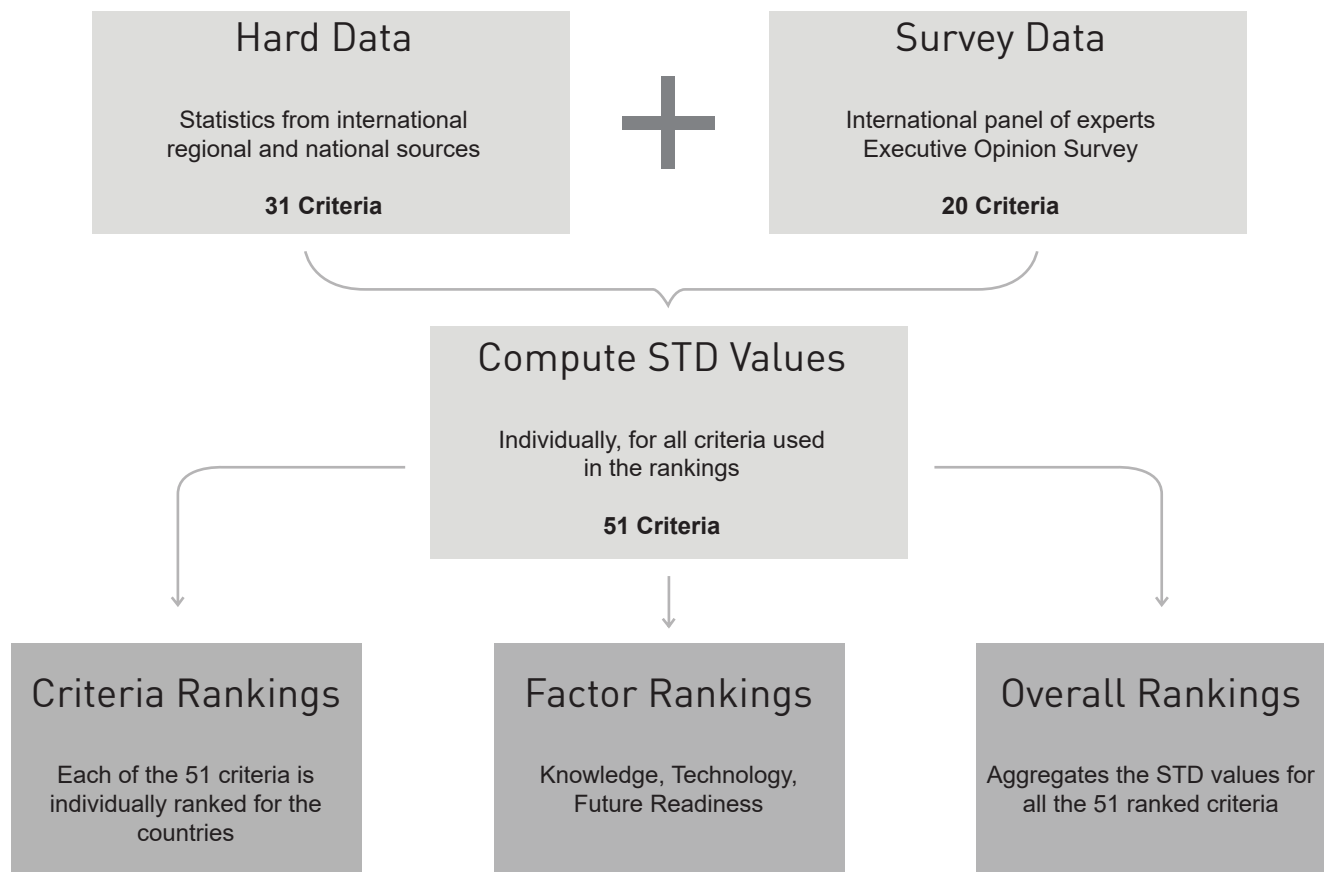
1. The IMD World Digital Competitiveness (WDC) ranking analyzes and ranks the extent to which countries adopt and explore digital technologies leading to transformation in government practices, business models and society in general.
2. As in the case of the IMD World Competitiveness ranking, we assume that digital transformation takes place primarily at enterprise level (whether private or state-owned) but it also occurs at the government and society levels.
3. Based on our research, the methodology of the WDC ranking defines digital competitiveness into three main factors:
  - Knowledge
  - Technology
  - Future readiness
4. In turn, each of these factors is divided into 3 sub-factors which highlight every facet of the areas analyzed. Altogether, the WDC features 9 such sub-factors.
5. These 9 sub-factors comprise 51 criteria, although each sub-factor does not necessarily have the same number of criteria (for example, it takes more criteria to assess Training and Education than to evaluate IT integration).
6. Each sub-factor, independently of the number of criteria it contains, has the same weight in the overall consolidation of results, that is approximately 11.1% ( $100 \div 9 \sim 11.1$ ).
7. Criteria can be hard data, which analyze digital competitiveness as it can be measured (e.g. Internet bandwidth speed) or soft data, which analyze competitiveness as it can be perceived (e.g. Agility of companies). Hard criteria represent a weight of 2/3 in the overall ranking whereas the survey data represent a weight of 1/3.
8. The 50 criteria include 19 new indicators which are only used in the assessment of the WDC ranking. The rest of the indicators are shared with the IMD World Competitiveness Ranking.
9. In addition, some criteria are for background information only, which means that they are not used in calculating the overall competitiveness ranking (i.e., Population and GDP).
10. Finally, aggregating the results of the 9 sub-factors makes the total consolidation, which leads to the overall ranking of the WDC.

# What is the IMD World Digital Competitiveness ranking?

## Digital Competitiveness Factors and Sub-factors

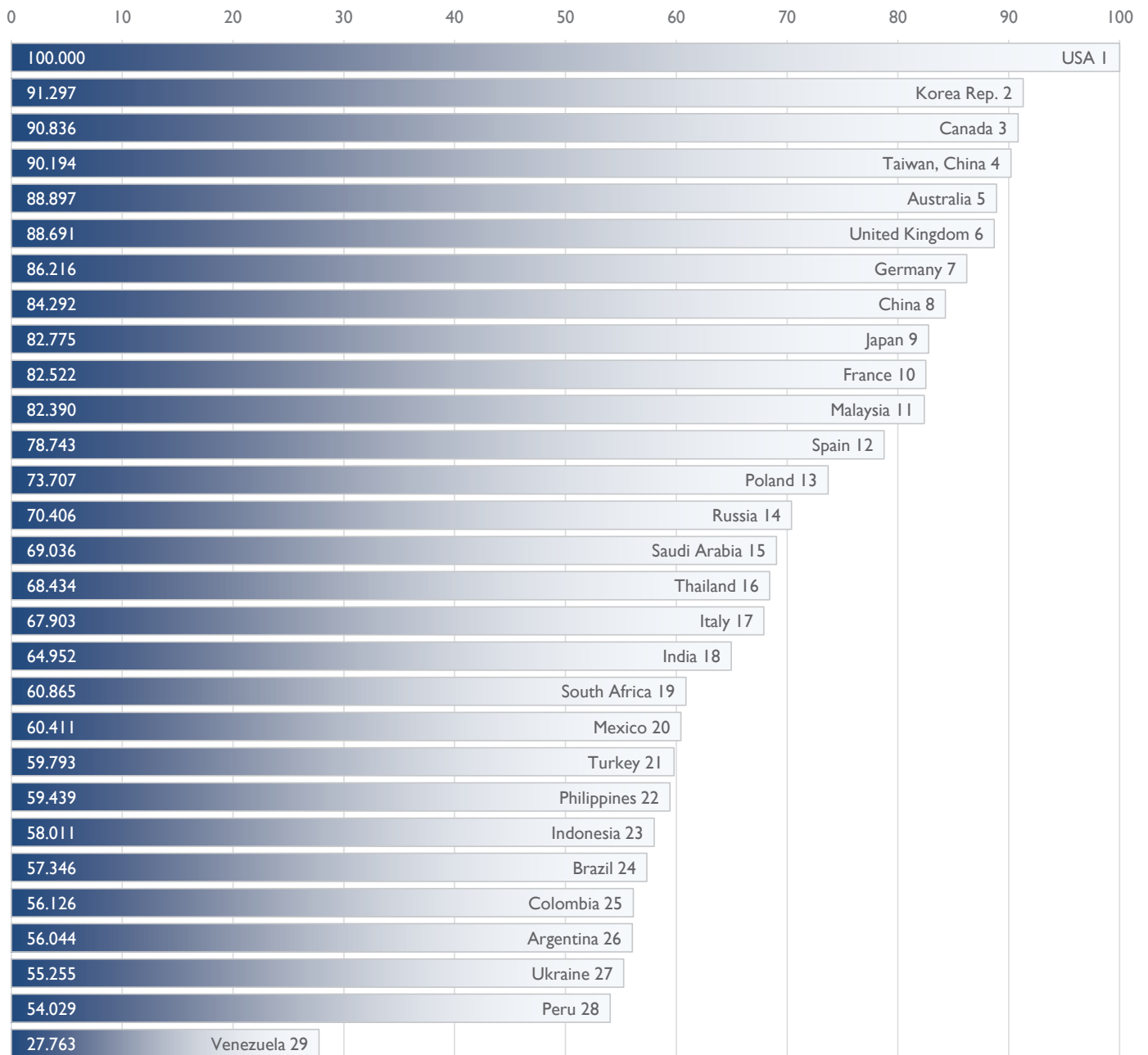


## Computing the Rankings

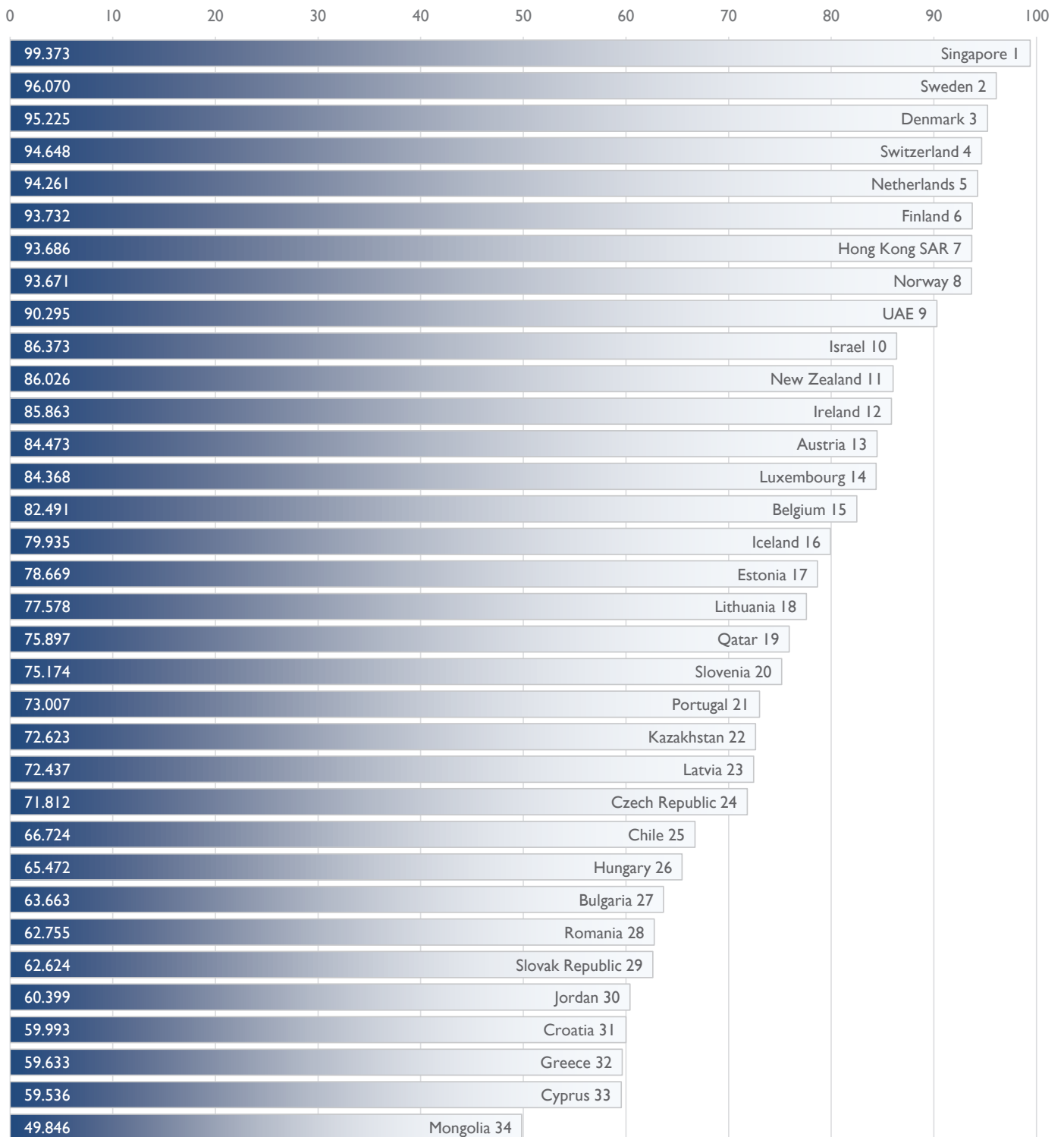


# The 2019 IMD World Digital Competitiveness Rankings : Selected Breakdowns

## Populations greater than 20 million

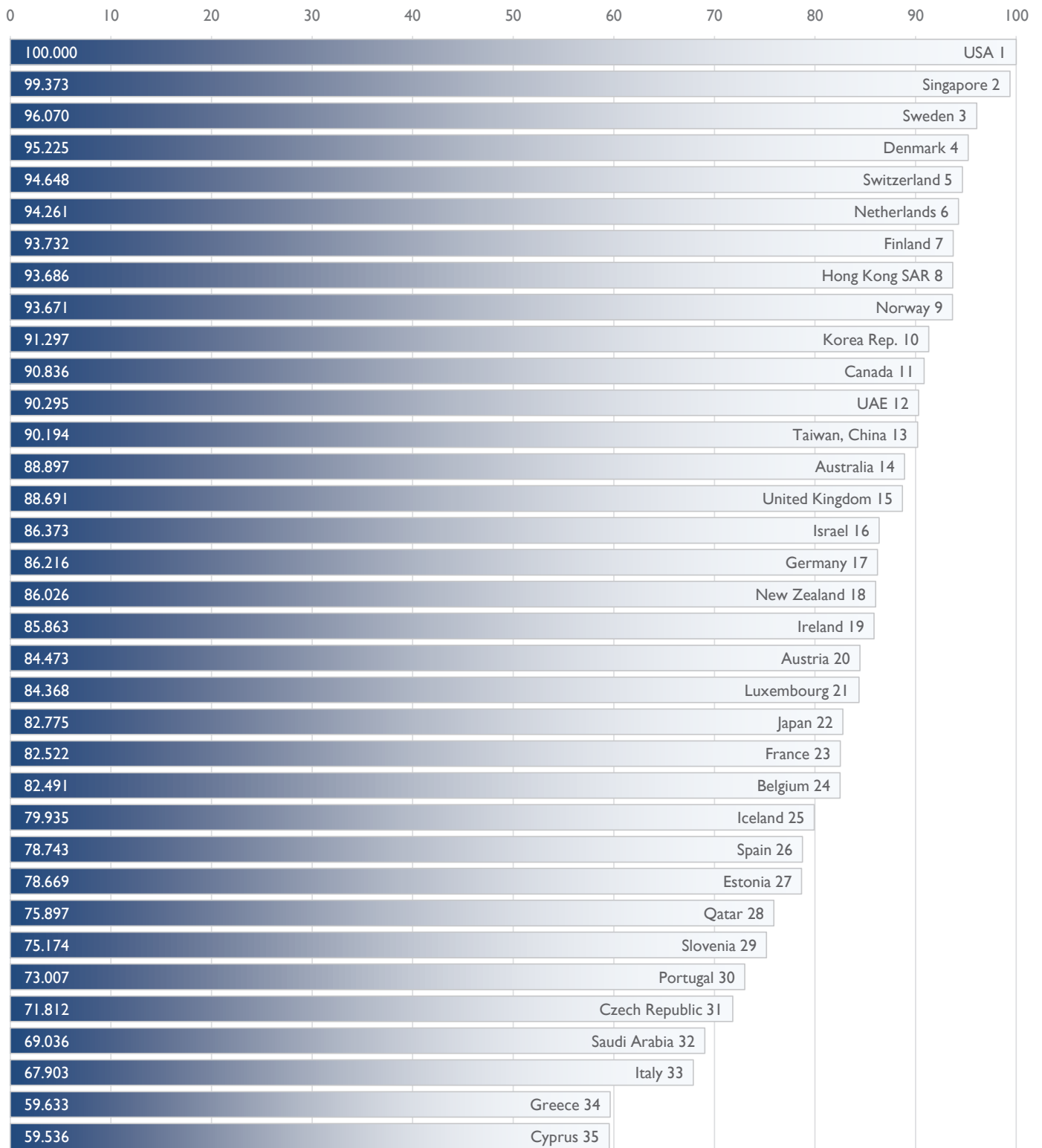


### Populations less than 20 million

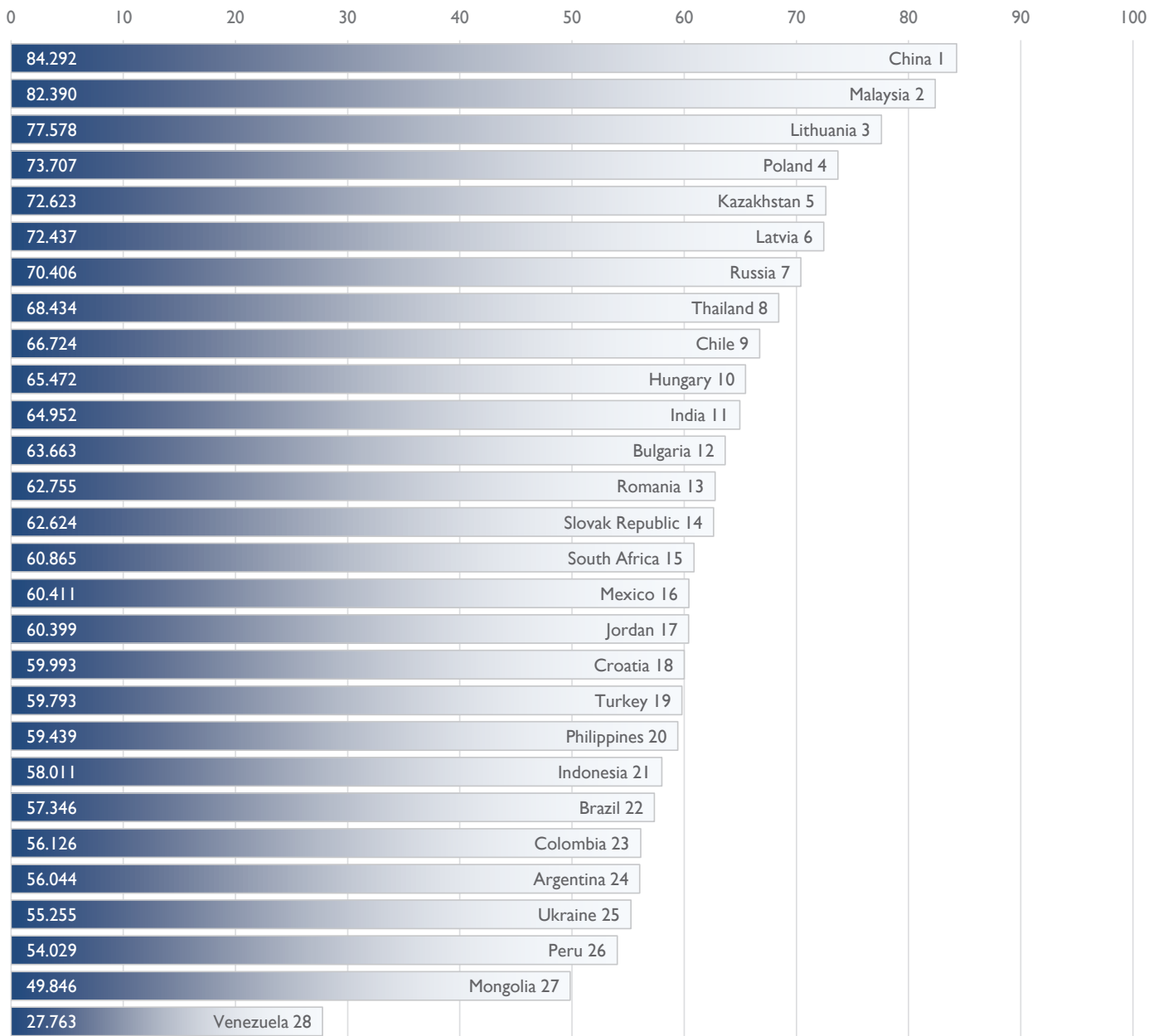




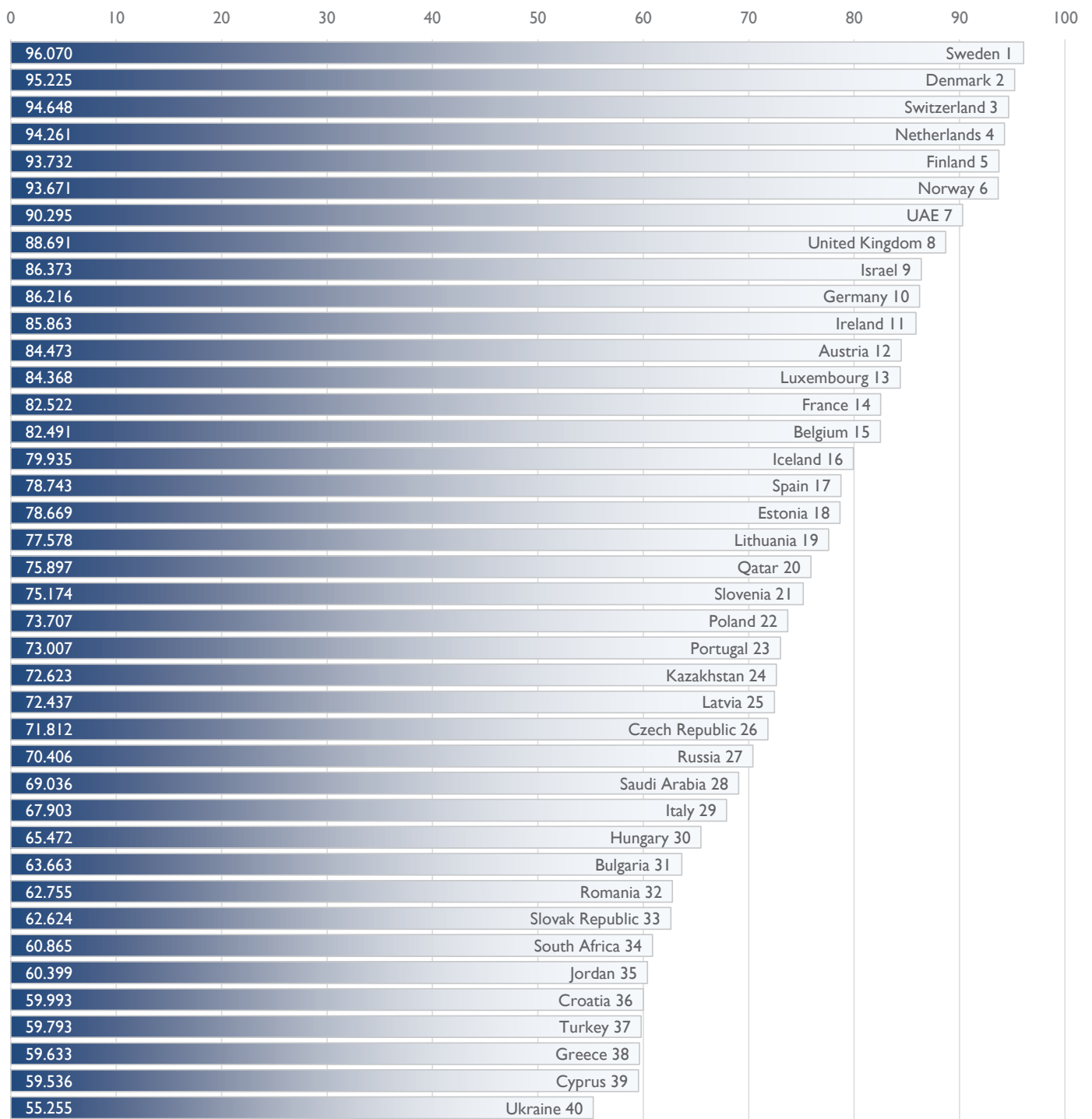
## GDP per capita greater than \$20,000



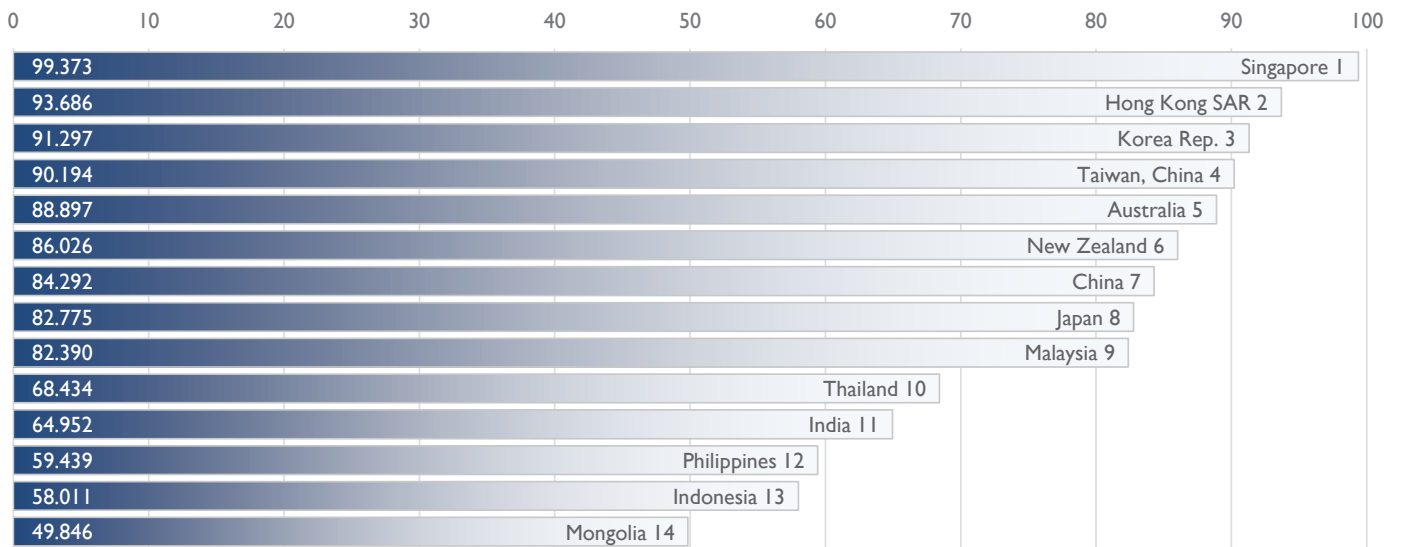
GDP per capita less than \$20,000



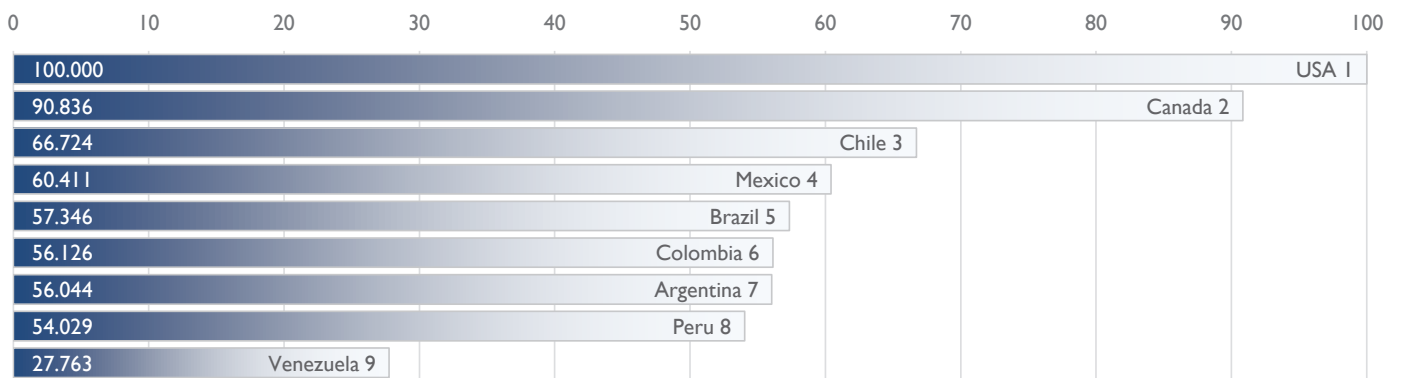
## Europe - Middle East - Africa



### Asia - Pacific

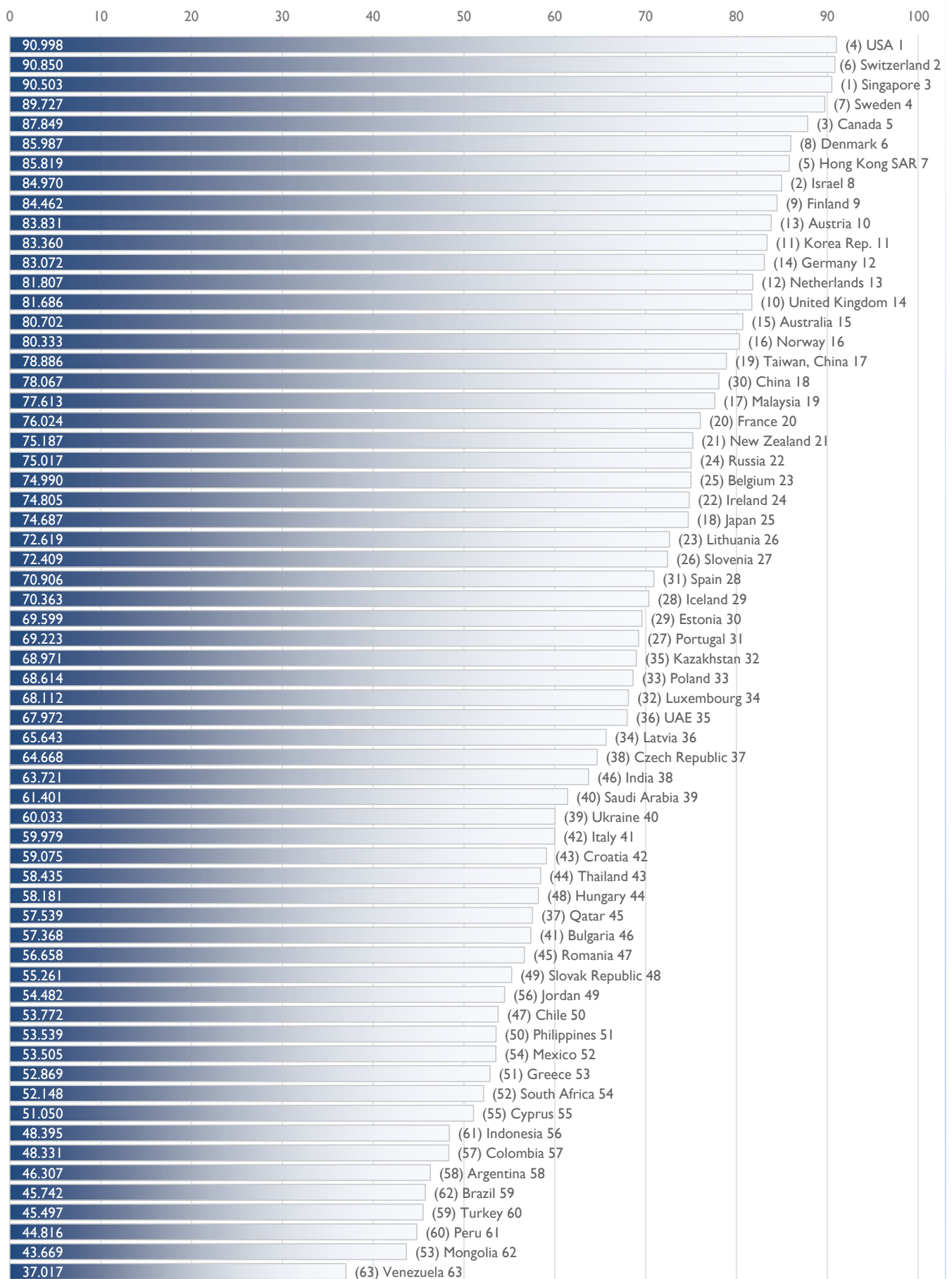


### The Americas

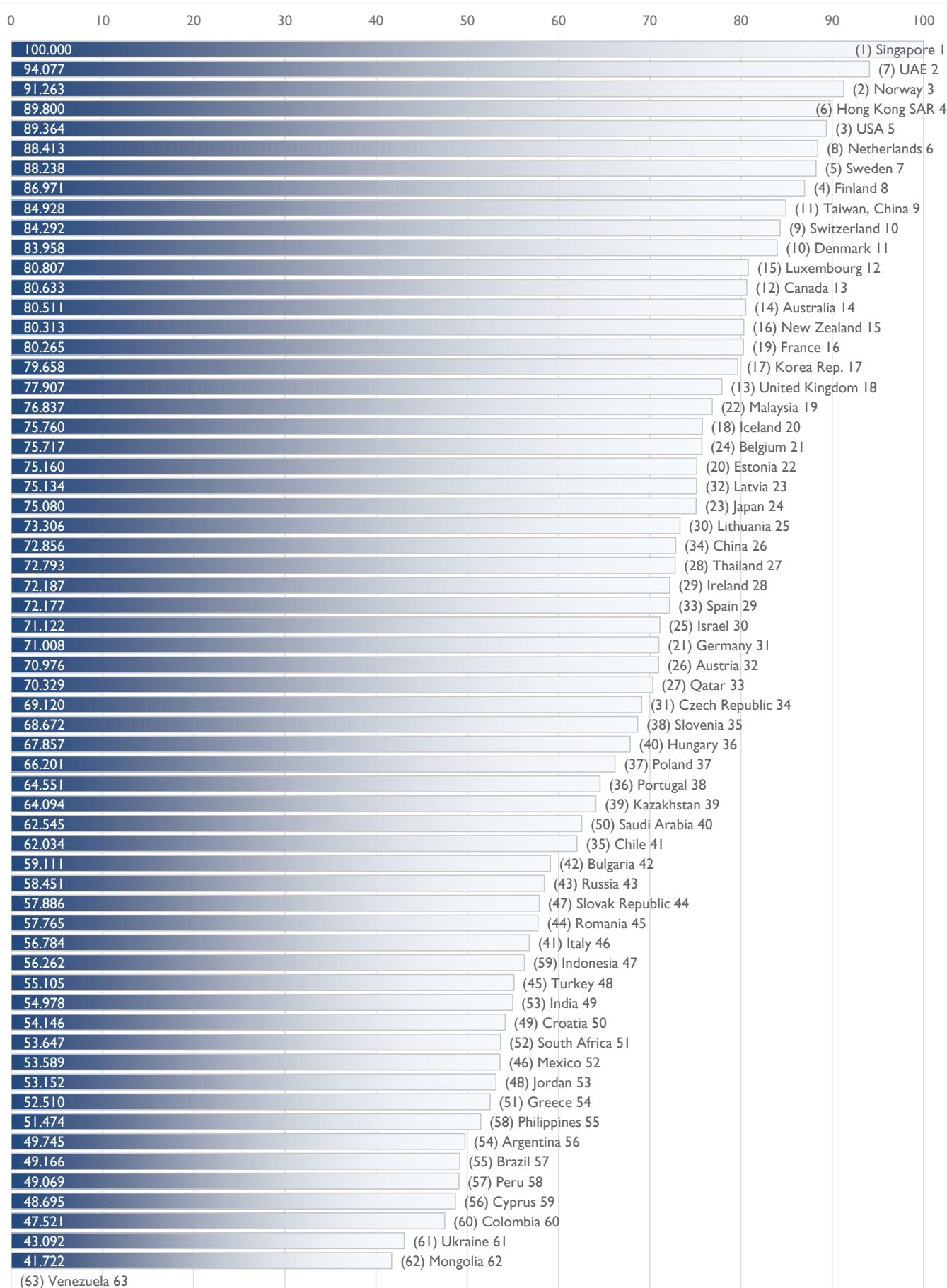


## Knowledge

Know-how necessary to discover, understand and build new technologies

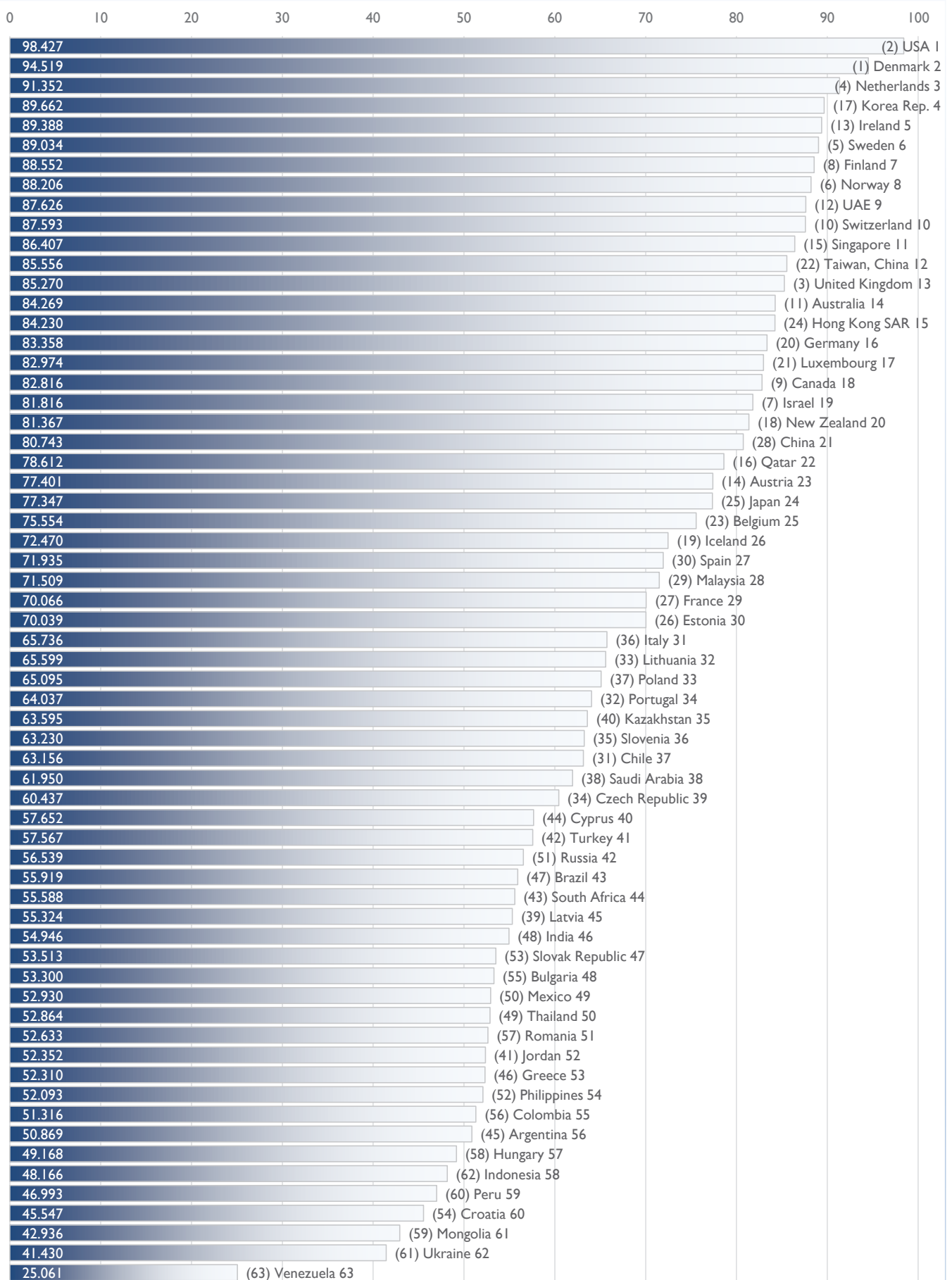


Overall context that enables the development of digital technologies



## Future Readiness

Level of country preparedness to exploit digital transformation







Factor Rankings - 5 years overview

	OVERALL					Knowledge				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Argentina	58	55	57	55	59	57	53	56	58	58
Australia	9	14	15	13	14	11	16	18	15	15
Austria	26	19	16	15	20	16	12	12	13	10
Belgium	19	18	22	23	25	21	20	22	25	23
Brazil	56	54	55	57	57	55	54	55	62	59
Bulgaria	54	47	45	43	45	45	38	41	41	46
Canada	4	5	9	8	11	3	7	3	3	5
Chile	37	37	40	37	42	53	51	52	47	50
China	33	35	31	30	22	22	24	23	30	18
Colombia	53	56	58	59	58	52	56	57	57	57
Croatia	46	44	48	44	51	46	45	50	43	42
Cyprus	-	-	53	54	54	-	-	46	55	55
Czech Republic	31	32	32	33	37	36	34	36	38	37
Denmark	8	8	5	4	4	9	8	8	8	6
Estonia	27	27	26	25	29	30	30	28	29	30
Finland	3	6	4	7	7	7	9	9	9	9
France	20	22	25	26	24	20	21	19	20	20
Germany	17	15	17	18	17	10	10	13	14	12
Greece	40	45	50	53	53	34	46	51	51	53
Hong Kong SAR	14	11	7	11	8	8	6	6	5	7
Hungary	44	42	44	46	43	44	43	48	48	44
Iceland	24	26	23	21	27	33	32	30	28	29
India	50	53	51	48	44	37	39	37	46	38
Indonesia	60	60	59	62	56	60	60	58	61	56
Ireland	25	20	21	20	19	26	25	25	22	24
Israel	10	13	13	12	16	4	5	7	2	8
Italy	36	34	39	41	41	42	40	42	42	41
Japan	23	23	27	22	23	24	23	29	18	25
Jordan	49	48	56	45	50	61	59	61	56	49
Kazakhstan	35	43	38	38	35	41	47	40	35	32
Korea Rep.	18	17	19	14	10	13	15	14	11	11
Latvia	34	33	35	35	36	32	33	34	34	36
Lithuania	28	29	29	29	30	18	18	21	23	26
Luxembourg	16	21	20	24	21	23	29	27	32	34
Malaysia	21	24	24	27	26	25	22	17	17	19
Mexico	48	52	49	51	49	51	52	54	54	52
Mongolia	55	57	61	61	62	56	55	59	53	62
Netherlands	6	4	6	9	6	14	13	11	12	13
New Zealand	13	10	14	19	18	15	14	20	21	21
Norway	11	9	10	6	9	17	17	15	16	16
Peru	57	58	62	60	61	58	61	62	60	61
Philippines	45	46	46	56	55	49	50	53	50	51
Poland	38	38	37	36	33	31	27	32	33	33
Portugal	29	31	33	32	34	29	31	31	27	31
Qatar	32	28	28	28	31	39	37	35	37	45
Romania	51	49	54	47	46	50	48	47	45	47
Russia	41	40	42	40	38	27	28	24	24	22
Saudi Arabia	-	-	36	42	39	-	-	39	40	39
Singapore	1	1	1	2	2	1	1	1	1	3
Slovak Republic	43	41	43	50	47	43	41	43	49	48
Slovenia	39	36	34	34	32	28	26	26	26	27
South Africa	47	51	47	49	48	47	49	49	52	54
Spain	30	30	30	31	28	35	36	33	31	28
Sweden	5	3	2	3	3	2	2	2	7	4
Switzerland	7	7	8	5	5	5	3	4	6	2
Taiwan, China	15	16	12	16	13	19	19	16	19	17
Thailand	42	39	41	39	40	48	42	44	44	43
Turkey	52	50	52	52	52	59	58	60	59	60
UAE	22	25	18	17	12	38	35	38	36	35
Ukraine	59	59	60	58	60	40	44	45	39	40
United Kingdom	12	12	11	10	15	12	11	10	10	14
USA	2	2	3	1	1	6	4	5	4	1
Venezuela	61	61	63	63	63	54	57	63	63	63

Technology					Future readiness					
2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
59	56	58	54	56	45	46	49	45	56	Argentina
12	15	15	14	14	8	7	14	11	14	Australia
29	28	28	26	32	19	19	15	14	23	Austria
24	21	24	24	21	15	16	22	23	25	Belgium
55	54	55	55	57	51	49	44	47	43	Brazil
42	38	42	42	42	59	58	57	55	48	Bulgaria
17	14	13	12	13	2	3	8	9	18	Canada
31	34	34	35	41	32	32	33	31	37	Chile
37	39	36	34	26	39	38	34	28	21	China
56	59	60	60	60	43	44	53	56	55	Colombia
41	43	47	49	50	52	50	56	54	60	Croatia
-	-	54	56	59	-	-	54	44	40	Cyprus
26	26	26	31	34	33	34	37	34	39	Czech Republic
13	12	10	10	11	6	6	1	1	2	Denmark
19	17	19	20	22	26	26	26	26	30	Estonia
7	7	4	4	8	4	5	4	8	7	Finland
23	23	22	19	16	21	20	28	27	29	France
25	25	21	21	31	13	14	18	20	16	Germany
51	52	52	51	54	36	36	47	46	53	Greece
5	2	3	6	4	25	27	17	24	15	Hong Kong SAR
39	37	38	40	36	47	45	55	58	57	Hungary
20	22	20	18	20	17	18	21	19	26	Iceland
58	57	59	53	49	53	54	51	48	46	India
57	58	56	59	47	58	60	62	62	58	Indonesia
27	27	25	29	28	12	12	10	13	5	Ireland
22	24	27	25	30	7	9	11	7	19	Israel
46	44	45	41	46	30	29	30	36	31	Italy
21	19	23	23	24	22	23	25	25	24	Japan
49	45	50	48	53	38	37	48	41	52	Jordan
34	42	35	39	39	35	41	38	40	35	Kazakhstan
16	13	17	17	17	24	25	24	17	4	Korea Rep.
32	33	32	32	23	37	39	41	39	45	Latvia
28	29	29	30	25	34	33	31	33	32	Lithuania
2	11	12	15	12	23	24	23	21	17	Luxembourg
14	16	18	22	19	27	28	27	29	28	Malaysia
47	49	48	46	52	54	56	50	50	49	Mexico
54	55	61	62	62	46	52	60	59	61	Mongolia
15	10	9	8	6	1	2	3	4	3	Netherlands
8	6	11	16	15	16	15	20	18	20	New Zealand
3	3	2	2	3	14	13	12	6	8	Norway
52	53	57	57	58	56	55	58	60	59	Peru
50	50	51	58	55	40	40	43	52	54	Philippines
36	36	39	37	37	49	51	39	37	33	Poland
30	35	37	36	38	31	31	35	32	34	Portugal
38	31	31	27	33	28	21	19	16	22	Qatar
45	46	46	44	45	57	57	59	57	51	Romania
44	47	44	43	43	55	53	52	51	42	Russia
-	-	41	50	40	-	-	32	38	38	Saudi Arabia
1	1	1	1	1	5	4	6	15	11	Singapore
40	41	43	47	44	44	43	46	53	47	Slovak Republic
43	40	40	38	35	41	35	36	35	36	Slovenia
53	51	53	52	51	48	47	42	43	44	South Africa
35	32	33	33	29	29	30	29	30	27	Spain
9	4	5	5	7	9	8	5	5	6	Sweden
11	9	8	9	10	10	10	13	10	10	Switzerland
4	8	7	11	9	20	22	16	22	12	Taiwan, China
33	30	30	28	27	50	48	45	49	50	Thailand
48	48	49	45	48	42	42	40	42	41	Turkey
10	20	14	7	2	18	17	7	12	9	UAE
60	60	62	61	61	61	61	61	61	62	Ukraine
18	18	16	13	18	11	11	9	3	13	United Kingdom
6	5	6	3	5	3	1	2	2	1	USA
61	61	63	63	63	60	59	63	63	63	Venezuela

	Knowledge			Technology			Future readiness			
	Talent	Training & education	Scientific concentration	Regulatory framework	Capital	Technological framework	Adaptive attitudes	Business agility	IT integration	
Argentina	51	62	50	49	51	57	57	48	52	Argentina
Australia	7	29	13	7	19	17	7	35	11	Australia
Austria	12	8	14	25	34	31	29	25	15	Austria
Belgium	18	26	24	22	25	26	23	33	23	Belgium
Brazil	61	59	44	57	61	47	33	58	49	Brazil
Bulgaria	50	46	37	46	42	44	43	56	47	Bulgaria
Canada	13	7	2	17	10	27	17	16	13	Canada
Chile	36	55	57	36	44	42	27	50	39	Chile
China	19	37	9	20	32	32	24	1	41	China
Colombia	56	49	58	61	55	52	56	55	45	Colombia
Croatia	58	31	33	59	50	41	51	62	57	Croatia
Cyprus	62	33	53	56	60	48	34	57	38	Cyprus
Czech Republic	35	44	30	43	28	28	46	37	35	Czech Republic
Denmark	6	6	17	10	27	8	1	10	1	Denmark
Estonia	37	10	46	31	24	16	26	43	26	Estonia
Finland	9	16	10	9	11	13	6	27	2	Finland
France	24	28	12	8	18	22	36	39	19	France
Germany	25	14	4	27	17	40	16	11	17	Germany
Greece	53	60	34	52	52	49	41	60	50	Greece
Hong Kong SAR	4	12	16	12	6	3	12	8	22	Hong Kong SAR
Hungary	47	43	45	35	46	19	62	53	37	Hungary
Iceland	34	18	39	15	39	15	28	24	28	Iceland
India	38	47	28	55	3	62	54	29	56	India
Indonesia	42	61	52	51	26	56	60	21	60	Indonesia
Ireland	10	30	29	13	49	24	3	9	20	Ireland
Israel	27	3	5	32	20	35	21	19	16	Israel
Italy	44	57	23	44	53	46	35	31	34	Italy
Japan	46	19	11	42	37	2	15	41	18	Japan
Jordan	43	32	63	47	41	55	61	22	54	Jordan
Kazakhstan	39	1	55	16	54	43	39	15	46	Kazakhstan
Korea Rep.	30	5	6	26	29	7	4	5	21	Korea Rep.
Latvia	32	27	47	30	35	14	52	47	44	Latvia
Lithuania	23	13	41	24	36	21	45	18	32	Lithuania
Luxembourg	31	24	42	4	9	34	22	20	6	Luxembourg
Malaysia	22	11	27	29	14	20	30	17	33	Malaysia
Mexico	55	53	40	48	47	53	47	51	53	Mexico
Mongolia	60	45	60	62	58	58	31	63	62	Mongolia
Netherlands	3	36	19	6	5	10	9	7	3	Netherlands
New Zealand	11	34	26	11	15	25	13	32	10	New Zealand
Norway	16	17	21	3	7	6	5	23	9	Norway
Peru	59	42	62	50	45	61	49	59	59	Peru
Philippines	41	54	54	60	40	51	53	42	58	Philippines
Poland	28	35	31	45	38	30	37	28	36	Poland
Portugal	26	39	32	21	48	45	32	52	29	Portugal
Qatar	15	48	61	28	23	38	18	12	27	Qatar
Romania	48	51	38	41	59	36	48	46	55	Romania
Russia	45	9	18	40	57	39	40	54	43	Russia
Saudi Arabia	20	38	59	39	13	54	50	36	30	Saudi Arabia
Singapore	1	4	22	2	8	1	19	6	4	Singapore
Slovak Republic	54	52	36	58	43	37	42	61	40	Slovak Republic
Slovenia	33	22	25	37	31	33	44	34	31	Slovenia
South Africa	49	58	48	53	30	59	55	40	42	South Africa
Spain	29	40	20	34	33	23	25	38	25	Spain
Sweden	8	2	3	5	4	12	8	13	12	Sweden
Switzerland	2	15	7	14	16	9	11	14	7	Switzerland
Taiwan, China	21	20	15	23	12	4	14	3	24	Taiwan, China
Thailand	40	50	35	33	21	29	58	30	51	Thailand
Turkey	52	63	43	38	56	50	38	44	48	Turkey
UAE	5	41	56	1	2	5	20	4	8	UAE
Ukraine	57	21	49	54	62	60	59	45	61	Ukraine
United Kingdom	17	23	8	18	22	18	10	26	14	United Kingdom
USA	14	25	1	19	1	11	2	2	5	USA
Venezuela	63	56	51	63	63	63	63	49	63	Venezuela

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# DIGITAL COMPETITIVENESS COUNTRY PROFILES

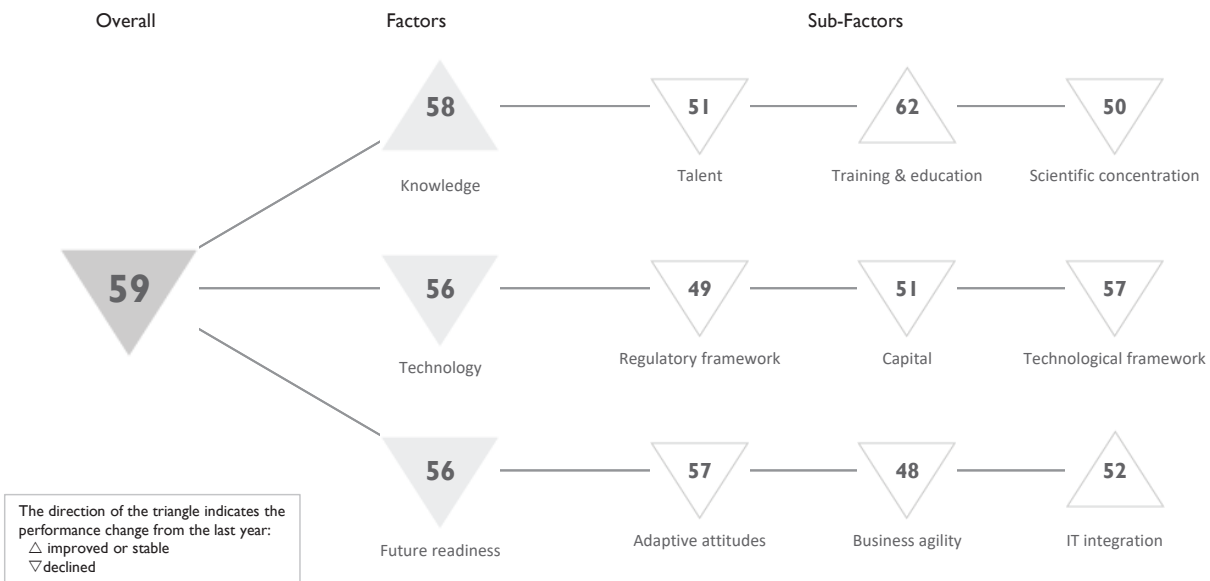
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The statistical tables are available for subscribers of the  
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# ARGENTINA

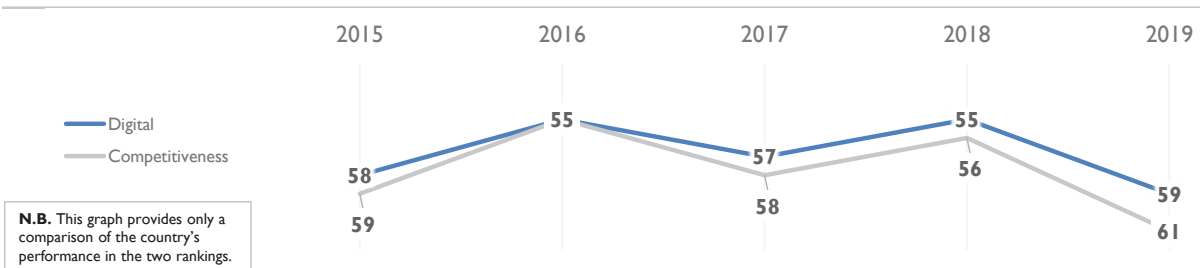
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	58	55	57	55	59
Knowledge	57	53	56	58	58
Technology	59	56	58	54	56
Future readiness	45	46	49	45	56

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### THE AMERICAS (9 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	59	50	54	47	51
Training & education	56	57	61	63	62
Scientific concentration	42	40	42	41	50

**Talent** Rank

Educational assessment PISA - Math	49
International experience	30
Foreign highly-skilled personnel	47
Management of cities	49
Digital/Technological skills	52
► Net flow of international students	18

**Training & education** Rank

Employee training	56
▷ Total public expenditure on education	62
Higher education achievement	55
Pupil-teacher ratio (tertiary education)	23
Graduates in Sciences	58
Women with degrees	43

**Scientific concentration** Rank

Total expenditure on R&D (%)	48
Total R&D personnel per capita	42
► Female researchers	4
R&D productivity by publication	22
Scientific and technical employment	50
High-tech patent grants	59
Robots in Education and R&D	35

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	54	46	46	48	49
Capital	59	59	59	48	51
Technological framework	56	54	56	53	57

**Regulatory framework** Rank

Starting a business	56
Enforcing contracts	51
► Immigration laws	4
Development and application of technc	54
Scientific research legislation	56
Intellectual property rights	55

**Capital** Rank

IT & media stock market capitalization	28
Funding for technological development	60
▷ Banking and financial services	62
▷ Country credit rating	60
▷ Venture capital	62
► Investment in Telecommunications	2

**Technological framework** Rank

▷ Communications technology	60
Mobile Broadband subscribers	53
Wireless broadband	50
Internet users	53
Internet bandwidth speed	57
High-tech exports (%)	40

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	49	49	49	49	57
Business agility	33	42	36	37	48
IT integration	54	51	54	52	52

**Adaptive attitudes** Rank

E-Participation	57
Internet retailing	39
Tablet possession	42
Smartphone possession	44
Attitudes toward globalization	58

**Business agility** Rank

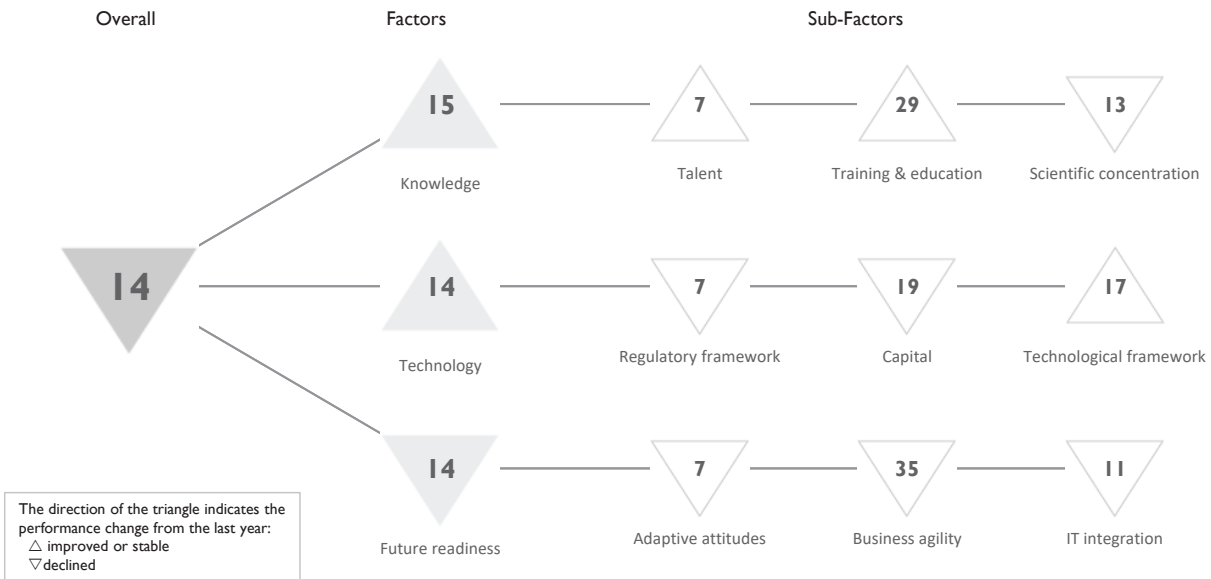
► Opportunities and threats	18
World robots distribution	38
Agility of companies	51
Use of big data and analytics	47
Knowledge transfer	48

**IT integration** Rank

E-Government	36
Public-private partnerships	43
Cyber security	48
Software piracy	58

# AUSTRALIA

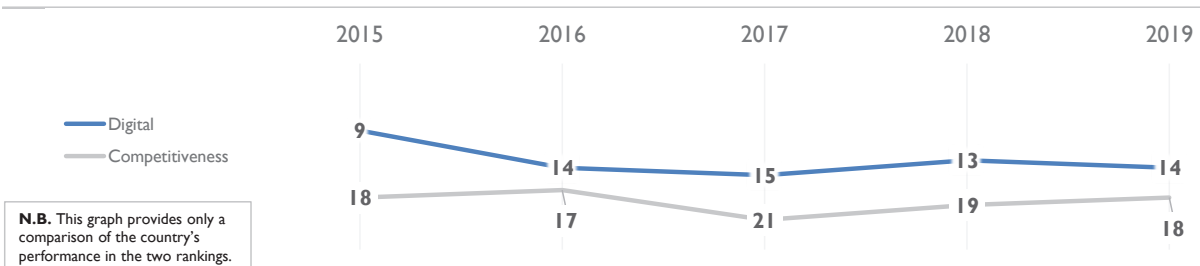
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	9	14	15	13	14
Knowledge	11	16	18	15	15
Technology	12	15	15	14	14
Future readiness	8	7	14	11	14

### COMPETITIVENESS & DIGITAL RANKINGS

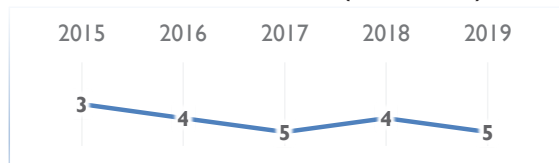


### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	3	6	8	8	7
Training & education	38	47	51	32	29
Scientific concentration	10	12	14	11	13

### Talent

	Rank
Educational assessment PISA - Math	23
International experience	35
Foreign highly-skilled personnel	10
Management of cities	26
▷ Digital/Technological skills	44
▶ Net flow of international students	1

### Training & education

	Rank
▷ Employee training	44
Total public expenditure on education	21
Higher education achievement	13
Pupil-teacher ratio (tertiary education)	32
▷ Graduates in Sciences	53
Women with degrees	10

### Scientific concentration

	Rank
Total expenditure on R&D (%)	19
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	17
Scientific and technical employment	6
High-tech patent grants	42
Robots in Education and R&D	24

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	8	6	11	6	7
Capital	15	15	16	18	19
Technological framework	13	17	21	19	17

### Regulatory framework

	Rank
Starting a business	5
▶ Enforcing contracts	5
Immigration laws	23
Development and application of techn	22
Scientific research legislation	20
Intellectual property rights	14

### Capital

	Rank
IT & media stock market capitalization	37
Funding for technological development	36
Banking and financial services	28
▶ Country credit rating	1
Venture capital	34
Investment in Telecommunications	14

### Technological framework

	Rank
▷ Communications technology	54
Mobile Broadband subscribers	5
Wireless broadband	9
Internet users	29
Internet bandwidth speed	38
High-tech exports (%)	28

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	2	2	4	2	7
Business agility	26	22	42	28	35
IT integration	6	8	10	6	11

### Adaptive attitudes

	Rank
E-Participation	5
Internet retailing	9
▶ Tablet possession	3
Smartphone possession	9
Attitudes toward globalization	32

### Business agility

	Rank
Opportunities and threats	38
World robots distribution	29
▷ Agility of companies	45
Use of big data and analytics	28
Knowledge transfer	30

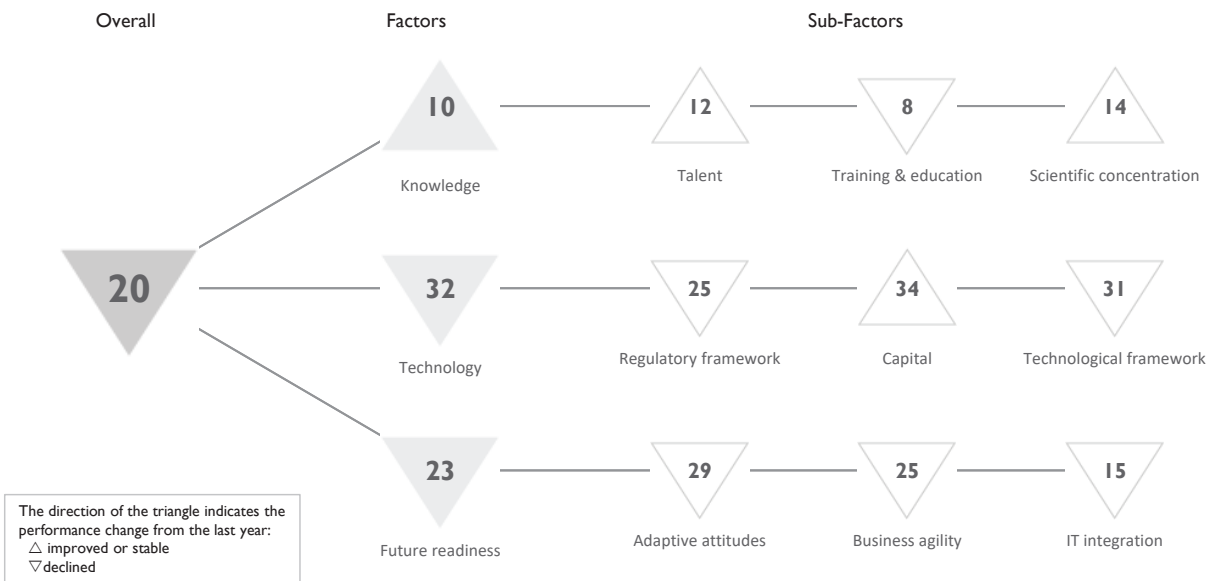
### IT integration

	Rank
▶ E-Government	2
Public-private partnerships	26
Cyber security	39
Software piracy	5



# AUSTRIA

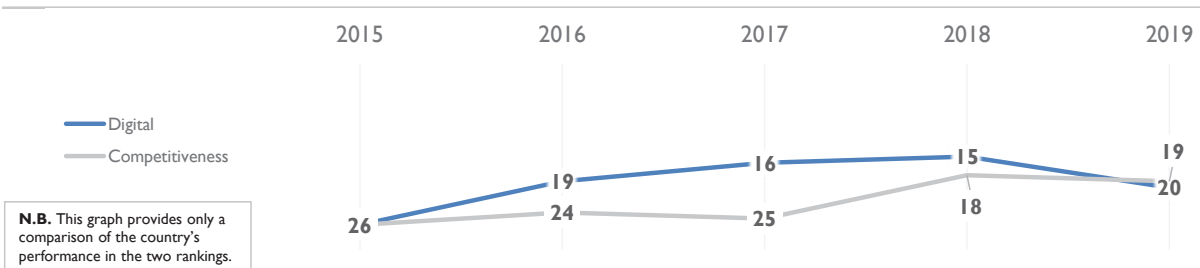
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	26	19	16	15	20
Knowledge	16	12	12	13	10
Technology	29	28	28	26	32
Future readiness	19	19	15	14	23

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	17	13	12	12	12
Training & education	16	4	4	7	8
Scientific concentration	22	22	21	18	14

### Talent

	Rank
Educational assessment PISA - Math	19
International experience	13
Foreign highly-skilled personnel	17
Management of cities	15
▷ Digital/Technological skills	45
▶ Net flow of international students	4

### Training & education

	Rank
▶ Employee training	1
Total public expenditure on education	27
Higher education achievement	36
▶ Pupil-teacher ratio (tertiary education)	2
Graduates in Sciences	8
Women with degrees	36

### Scientific concentration

	Rank
Total expenditure on R&D (%)	7
Total R&D personnel per capita	9
Female researchers	43
▷ R&D productivity by publication	50
Scientific and technical employment	19
High-tech patent grants	25
Robots in Education and R&D	10

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	31	29	25	24	25
Capital	47	39	38	38	34
Technological framework	18	19	22	21	31

### Regulatory framework

	Rank
▷ Starting a business	50
Enforcing contracts	9
▷ Immigration laws	51
Development and application of techn	27
Scientific research legislation	16
Intellectual property rights	10

### Capital

	Rank
IT & media stock market capitalization	39
Funding for technological development	21
Banking and financial services	15
Country credit rating	12
Venture capital	37
▷ Investment in Telecommunications	60

### Technological framework

	Rank
Communications technology	30
Mobile Broadband subscribers	20
Wireless broadband	31
Internet users	30
Internet bandwidth speed	37
High-tech exports (%)	37

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	31	30	25	25	29
Business agility	10	9	8	5	25
IT integration	15	16	9	10	15

### Adaptive attitudes

	Rank
E-Participation	40
Internet retailing	17
Tablet possession	20
Smartphone possession	36
Attitudes toward globalization	36

### Business agility

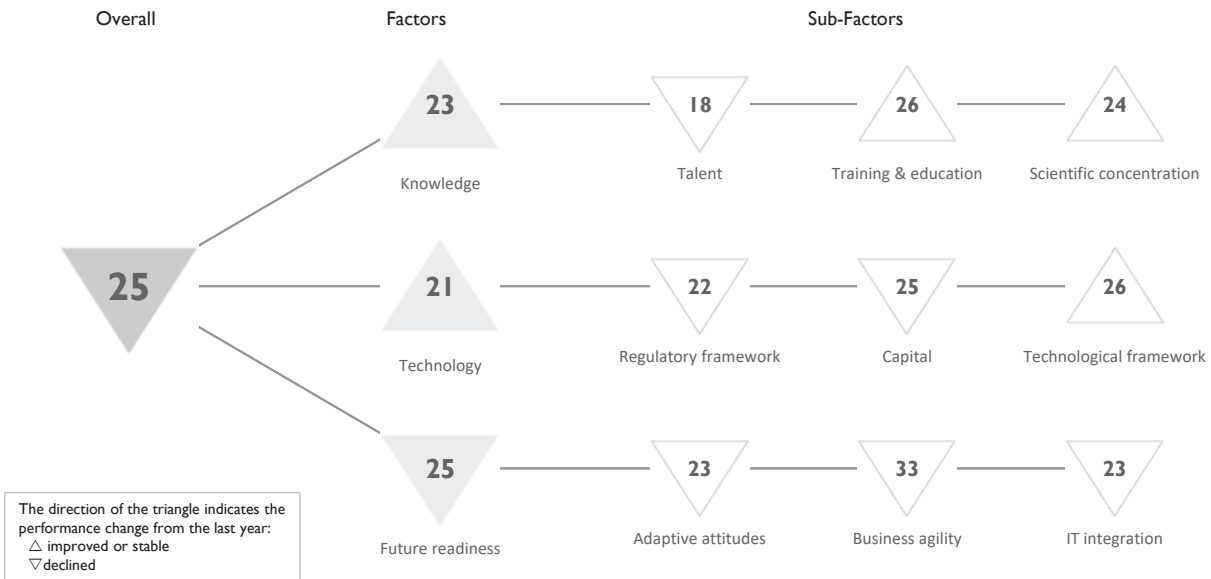
	Rank
Opportunities and threats	20
World robots distribution	23
Agility of companies	15
Use of big data and analytics	41
Knowledge transfer	12

### IT integration

	Rank
E-Government	20
Public-private partnerships	38
▶ Cyber security	5
▶ Software piracy	6

# BELGIUM

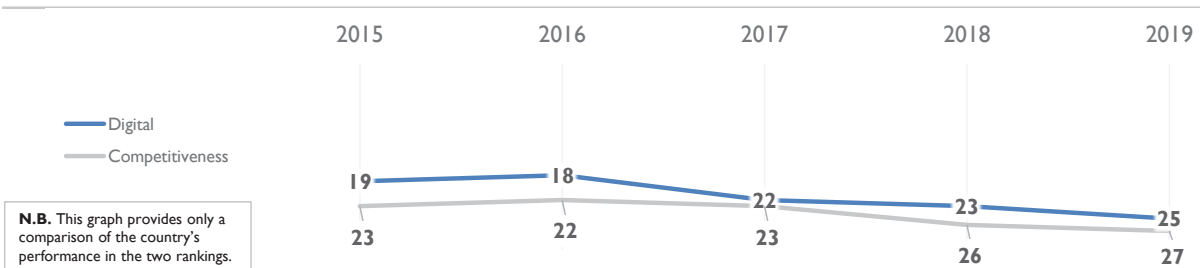
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	19	18	22	23	25
Knowledge	21	20	22	25	23
Technology	24	21	24	24	21
Future readiness	15	16	22	23	25

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	11	12	17	17	18
Training & education	26	24	29	30	26
Scientific concentration	31	30	27	29	24

Talent	Rank
Educational assessment PISA - Math	14
► International experience	10
Foreign highly-skilled personnel	28
Management of cities	40
Digital/Technological skills	36
► Net flow of international students	10

Training & education	Rank
Employee training	29
► Total public expenditure on education	7
Higher education achievement	24
Pupil-teacher ratio (tertiary education)	39
▷ Graduates in Sciences	57
Women with degrees	21

Scientific concentration	Rank
Total expenditure on R&D (%)	12
Total R&D personnel per capita	14
Female researchers	33
R&D productivity by publication	40
Scientific and technical employment	23
▷ High-tech patent grants	45
Robots in Education and R&D	18

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	15	13	16	17	22
Capital	24	19	23	23	25
Technological framework	30	29	31	33	26

Regulatory framework	Rank
Starting a business	20
Enforcing contracts	40
► Immigration laws	10
Development and application of techn	33
Scientific research legislation	18
Intellectual property rights	23

Capital	Rank
IT & media stock market capitalization	32
Funding for technological development	17
Banking and financial services	24
Country credit rating	19
Venture capital	17
Investment in Telecommunications	38

Technological framework	Rank
Communications technology	28
Mobile Broadband subscribers	21
▷ Wireless broadband	46
Internet users	19
Internet bandwidth speed	19
High-tech exports (%)	38

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	20	18	21	19	23
Business agility	7	7	21	21	33
IT integration	22	23	19	21	23

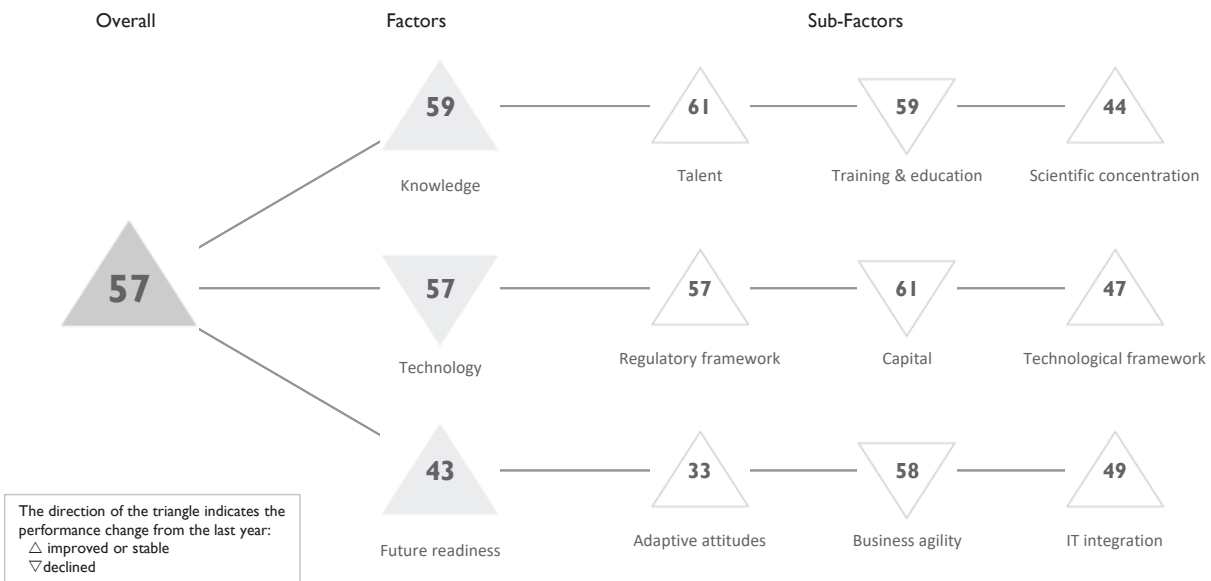
Adaptive attitudes	Rank
▷ E-Participation	47
Internet retailing	11
► Tablet possession	10
Smartphone possession	20
Attitudes toward globalization	39

Business agility	Rank
▷ Opportunities and threats	48
World robots distribution	24
Agility of companies	39
Use of big data and analytics	35
Knowledge transfer	16

IT integration	Rank
E-Government	25
Public-private partnerships	29
Cyber security	33
Software piracy	13

# BRAZIL

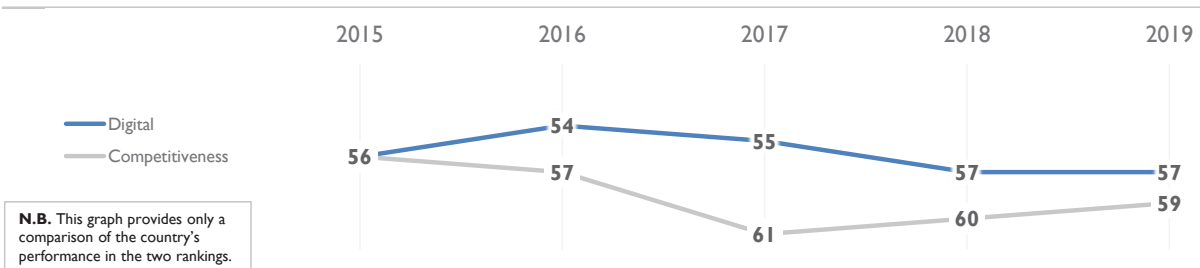
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	56	54	55	57	57
Knowledge	55	54	55	62	59
Technology	55	54	55	55	57
Future readiness	51	49	44	47	43

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### THE AMERICAS (9 countries)



#### POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	60	59	60	61	61
Training & education	52	49	48	57	59
Scientific concentration	40	43	44	54	44

Talent	Rank
Educational assessment PISA - Math	56
International experience	58
Foreign highly-skilled personnel	58
▷ Management of cities	60
▷ Digital/Technological skills	62
Net flow of international students	38

Training & education	Rank
Employee training	53
▶ Total public expenditure on education	8
Higher education achievement	57
Pupil-teacher ratio (tertiary education)	48
Graduates in Sciences	56
Women with degrees	51

Scientific concentration	Rank
Total expenditure on R&D (%)	30
Total R&D personnel per capita	44
Female researchers	51
▶ R&D productivity by publication	8
Scientific and technical employment	-
High-tech patent grants	46
▶ Robots in Education and R&D	14

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	57	58	60	59	57
Capital	55	54	56	56	61
Technological framework	49	47	48	47	47

Regulatory framework	Rank
▷ Starting a business	60
Enforcing contracts	36
Immigration laws	46
Development and application of techn	59
▷ Scientific research legislation	60
Intellectual property rights	57

Capital	Rank
IT & media stock market capitalization	44
Funding for technological development	59
Banking and financial services	58
Country credit rating	56
Venture capital	55
Investment in Telecommunications	39

Technological framework	Rank
▷ Communications technology	61
▶ Mobile Broadband subscribers	27
Wireless broadband	33
Internet users	46
Internet bandwidth speed	52
High-tech exports (%)	30

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	43	44	45	38	33
Business agility	54	51	46	52	58
IT integration	51	48	49	51	49

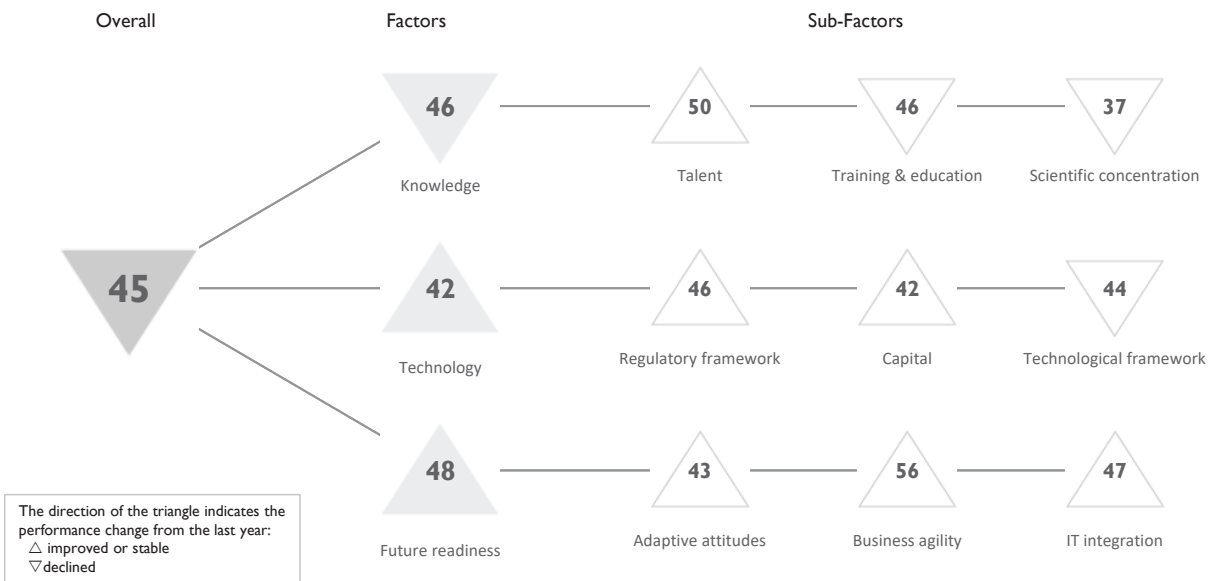
Adaptive attitudes	Rank
▶ E-Participation	12
Internet retailing	42
Tablet possession	48
Smartphone possession	28
Attitudes toward globalization	47

Business agility	Rank
Opportunities and threats	50
World robots distribution	19
Agility of companies	57
Use of big data and analytics	60
Knowledge transfer	59

IT integration	Rank
E-Government	37
Public-private partnerships	58
Cyber security	58
Software piracy	36

# BULGARIA

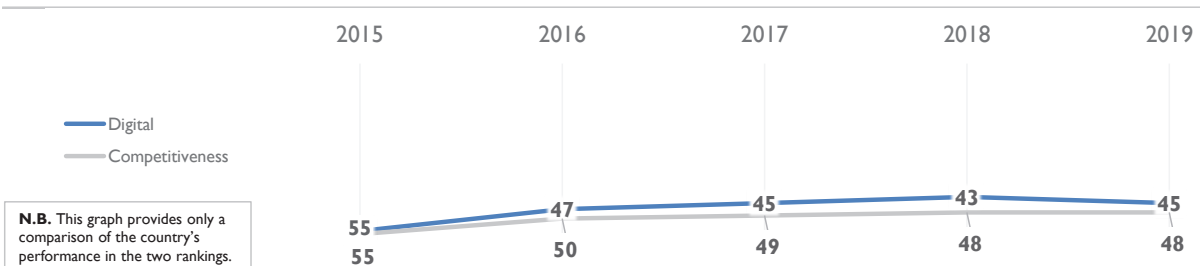
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	54	47	45	43	45
Knowledge	45	38	41	41	46
Technology	42	38	42	42	42
Future readiness	59	58	57	55	48

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	54	52	51	53	50
Training & education	47	40	39	42	46
Scientific concentration	32	31	30	33	37

**Talent** Rank

Educational assessment PISA - Math	43
▷ International experience	55
Foreign highly-skilled personnel	50
Management of cities	39
Digital/Technological skills	32
Net flow of international students	52

**Training & education** Rank

▷ Employee training	55
Total public expenditure on education	47
Higher education achievement	42
▶ Pupil-teacher ratio (tertiary education)	16
Graduates in Sciences	47
▶ Women with degrees	25

**Scientific concentration** Rank

Total expenditure on R&D (%)	46
Total R&D personnel per capita	29
▶ Female researchers	8
R&D productivity by publication	52
Scientific and technical employment	39
▶ High-tech patent grants	15
Robots in Education and R&D	49

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	51	48	50	52	46
Capital	43	36	46	50	42
Technological framework	35	34	34	36	44

**Regulatory framework** Rank

Starting a business	44
Enforcing contracts	32
Immigration laws	44
Development and application of techn	52
Scientific research legislation	50
Intellectual property rights	49

**Capital** Rank

IT & media stock market capitalization	36
Funding for technological development	43
Banking and financial services	41
Country credit rating	45
Venture capital	32
▶ Investment in Telecommunications	24

**Technological framework** Rank

Communications technology	37
Mobile Broadband subscribers	42
Wireless broadband	24
Internet users	44
Internet bandwidth speed	45
High-tech exports (%)	47

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	59	58	47	48	43
Business agility	60	60	61	59	56
IT integration	52	53	55	54	47

**Adaptive attitudes** Rank

E-Participation	33
Internet retailing	50
Tablet possession	45
Smartphone possession	38
Attitudes toward globalization	55

**Business agility** Rank

▷ Opportunities and threats	55
World robots distribution	45
▷ Agility of companies	56
Use of big data and analytics	38
▷ Knowledge transfer	55

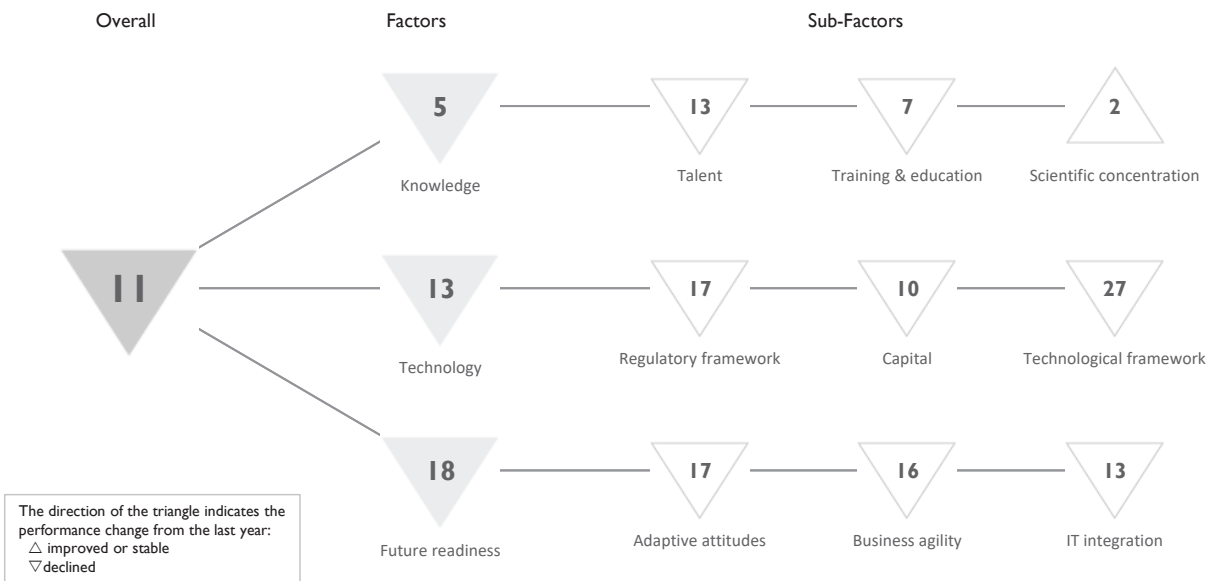
**IT integration** Rank

E-Government	39
Public-private partnerships	44
Cyber security	46
Software piracy	50



# CANADA

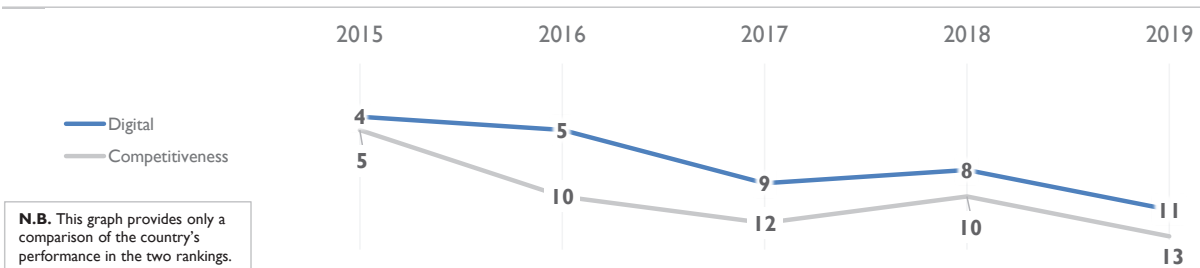
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	4	5	9	8	11
Knowledge	3	7	3	3	5
Technology	17	14	13	12	13
Future readiness	2	3	8	9	18

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### THE AMERICAS (9 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	8	10	9	7	13
Training & education	12	13	10	4	7
Scientific concentration	4	4	4	4	2

Talent		Rank	Training & education		Rank	Scientific concentration		Rank
Educational assessment PISA - Math	9		Employee training	22		Total expenditure on R&D (%)	23	
▷ International experience	40		▷ Total public expenditure on education	35		Total R&D personnel per capita	20	
Foreign highly-skilled personnel	13		► Higher education achievement	5		Female researchers	-	
Management of cities	22		Pupil-teacher ratio (tertiary education)	6		R&D productivity by publication	13	
Digital/Technological skills	19		▷ Graduates in Sciences	39		► Scientific and technical employment	5	
Net flow of international students	11		► Women with degrees	2		High-tech patent grants	11	
						Robots in Education and R&D	9	

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	12	17	21	11	17
Capital	8	5	1	5	10
Technological framework	26	24	27	24	27

Regulatory framework		Rank	Capital		Rank	Technological framework		Rank
► Starting a business	2		IT & media stock market capitalization	19		Communications technology	35	
▷ Enforcing contracts	48		Funding for technological development	16		Mobile Broadband subscribers	38	
Immigration laws	11		Banking and financial services	15		▷ Wireless broadband	54	
Development and application of techn	12		► Country credit rating	1		Internet users	17	
Scientific research legislation	17		Venture capital	14		Internet bandwidth speed	12	
Intellectual property rights	18		Investment in Telecommunications	13		High-tech exports (%)	27	

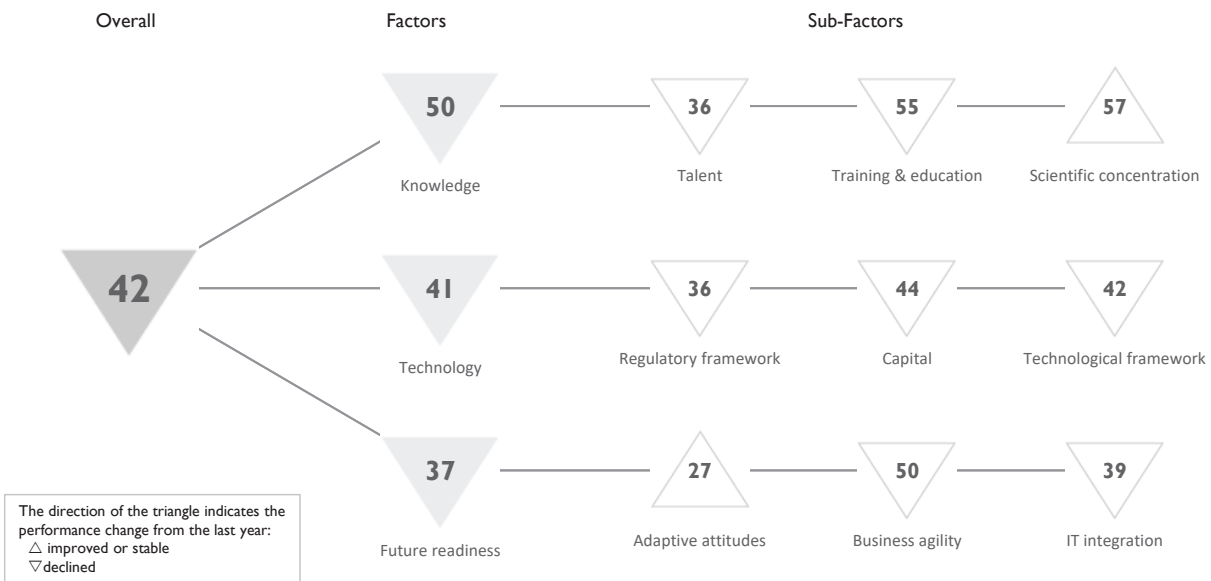
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	16	16	13	15	17
Business agility	1	1	5	4	16
IT integration	3	7	15	12	13

Adaptive attitudes		Rank	Business agility		Rank	IT integration		Rank
E-Participation	26		Opportunities and threats	23		E-Government	23	
Internet retailing	12		World robots distribution	14		Public-private partnerships	8	
Tablet possession	22		Agility of companies	21		Cyber security	18	
Smartphone possession	32		Use of big data and analytics	13		Software piracy	13	
Attitudes toward globalization	12		Knowledge transfer	11				

# CHILE

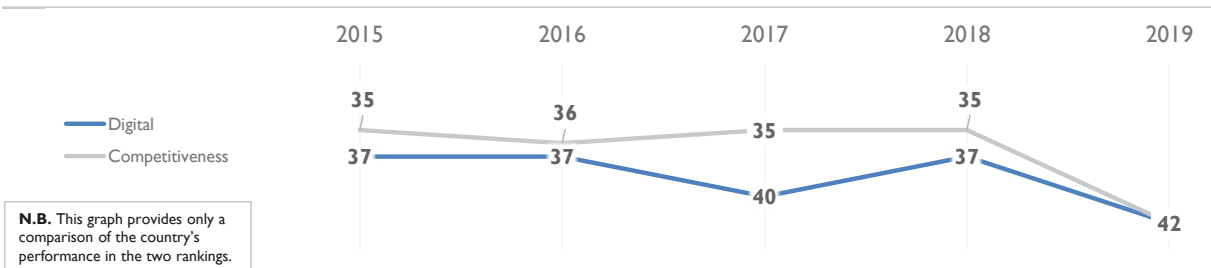
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	37	37	40	37	42
Knowledge	53	51	52	47	50
Technology	31	34	34	35	41
Future readiness	32	32	33	31	37

### COMPETITIVENESS & DIGITAL RANKINGS

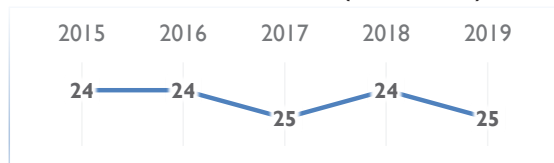


### PEER GROUPS RANKINGS

#### THE AMERICAS (9 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	35	35	34	31	36
Training & education	51	52	50	49	55
Scientific concentration	58	58	59	61	57

**Talent** Rank

Educational assessment PISA - Math	46
International experience	27
► Foreign highly-skilled personnel	8
Management of cities	32
Digital/Technological skills	33
Net flow of international students	42

**Training & education** Rank

▷ Employee training	62
► Total public expenditure on education	19
Higher education achievement	48
Pupil-teacher ratio (tertiary education)	35
Graduates in Sciences	46
Women with degrees	47

**Scientific concentration** Rank

▷ Total expenditure on R&D (%)	55
Total R&D personnel per capita	51
Female researchers	36
R&D productivity by publication	21
Scientific and technical employment	-
▷ High-tech patent grants	60
Robots in Education and R&D	43

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	30	32	33	33	36
Capital	21	23	20	26	44
Technological framework	46	45	46	41	42

**Regulatory framework** Rank

Starting a business	34
Enforcing contracts	37
► Immigration laws	13
Development and application of techn	39
▷ Scientific research legislation	54
Intellectual property rights	39

**Capital** Rank

IT & media stock market capitalization	46
Funding for technological development	47
Banking and financial services	31
Country credit rating	26
Venture capital	47
Investment in Telecommunications	21

**Technological framework** Rank

Communications technology	25
Mobile Broadband subscribers	43
Wireless broadband	27
Internet users	39
Internet bandwidth speed	40
▷ High-tech exports (%)	53

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	23	22	30	27	27
Business agility	45	44	31	39	50
IT integration	35	37	40	38	39

**Adaptive attitudes** Rank

E-Participation	41
Internet retailing	38
Tablet possession	28
► Smartphone possession	10
► Attitudes toward globalization	13

**Business agility** Rank

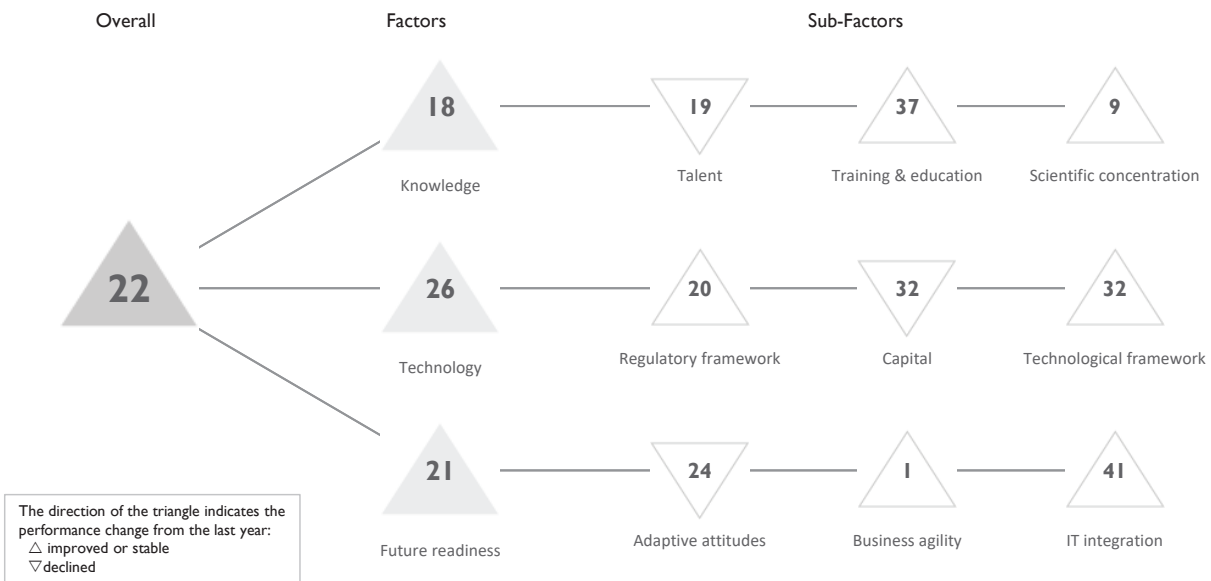
Opportunities and threats	40
World robots distribution	47
Agility of companies	44
Use of big data and analytics	52
Knowledge transfer	36

**IT integration** Rank

E-Government	35
Public-private partnerships	23
Cyber security	52
Software piracy	46

# CHINA

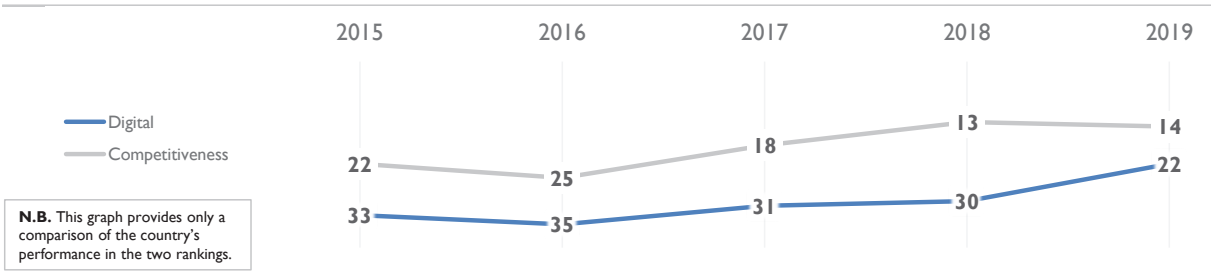
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	33	35	31	30	22
Knowledge	22	24	23	30	18
Technology	37	39	36	34	26
Future readiness	39	38	34	28	21

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	18	21	23	18	19
Training & education	55	54	53	46	37
Scientific concentration	3	3	3	21	9

Talent		Rank	Training & education		Rank	Scientific concentration		Rank
▶	Educational assessment PISA - Math	5	Employee training		13	Total expenditure on R&D (%)		14
	International experience	45	Total public expenditure on education		46	Total R&D personnel per capita		35
	Foreign highly-skilled personnel	27	Higher education achievement		25	Female researchers		-
	Management of cities	13	Pupil-teacher ratio (tertiary education)		40	▶ R&D productivity by publication		1
	Digital/Technological skills	15	Graduates in Sciences		-	▷ Scientific and technical employment		49
	Net flow of international students	47	Women with degrees		-	High-tech patent grants		14
						▶ Robots in Education and R&D		1

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	34	38	32	26	20
Capital	27	27	22	30	32
Technological framework	45	46	47	40	32

Regulatory framework		Rank	Capital		Rank	Technological framework		Rank
	Starting a business	16	IT & media stock market capitalization		33	Communications technology		15
▶	Enforcing contracts	6	Funding for technological development		24	Mobile Broadband subscribers		35
	Immigration laws	36	Banking and financial services		42	Wireless broadband		30
	Development and application of techn	24	Country credit rating		27	▷ Internet users		56
	Scientific research legislation	19	Venture capital		38	Internet bandwidth speed		25
▷	Intellectual property rights	48	Investment in Telecommunications		17	High-tech exports (%)		6

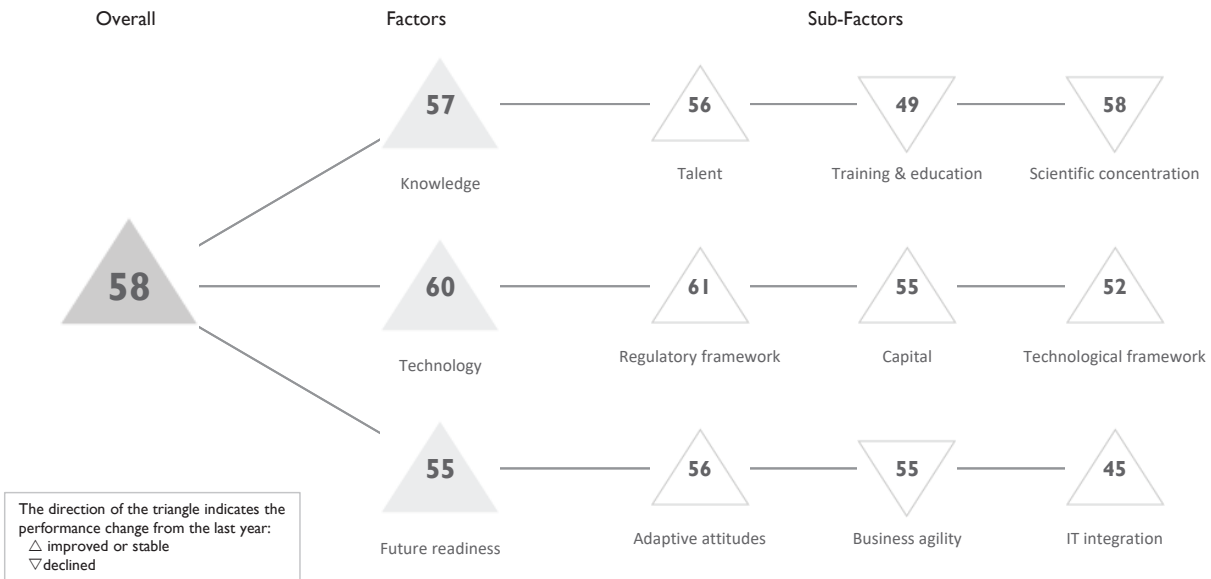
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	38	36	32	23	24
Business agility	34	32	24	19	1
IT integration	49	50	44	41	41

Adaptive attitudes		Rank	Business agility		Rank	IT integration		Rank
	E-Participation	28	Opportunities and threats		19	▷ E-Government		50
	Internet retailing	21	▶ World robots distribution		1	Public-private partnerships		15
	Tablet possession	31	Agility of companies		25	Cyber security		16
	Smartphone possession	16	Use of big data and analytics		12	▷ Software piracy		56
	Attitudes toward globalization	10	Knowledge transfer		31			

# COLOMBIA

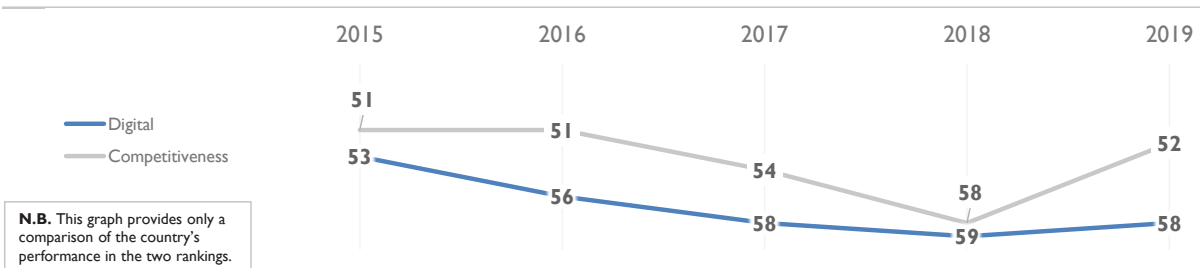
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	53	56	58	59	58
Knowledge	52	56	57	57	57
Technology	56	59	60	60	60
Future readiness	43	44	53	56	55

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### THE AMERICAS (9 countries)



#### POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	53	55	58	57	56
Training & education	42	46	45	45	49
Scientific concentration	50	57	58	57	58

Talent	Rank
Educational assessment PISA - Math	52
International experience	41
Foreign highly-skilled personnel	34
Management of cities	50
Digital/Technological skills	47
Net flow of international students	48

Training & education	Rank
Employee training	41
Total public expenditure on education	40
Higher education achievement	49
Pupil-teacher ratio (tertiary education)	36
Graduates in Sciences	31
Women with degrees	44

Scientific concentration	Rank
Total expenditure on R&D (%)	57
Total R&D personnel per capita	52
Female researchers	25
▶ R&D productivity by publication	19
Scientific and technical employment	53
▷ High-tech patent grants	58
Robots in Education and R&D	49

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	56	57	58	62	61
Capital	53	53	55	57	55
Technological framework	52	55	55	55	52

Regulatory framework	Rank
Starting a business	45
▷ Enforcing contracts	63
Immigration laws	43
Development and application of techn	43
Scientific research legislation	53
Intellectual property rights	51

Capital	Rank
IT & media stock market capitalization	49
Funding for technological development	49
Banking and financial services	48
Country credit rating	44
Venture capital	49
▶ Investment in Telecommunications	8

Technological framework	Rank
Communications technology	53
▶ Mobile Broadband subscribers	8
▷ Wireless broadband	62
Internet users	51
▷ Internet bandwidth speed	60
High-tech exports (%)	41

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	40	42	53	57	56
Business agility	47	47	54	54	55
IT integration	43	44	45	48	45

Adaptive attitudes	Rank
▶ E-Participation	23
Internet retailing	46
Tablet possession	53
▷ Smartphone possession	60
Attitudes toward globalization	34

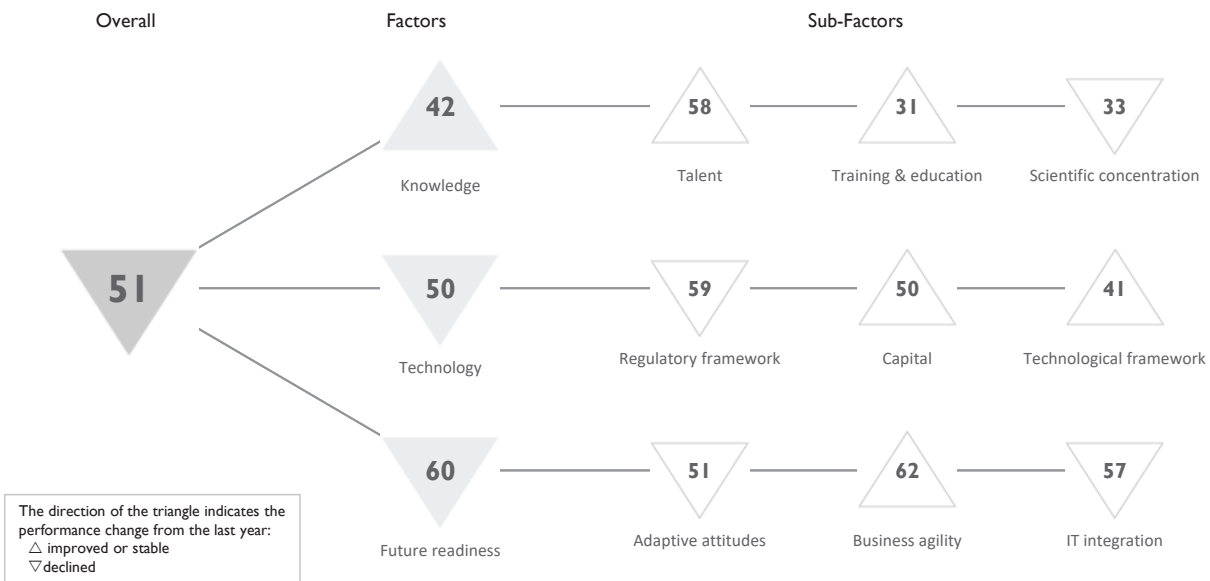
Business agility	Rank
Opportunities and threats	57
World robots distribution	50
Agility of companies	48
Use of big data and analytics	49
Knowledge transfer	40

IT integration	Rank
E-Government	48
▶ Public-private partnerships	31
Cyber security	54
Software piracy	40



# CROATIA

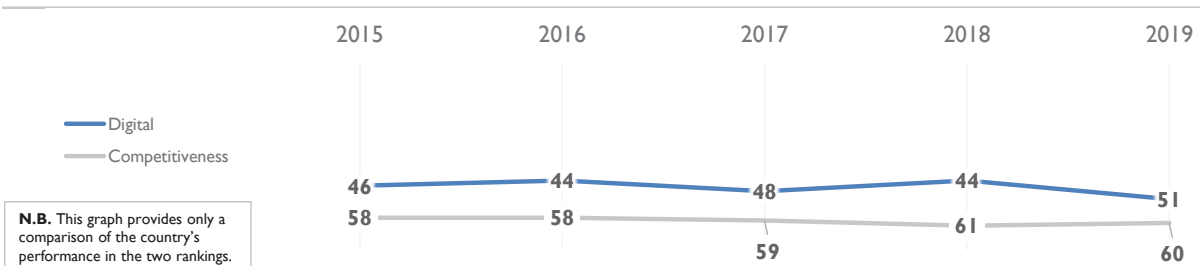
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	46	44	48	44	51
Knowledge	46	45	50	43	42
Technology	41	43	47	49	50
Future readiness	52	50	56	54	60

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	57	56	59	59	58
Training & education	39	37	41	36	31
Scientific concentration	35	36	35	32	33

Talent	Rank
Educational assessment PISA - Math	38
▷ International experience	62
▷ Foreign highly-skilled personnel	62
Management of cities	58
Digital/Technological skills	57
Net flow of international students	55

Training & education	Rank
▷ Employee training	63
Total public expenditure on education	29
Higher education achievement	43
▶ Pupil-teacher ratio (tertiary education)	8
Graduates in Sciences	23
▶ Women with degrees	5

Scientific concentration	Rank
Total expenditure on R&D (%)	42
Total R&D personnel per capita	38
▶ Female researchers	11
R&D productivity by publication	48
Scientific and technical employment	27
▶ High-tech patent grants	9
Robots in Education and R&D	40

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	47	47	52	55	59
Capital	42	48	52	52	50
Technological framework	39	40	40	43	41

Regulatory framework	Rank
Starting a business	53
Enforcing contracts	23
▷ Immigration laws	63
▷ Development and application of techn	62
Scientific research legislation	59
Intellectual property rights	60

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	57
Banking and financial services	55
Country credit rating	54
Venture capital	57
▶ Investment in Telecommunications	4

Technological framework	Rank
Communications technology	49
Mobile Broadband subscribers	25
Wireless broadband	44
Internet users	37
Internet bandwidth speed	44
High-tech exports (%)	46

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	54	54	43	37	51
Business agility	50	45	62	63	62
IT integration	44	46	46	49	57

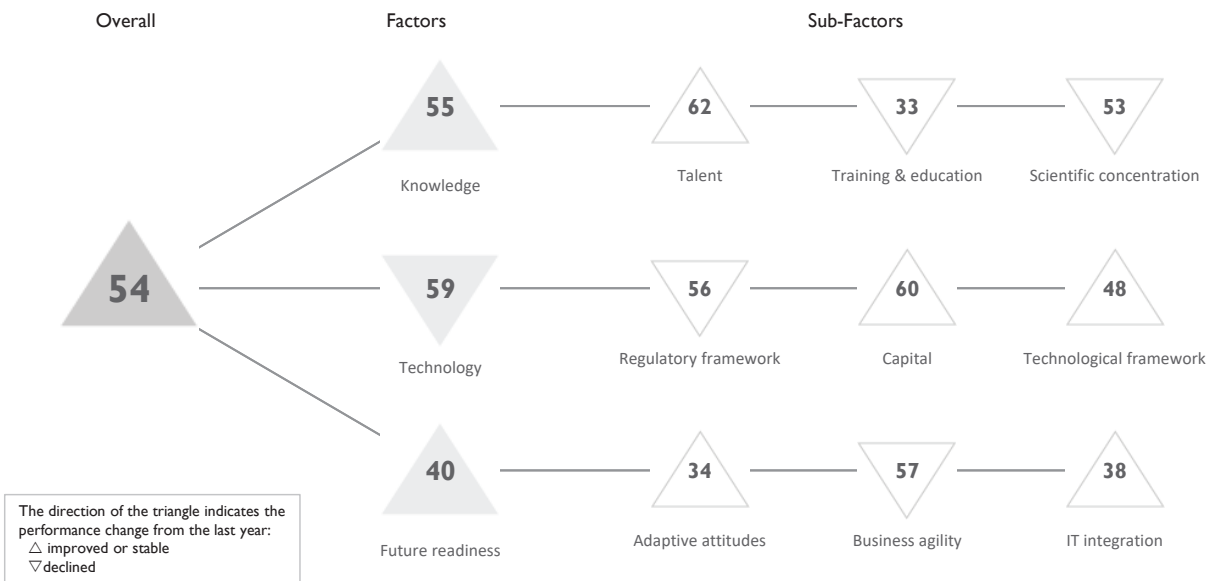
Adaptive attitudes	Rank
E-Participation	46
Internet retailing	44
Tablet possession	35
Smartphone possession	35
Attitudes toward globalization	62

Business agility	Rank
Opportunities and threats	62
World robots distribution	48
Agility of companies	62
Use of big data and analytics	61
Knowledge transfer	61

IT integration	Rank
E-Government	46
Public-private partnerships	61
Cyber security	56
Software piracy	43

# CYPRUS

## OVERALL PERFORMANCE (63 countries)



## OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL			53	54	54
Knowledge			46	55	55
Technology			54	56	59
Future readiness			54	44	40

## COMPETITIVENESS & DIGITAL RANKINGS



## PEER GROUPS RANKINGS

### EUROPE - MIDDLE EAST - AFRICA (40 countries)



### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent			56	62	62
Training & education			22	29	33
Scientific concentration			51	52	53

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	44	Employee training	57	Total expenditure on R&D (%)	52
International experience	47	► Total public expenditure on education	13	Total R&D personnel per capita	46
Foreign highly-skilled personnel	42	► Higher education achievement	10	Female researchers	26
Management of cities	46	Pupil-teacher ratio (tertiary education)	22	R&D productivity by publication	58
Digital/Technological skills	43	▷ Graduates in Sciences	59	► Scientific and technical employment	10
▷ Net flow of international students	61	► Women with degrees	18	High-tech patent grants	43
				Robots in Education and R&D	-

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework			45	51	56
Capital			54	60	60
Technological framework			54	49	48

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	28	IT & media stock market capitalization	38	Communications technology	41
Enforcing contracts	58	Funding for technological development	54	▷ Mobile Broadband subscribers	61
Immigration laws	55	Banking and financial services	53	Wireless broadband	49
Development and application of techn	53	Country credit rating	54	Internet users	42
Scientific research legislation	44	▷ Venture capital	59	Internet bandwidth speed	54
Intellectual property rights	44	Investment in Telecommunications	55	► High-tech exports (%)	18

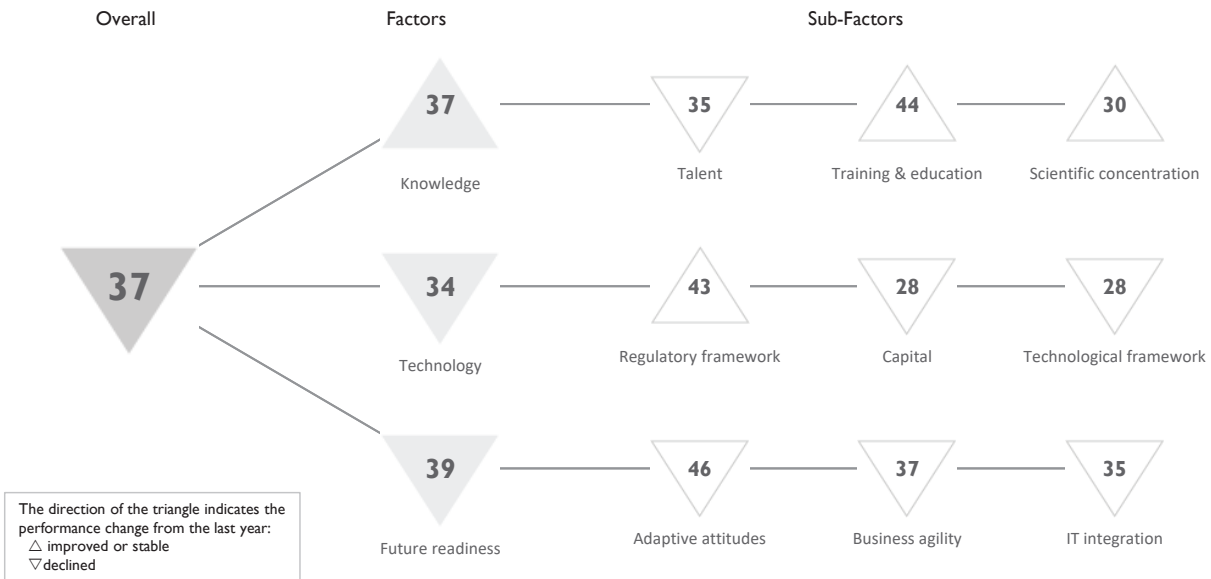
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes			56	45	34
Business agility			51	45	57
IT integration			47	46	38

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	41	Opportunities and threats	47	E-Government	31
Internet retailing	-	World robots distribution	-	Public-private partnerships	56
Tablet possession	29	Agility of companies	52	Cyber security	55
Smartphone possession	-	▷ Use of big data and analytics	62	Software piracy	34
Attitudes toward globalization	54	Knowledge transfer	52		

# CZECH REPUBLIC

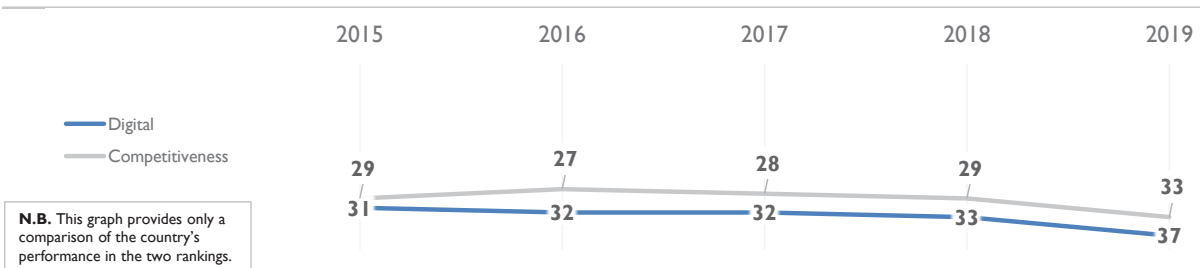
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	31	32	32	33	37
Knowledge	36	34	36	38	37
Technology	26	26	26	31	34
Future readiness	33	34	37	34	39

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## CZECH REPUBLIC

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	20	22	26	29	35
Training & education	50	50	49	55	44
Scientific concentration	36	33	34	36	30

Talent	Rank
Educational assessment PISA - Math	26
▷ International experience	51
Foreign highly-skilled personnel	43
Management of cities	38
Digital/Technological skills	39
► Net flow of international students	14

Training & education	Rank
Employee training	40
Total public expenditure on education	31
Higher education achievement	40
Pupil-teacher ratio (tertiary education)	45
Graduates in Sciences	20
Women with degrees	42

Scientific concentration	Rank
Total expenditure on R&D (%)	21
► Total R&D personnel per capita	17
Female researchers	47
R&D productivity by publication	32
Scientific and technical employment	24
High-tech patent grants	32
Robots in Education and R&D	23

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	35	39	43	44	43
Capital	20	17	15	19	28
Technological framework	24	15	15	18	28

Regulatory framework	Rank
▷ Starting a business	49
▷ Enforcing contracts	49
Immigration laws	33
Development and application of techn	44
Scientific research legislation	38
Intellectual property rights	25

Capital	Rank
► IT & media stock market capitalization	14
Funding for technological development	41
Banking and financial services	39
Country credit rating	21
Venture capital	31
Investment in Telecommunications	25

Technological framework	Rank
Communications technology	48
► Mobile Broadband subscribers	17
Wireless broadband	32
Internet users	28
Internet bandwidth speed	28
High-tech exports (%)	29

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	46	48	42	34	46
Business agility	30	29	33	25	37
IT integration	31	36	33	34	35

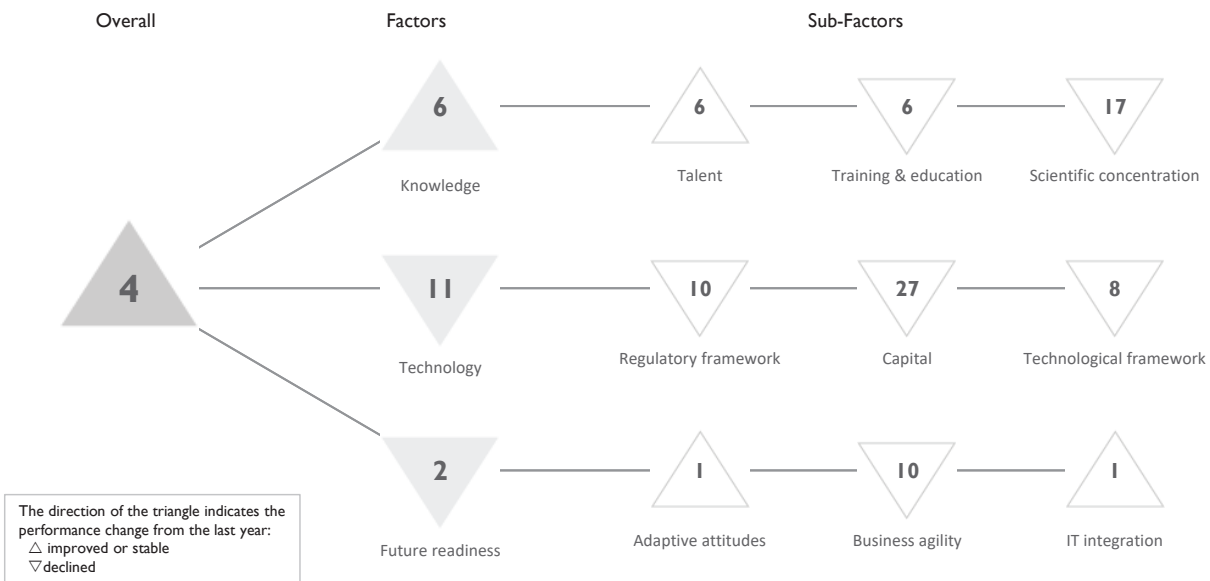
Adaptive attitudes	Rank
▷ E-Participation	58
Internet retailing	19
Tablet possession	47
Smartphone possession	29
Attitudes toward globalization	41

Business agility	Rank
Opportunities and threats	41
► World robots distribution	16
Agility of companies	35
Use of big data and analytics	36
▷ Knowledge transfer	51

IT integration	Rank
E-Government	45
Public-private partnerships	49
Cyber security	28
Software piracy	20

# DENMARK

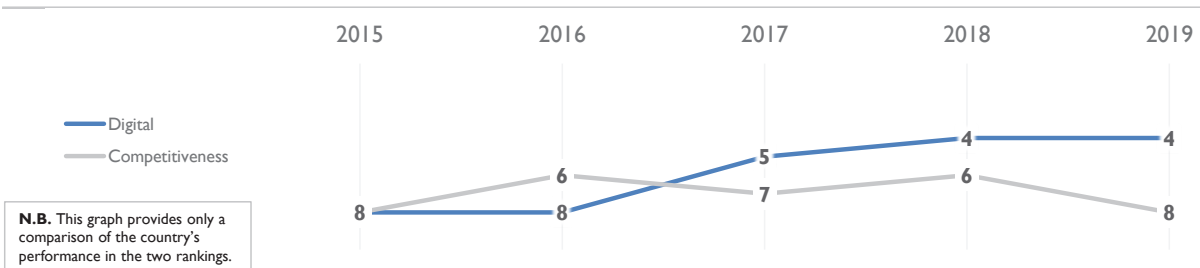
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	8	8	5	4	4
Knowledge	9	8	8	8	6
Technology	13	12	10	10	11
Future readiness	6	6	1	1	2

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	10	8	6	6	6
Training & education	9	7	5	3	6
Scientific concentration	16	18	19	14	17

Talent	Rank
Educational assessment PISA - Math	11
International experience	14
Foreign highly-skilled personnel	20
Management of cities	3
Digital/Technological skills	11
Net flow of international students	6

Training & education	Rank
▶ Employee training	2
Total public expenditure on education	6
Higher education achievement	23
Pupil-teacher ratio (tertiary education)	4
▷ Graduates in Sciences	43
Women with degrees	19

Scientific concentration	Rank
Total expenditure on R&D (%)	8
▶ Total R&D personnel per capita	1
Female researchers	38
▷ R&D productivity by publication	49
Scientific and technical employment	21
High-tech patent grants	39
Robots in Education and R&D	25

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	9	9	8	8	10
Capital	23	26	25	22	27
Technological framework	8	8	5	5	8

Regulatory framework	Rank
Starting a business	24
Enforcing contracts	13
▷ Immigration laws	42
Development and application of techn	6
Scientific research legislation	6
Intellectual property rights	4

Capital	Rank
▷ IT & media stock market capitalization	45
Funding for technological development	9
Banking and financial services	13
▶ Country credit rating	1
Venture capital	9
▷ Investment in Telecommunications	43

Technological framework	Rank
Communications technology	6
Mobile Broadband subscribers	13
Wireless broadband	10
Internet users	8
Internet bandwidth speed	11
High-tech exports (%)	33

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	4	5	1	5	1
Business agility	14	15	11	6	10
IT integration	9	10	11	5	1

Adaptive attitudes	Rank
▶ E-Participation	1
Internet retailing	4
Tablet possession	9
Smartphone possession	7
Attitudes toward globalization	9

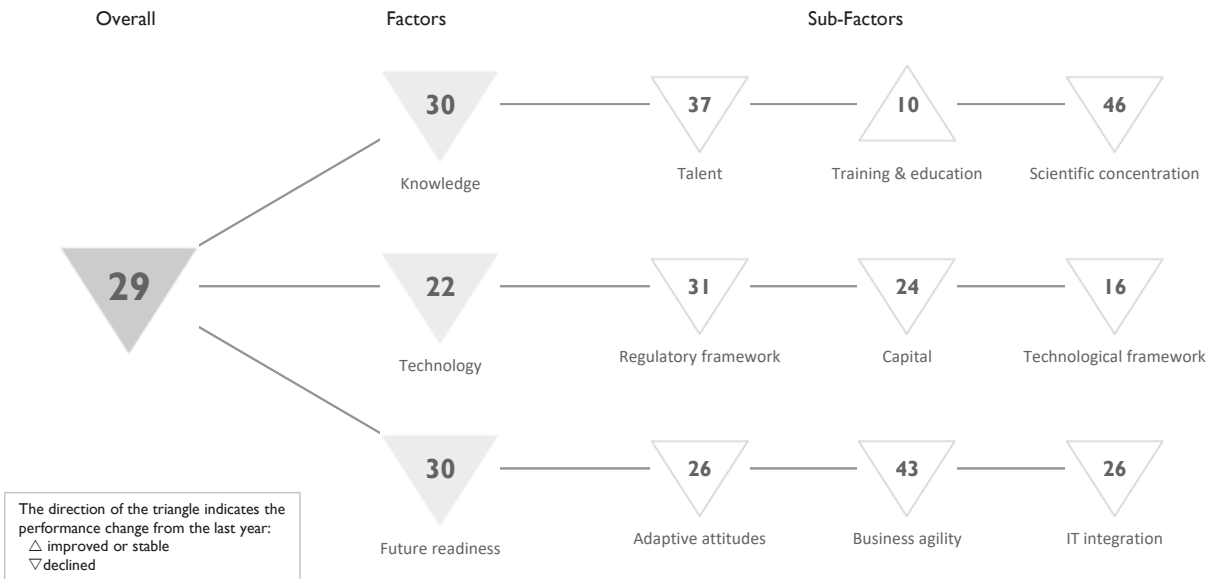
Business agility	Rank
Opportunities and threats	8
World robots distribution	30
Agility of companies	6
Use of big data and analytics	17
Knowledge transfer	8

IT integration	Rank
▶ E-Government	1
Public-private partnerships	6
Cyber security	17
Software piracy	8



# ESTONIA

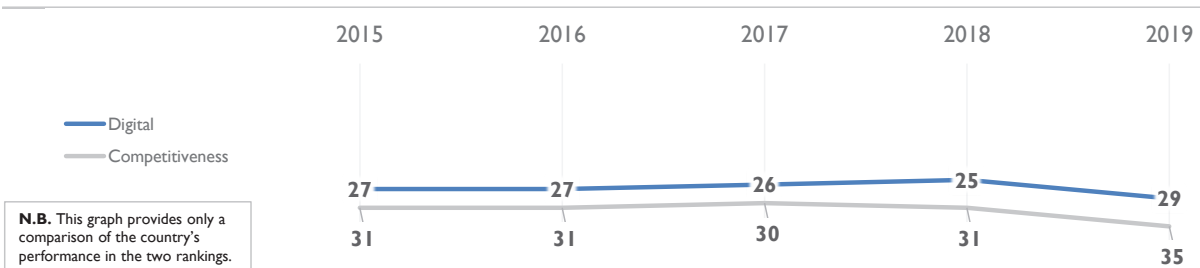
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	27	27	26	25	29
Knowledge	30	30	28	29	30
Technology	19	17	19	20	22
Future readiness	26	26	26	26	30

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	51	46	40	34	37
Training & education	1	3	2	17	10
Scientific concentration	38	38	38	39	46

Talent		Rank	Training & education		Rank	Scientific concentration		Rank
▶	Educational assessment PISA - Math	8		Employee training	11		Total expenditure on R&D (%)	28
	International experience	46	▶	Total public expenditure on education	11		Total R&D personnel per capita	27
	Foreign highly-skilled personnel	37		Higher education achievement	30		Female researchers	17
	Management of cities	43		Pupil-teacher ratio (tertiary education)	30	▷	R&D productivity by publication	60
▷	Digital/Technological skills	50		Graduates in Sciences	16		Scientific and technical employment	29
	Net flow of international students	46		Women with degrees	12		High-tech patent grants	20
						▷	Robots in Education and R&D	52

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	24	19	23	25	31
Capital	16	16	18	21	24
Technological framework	14	14	18	15	16

Regulatory framework		Rank	Capital		Rank	Technological framework		Rank
▶	Starting a business	8		IT & media stock market capitalization	-		Communications technology	26
	Enforcing contracts	12		Funding for technological development	37		Mobile Broadband subscribers	41
▷	Immigration laws	62		Banking and financial services	26	▶	Wireless broadband	7
	Development and application of techn	32		Country credit rating	22		Internet users	11
	Scientific research legislation	39		Venture capital	19		Internet bandwidth speed	26
	Intellectual property rights	36		Investment in Telecommunications	26		High-tech exports (%)	16

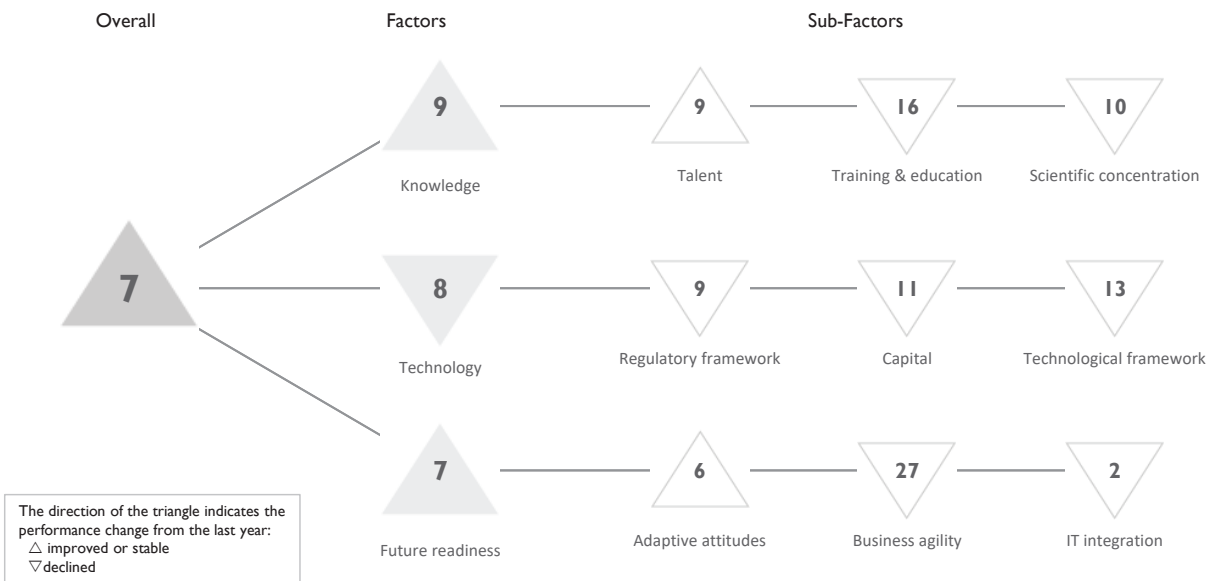
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	29	28	31	24	26
Business agility	21	20	19	29	43
IT integration	25	25	25	22	26

Adaptive attitudes		Rank	Business agility		Rank	IT integration		Rank
	E-Participation	26		Opportunities and threats	34		E-Government	16
	Internet retailing	22		World robots distribution	49	▷	Public-private partnerships	53
▶	Tablet possession	7		Agility of companies	26		Cyber security	14
	Smartphone possession	34		Use of big data and analytics	43		Software piracy	30
	Attitudes toward globalization	45		Knowledge transfer	46			

# FINLAND

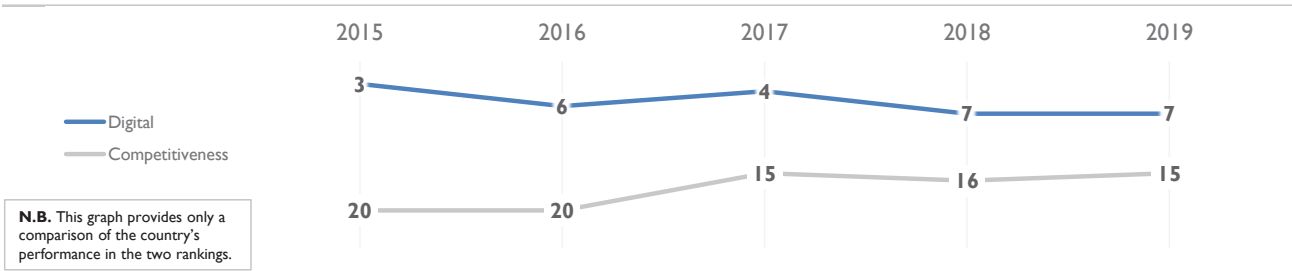
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

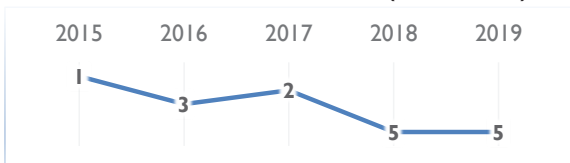
	2015	2016	2017	2018	2019
OVERALL	3	6	4	7	7
Knowledge	7	9	9	9	9
Technology	7	7	4	4	8
Future readiness	4	5	4	8	7

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	13	15	10	13	9
Training & education	6	8	8	9	16
Scientific concentration	6	7	12	9	10

Talent	Rank
Educational assessment PISA - Math	12
International experience	23
Foreign highly-skilled personnel	38
Management of cities	6
► Digital/Technological skills	2
Net flow of international students	15

Training & education	Rank
Employee training	9
Total public expenditure on education	14
Higher education achievement	34
▷ Pupil-teacher ratio (tertiary education)	50
Graduates in Sciences	10
Women with degrees	7

Scientific concentration	Rank
Total expenditure on R&D (%)	11
Total R&D personnel per capita	7
Female researchers	37
▷ R&D productivity by publication	51
Scientific and technical employment	11
High-tech patent grants	10
Robots in Education and R&D	19

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	6	7	2	4	9
Capital	9	13	10	9	11
Technological framework	6	7	8	6	13

Regulatory framework	Rank
Starting a business	25
Enforcing contracts	34
Immigration laws	28
► Development and application of technc	2
Scientific research legislation	3
► Intellectual property rights	1

Capital	Rank
IT & media stock market capitalization	7
Funding for technological development	5
Banking and financial services	4
Country credit rating	12
Venture capital	8
▷ Investment in Telecommunications	52

Technological framework	Rank
► Communications technology	1
Mobile Broadband subscribers	11
Wireless broadband	4
Internet users	6
Internet bandwidth speed	24
▷ High-tech exports (%)	44

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	9	9	3	6	6
Business agility	8	12	17	22	27
IT integration	4	5	2	1	2

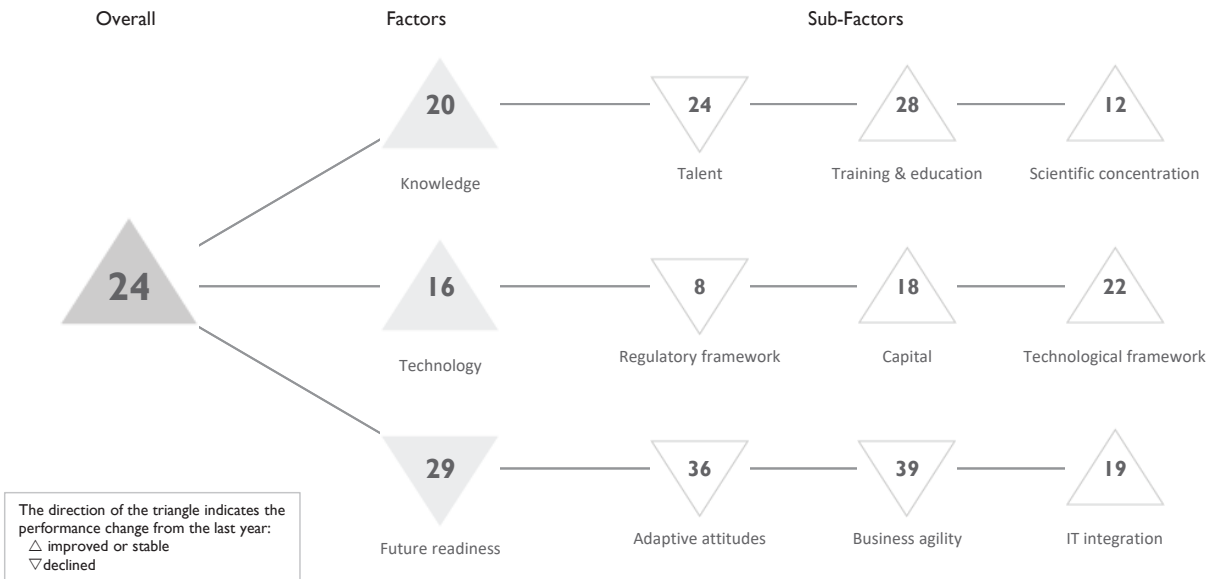
Adaptive attitudes	Rank
► E-Participation	1
Internet retailing	8
Tablet possession	11
Smartphone possession	15
Attitudes toward globalization	7

Business agility	Rank
▷ Opportunities and threats	39
World robots distribution	33
Agility of companies	30
Use of big data and analytics	24
Knowledge transfer	7

IT integration	Rank
E-Government	6
Public-private partnerships	11
Cyber security	4
Software piracy	13

# FRANCE

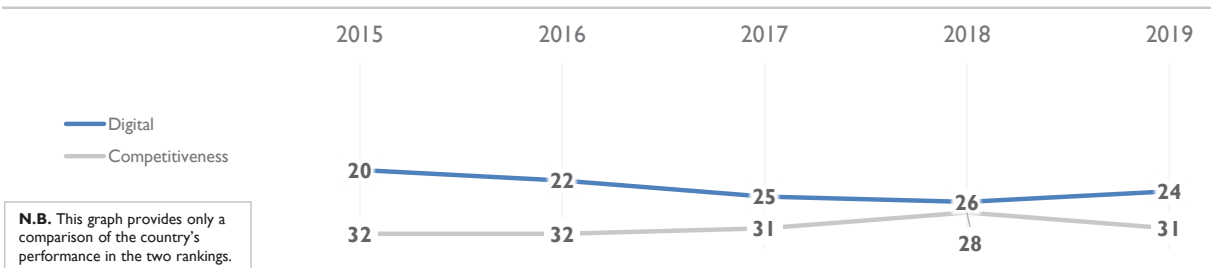
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	20	22	25	26	24
Knowledge	20	21	19	20	20
Technology	23	23	22	19	16
Future readiness	21	20	28	27	29

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	24	24	24	21	24
Training & education	37	34	35	33	28
Scientific concentration	8	9	10	17	12

Talent	Rank
Educational assessment PISA - Math	24
International experience	48
Foreign highly-skilled personnel	30
Management of cities	9
Digital/Technological skills	29
Net flow of international students	16

Training & education	Rank
Employee training	35
Total public expenditure on education	17
Higher education achievement	27
Pupil-teacher ratio (tertiary education)	44
Graduates in Sciences	21
Women with degrees	31

Scientific concentration	Rank
Total expenditure on R&D (%)	13
Total R&D personnel per capita	18
Female researchers	46
R&D productivity by publication	14
Scientific and technical employment	16
High-tech patent grants	19
► Robots in Education and R&D	5

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	18	15	15	5	8
Capital	31	31	26	25	18
Technological framework	20	22	25	28	22

Regulatory framework	Rank
Starting a business	17
Enforcing contracts	11
Immigration laws	12
Development and application of techn	29
Scientific research legislation	11
► Intellectual property rights	8

Capital	Rank
IT & media stock market capitalization	25
Funding for technological development	11
Banking and financial services	40
Country credit rating	16
Venture capital	18
Investment in Telecommunications	30

Technological framework	Rank
Communications technology	13
Mobile Broadband subscribers	50
Wireless broadband	35
Internet users	24
Internet bandwidth speed	16
► High-tech exports (%)	7

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	25	23	26	32	36
Business agility	18	21	44	36	39
IT integration	19	19	20	19	19

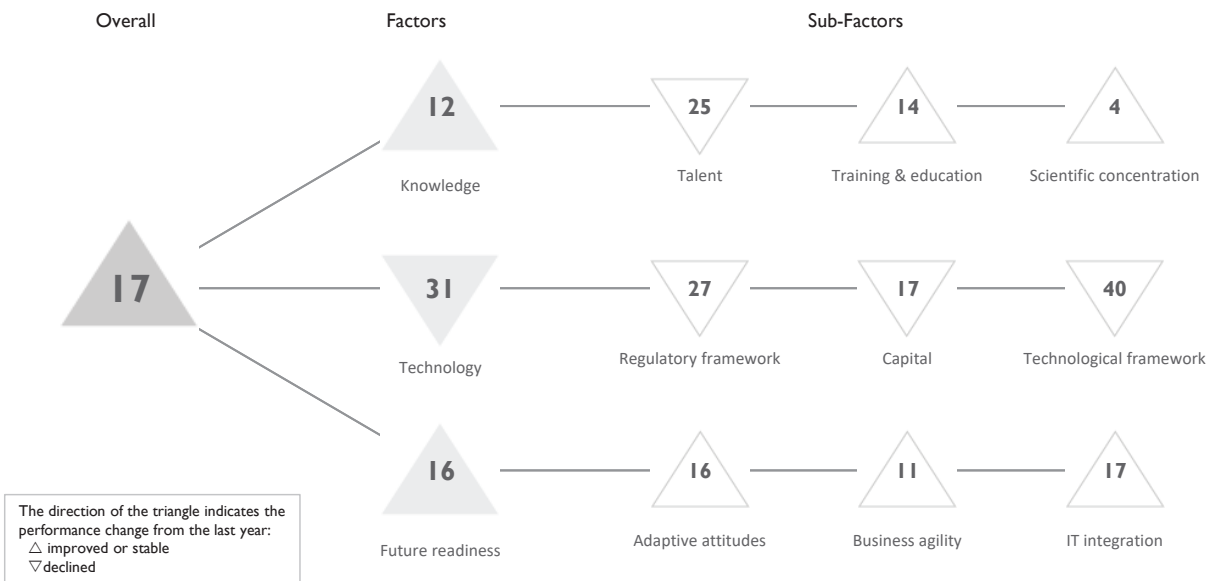
Adaptive attitudes	Rank
E-Participation	13
Internet retailing	14
▷ Tablet possession	50
Smartphone possession	41
▷ Attitudes toward globalization	63

Business agility	Rank
▷ Opportunities and threats	53
► World robots distribution	8
▷ Agility of companies	55
▷ Use of big data and analytics	53
Knowledge transfer	26

IT integration	Rank
► E-Government	9
Public-private partnerships	19
Cyber security	22
Software piracy	20

# GERMANY

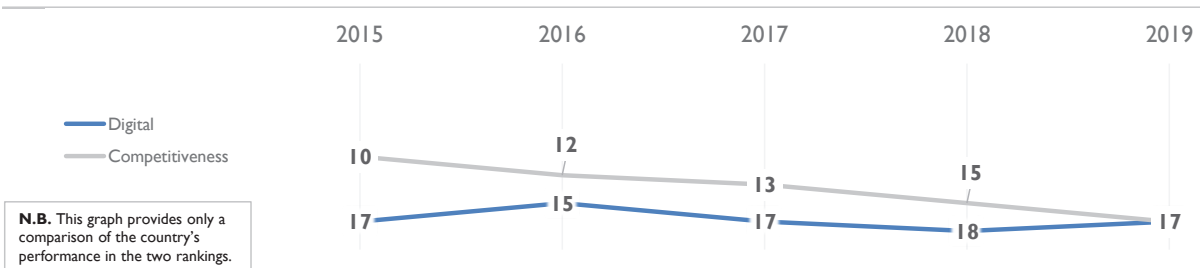
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	17	15	17	18	17
Knowledge	10	10	13	14	12
Technology	25	25	21	21	31
Future readiness	13	14	18	20	16

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	15	16	16	22	25
Training & education	4	2	15	19	14
Scientific concentration	17	15	15	10	4

**Talent** Rank

Educational assessment PISA - Math	15
International experience	21
Foreign highly-skilled personnel	18
Management of cities	23
▷ Digital/Technological skills	55
Net flow of international students	20

**Training & education** Rank

► Employee training	3
Total public expenditure on education	38
Higher education achievement	46
► Pupil-teacher ratio (tertiary education)	3
► Graduates in Sciences	1
Women with degrees	41

**Scientific concentration** Rank

Total expenditure on R&D (%)	9
Total R&D personnel per capita	11
Female researchers	45
R&D productivity by publication	11
Scientific and technical employment	18
High-tech patent grants	24
► Robots in Education and R&D	2

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	27	23	20	23	27
Capital	19	22	19	16	17
Technological framework	31	30	26	27	40

**Regulatory framework** Rank

Starting a business	48
Enforcing contracts	24
Immigration laws	25
Development and application of technc	41
Scientific research legislation	24
Intellectual property rights	3

**Capital** Rank

IT & media stock market capitalization	9
Funding for technological development	33
Banking and financial services	24
► Country credit rating	1
Venture capital	26
▷ Investment in Telecommunications	51

**Technological framework** Rank

▷ Communications technology	55
▷ Mobile Broadband subscribers	54
Wireless broadband	48
Internet users	18
Internet bandwidth speed	23
High-tech exports (%)	24

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	18	20	22	22	16
Business agility	5	6	18	20	11
IT integration	18	17	16	18	17

**Adaptive attitudes** Rank

E-Participation	23
Internet retailing	13
Tablet possession	25
Smartphone possession	22
Attitudes toward globalization	33

**Business agility** Rank

▷ Opportunities and threats	56
World robots distribution	5
Agility of companies	36
Use of big data and analytics	46
Knowledge transfer	10

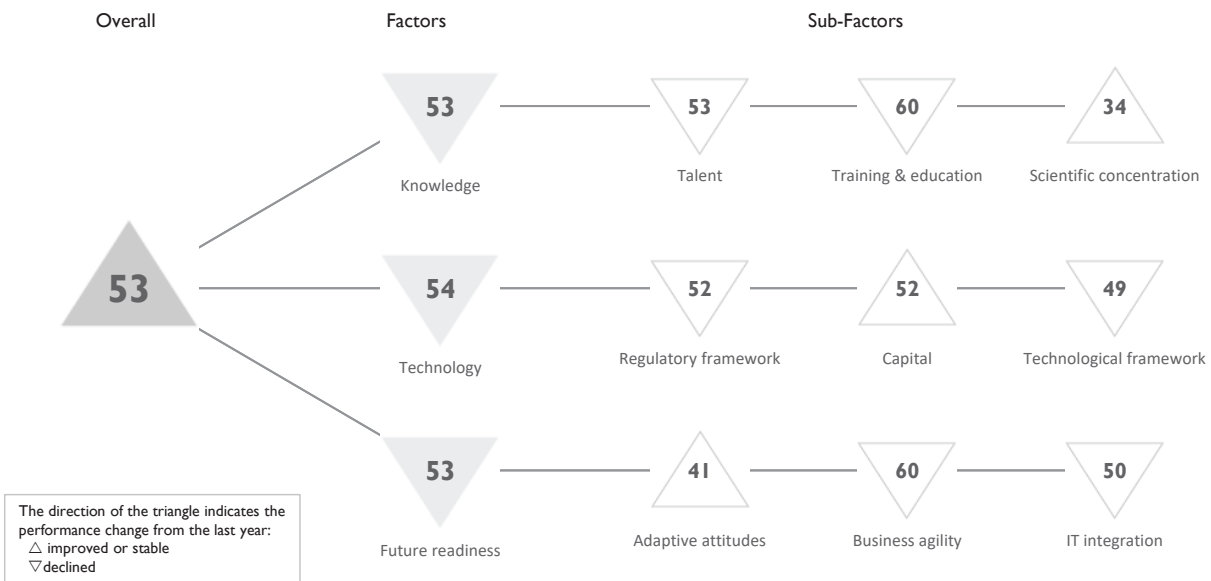
**IT integration** Rank

E-Government	12
Public-private partnerships	40
Cyber security	26
Software piracy	8



# GREECE

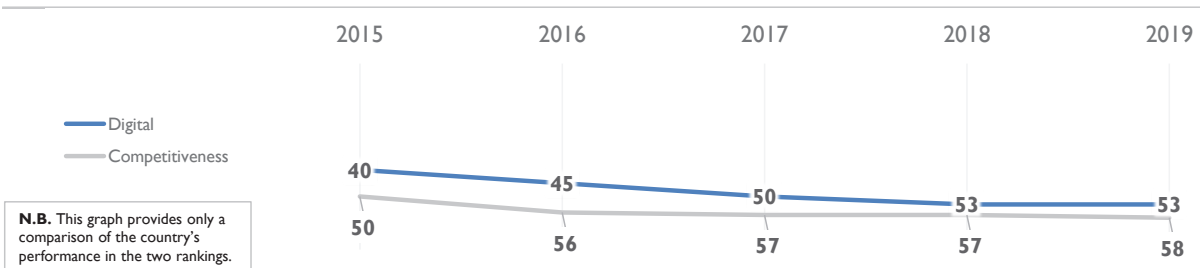
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	40	45	50	53	53
Knowledge	34	46	51	51	53
Technology	51	52	52	51	54
Future readiness	36	36	47	46	53

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	38	47	47	50	53
Training & education	28	51	55	58	60
Scientific concentration	29	34	33	37	34

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	40	▷ Employee training	60	Total expenditure on R&D (%)	33
International experience	37	Total public expenditure on education	41	Total R&D personnel per capita	28
▷ Foreign highly-skilled personnel	61	Higher education achievement	32	▶ Female researchers	23
Management of cities	54	▷ Pupil-teacher ratio (tertiary education)	59	R&D productivity by publication	30
Digital/Technological skills	34	▶ Graduates in Sciences	14	▶ Scientific and technical employment	20
Net flow of international students	51	Women with degrees	34	High-tech patent grants	40
				Robots in Education and R&D	38

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	40	51	49	47	52
Capital	57	55	58	54	52
Technological framework	48	49	49	48	49

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	26	▶ IT & media stock market capitalization	10	Communications technology	45
Enforcing contracts	57	Funding for technological development	55	Mobile Broadband subscribers	57
Immigration laws	31	▷ Banking and financial services	61	Wireless broadband	55
Development and application of techn	55	▷ Country credit rating	59	Internet users	40
Scientific research legislation	52	Venture capital	58	Internet bandwidth speed	49
Intellectual property rights	50	▶ Investment in Telecommunications	5	High-tech exports (%)	36

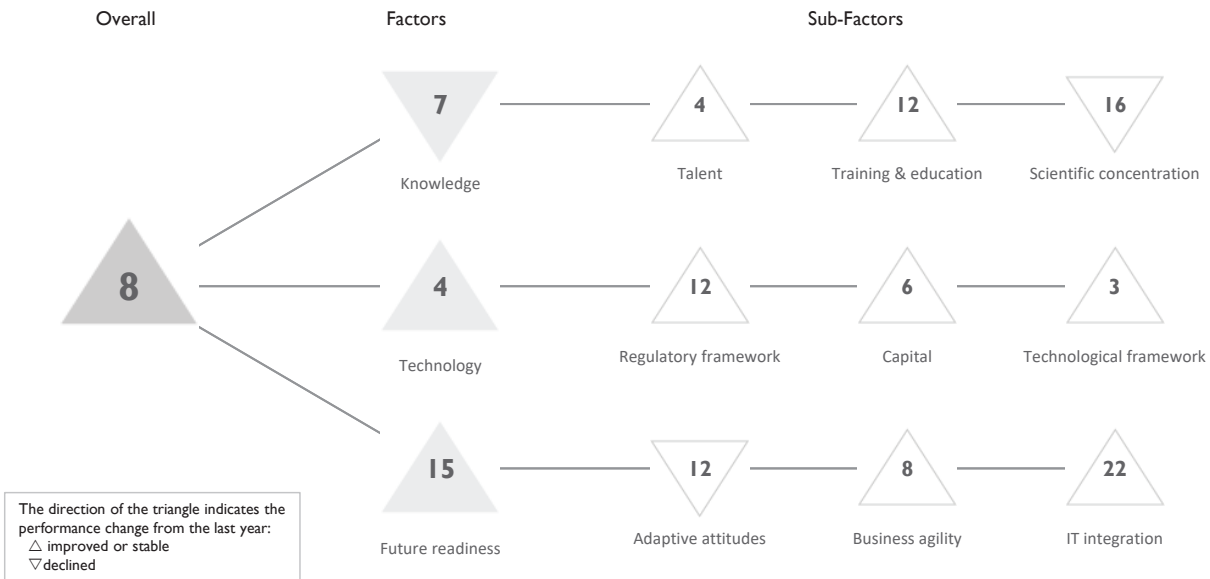
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	32	33	41	50	41
Business agility	39	40	53	49	60
IT integration	39	43	48	47	50

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	32	Opportunities and threats	54	E-Government	30
Internet retailing	28	World robots distribution	44	Public-private partnerships	57
Tablet possession	41	Agility of companies	59	Cyber security	53
Smartphone possession	48	Use of big data and analytics	54	Software piracy	52
Attitudes toward globalization	57	Knowledge transfer	58		

# HONG KONG SAR

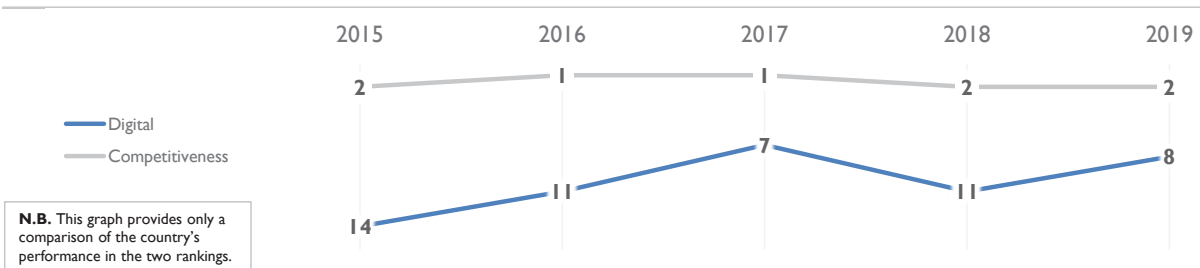
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	14	11	7	11	8
Knowledge	8	6	6	5	7
Technology	5	2	3	6	4
Future readiness	25	27	17	24	15

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## HONG KONG SAR

- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	4	3	4	5	4
Training & education	31	26	27	13	12
Scientific concentration	7	6	7	5	16

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
▶ Educational assessment PISA - Math	2	Employee training	20	▷ Total expenditure on R&D (%)	44
International experience	7	▷ Total public expenditure on education	53	Total R&D personnel per capita	32
Foreign highly-skilled personnel	11	Higher education achievement	8	Female researchers	-
Management of cities	7	Pupil-teacher ratio (tertiary education)	28	R&D productivity by publication	18
Digital/Technological skills	14	Graduates in Sciences	5	▶ Scientific and technical employment	2
▷ Net flow of international students	43	Women with degrees	-	▶ High-tech patent grants	2
				▷ Robots in Education and R&D	54

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	7	4	6	14	12
Capital	5	2	6	6	6
Technological framework	10	11	9	11	3

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	4	IT & media stock market capitalization	5	Communications technology	7
Enforcing contracts	25	Funding for technological development	13	Mobile Broadband subscribers	18
Immigration laws	16	Banking and financial services	9	Wireless broadband	6
Development and application of technc	11	Country credit rating	14	Internet users	13
Scientific research legislation	22	Venture capital	11	▶ Internet bandwidth speed	3
Intellectual property rights	11	▷ Investment in Telecommunications	41	High-tech exports (%)	31

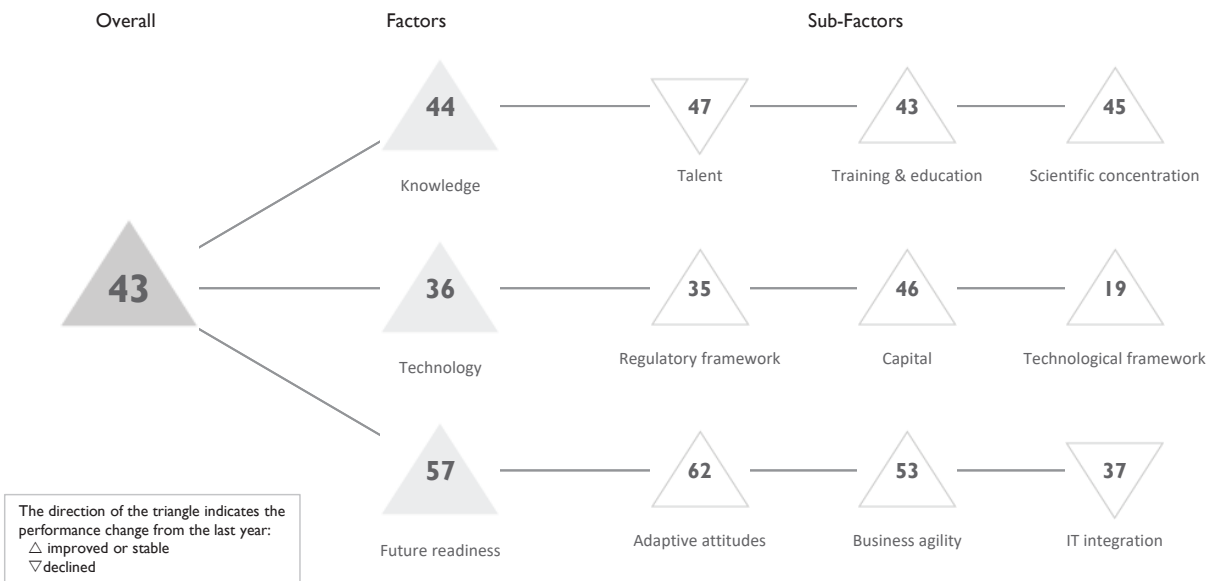
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	6	6	9	11	12
Business agility	46	57	25	26	8
IT integration	20	20	21	25	22

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	-	▶ Opportunities and threats	2	E-Government	-
Internet retailing	24	World robots distribution	36	Public-private partnerships	4
Tablet possession	4	Agility of companies	5	Cyber security	10
Smartphone possession	13	Use of big data and analytics	19	Software piracy	28
Attitudes toward globalization	8	Knowledge transfer	15		

# HUNGARY

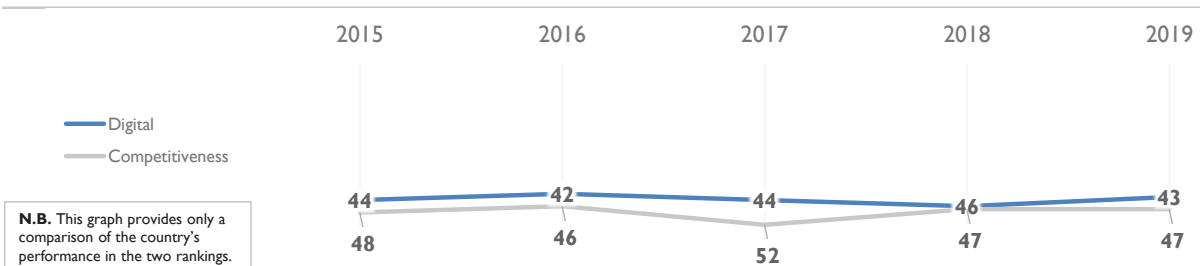
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	44	42	44	46	43
Knowledge	44	43	48	48	44
Technology	39	37	38	40	36
Future readiness	47	45	55	58	57

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	46	43	46	46	47
Training & education	46	41	43	48	43
Scientific concentration	48	46	46	51	45

### Talent

	Rank
Educational assessment PISA - Math	34
International experience	33
Foreign highly-skilled personnel	52
Management of cities	41
▷ Digital/Technological skills	61
▶ Net flow of international students	21

### Training & education

	Rank
Employee training	48
▶ Total public expenditure on education	20
Higher education achievement	47
Pupil-teacher ratio (tertiary education)	27
Graduates in Sciences	36
Women with degrees	39

### Scientific concentration

	Rank
Total expenditure on R&D (%)	26
Total R&D personnel per capita	30
Female researchers	41
R&D productivity by publication	46
Scientific and technical employment	34
High-tech patent grants	38
Robots in Education and R&D	31

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	32	30	29	35	35
Capital	49	47	44	51	46
Technological framework	44	44	45	46	19

### Regulatory framework

	Rank
Starting a business	38
▶ Enforcing contracts	21
Immigration laws	21
Development and application of techn	47
Scientific research legislation	49
Intellectual property rights	43

### Capital

	Rank
IT & media stock market capitalization	31
Funding for technological development	39
Banking and financial services	46
Country credit rating	49
Venture capital	40
Investment in Telecommunications	37

### Technological framework

	Rank
Communications technology	47
▶ Mobile Broadband subscribers	6
▷ Wireless broadband	57
Internet users	31
▶ Internet bandwidth speed	10
High-tech exports (%)	22

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	51	50	57	62	62
Business agility	51	50	58	56	53
IT integration	36	35	38	36	37

### Adaptive attitudes

	Rank
E-Participation	51
Internet retailing	37
Tablet possession	51
▷ Smartphone possession	59
▷ Attitudes toward globalization	61

### Business agility

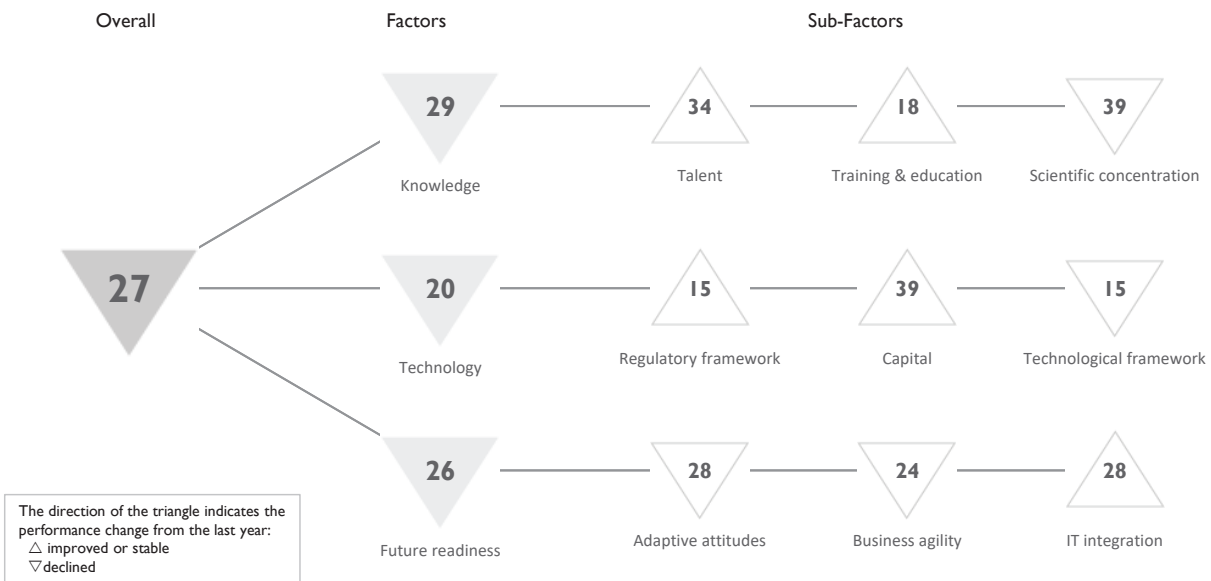
	Rank
▷ Opportunities and threats	59
World robots distribution	26
Agility of companies	50
Use of big data and analytics	50
Knowledge transfer	39

### IT integration

	Rank
E-Government	38
Public-private partnerships	42
Cyber security	51
Software piracy	27

# ICELAND

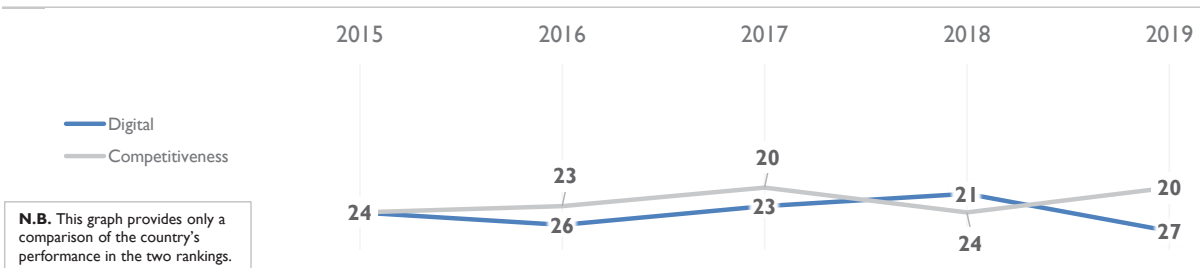
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	24	26	23	21	27
Knowledge	33	32	30	28	29
Technology	20	22	20	18	20
Future readiness	17	18	21	19	26

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	40	41	38	37	34
Training & education	8	10	7	18	18
Scientific concentration	47	37	37	35	39

Talent	Rank
Educational assessment PISA - Math	29
International experience	50
Foreign highly-skilled personnel	44
Management of cities	16
► Digital/Technological skills	3
▷ Net flow of international students	59

Training & education	Rank
Employee training	34
► Total public expenditure on education	2
Higher education achievement	20
Pupil-teacher ratio (tertiary education)	-
Graduates in Sciences	49
Women with degrees	9

Scientific concentration	Rank
Total expenditure on R&D (%)	15
► Total R&D personnel per capita	4
Female researchers	12
▷ R&D productivity by publication	63
Scientific and technical employment	14
▷ High-tech patent grants	54
▷ Robots in Education and R&D	54

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	11	22	22	18	15
Capital	37	43	43	40	39
Technological framework	9	10	11	12	15

Regulatory framework	Rank
Starting a business	32
Enforcing contracts	26
Immigration laws	9
Development and application of techn	15
Scientific research legislation	26
Intellectual property rights	19

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	27
Banking and financial services	33
Country credit rating	32
Venture capital	39
Investment in Telecommunications	47

Technological framework	Rank
► Communications technology	2
Mobile Broadband subscribers	19
Wireless broadband	14
Internet users	10
Internet bandwidth speed	46
High-tech exports (%)	23

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	21	25	16	18	28
Business agility	4	5	10	11	24
IT integration	27	27	28	28	28

Adaptive attitudes	Rank
E-Participation	53
Internet retailing	25
Tablet possession	23
Smartphone possession	11
Attitudes toward globalization	14

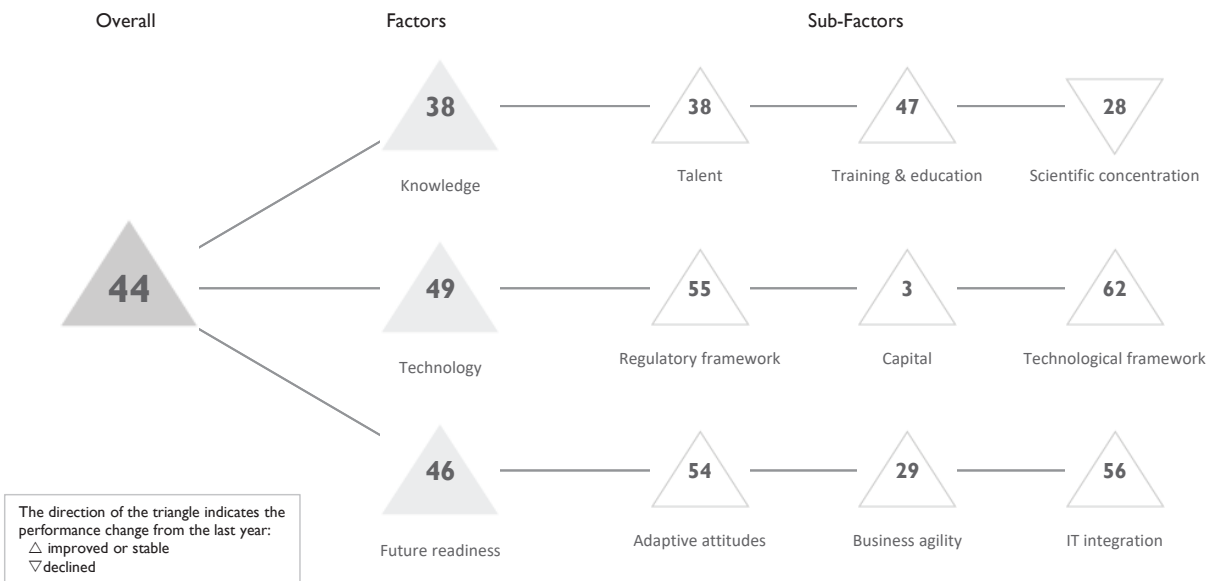
Business agility	Rank
► Opportunities and threats	5
▷ World robots distribution	55
Agility of companies	13
Use of big data and analytics	26
Knowledge transfer	22

IT integration	Rank
E-Government	19
Public-private partnerships	36
Cyber security	34
Software piracy	34



# INDIA

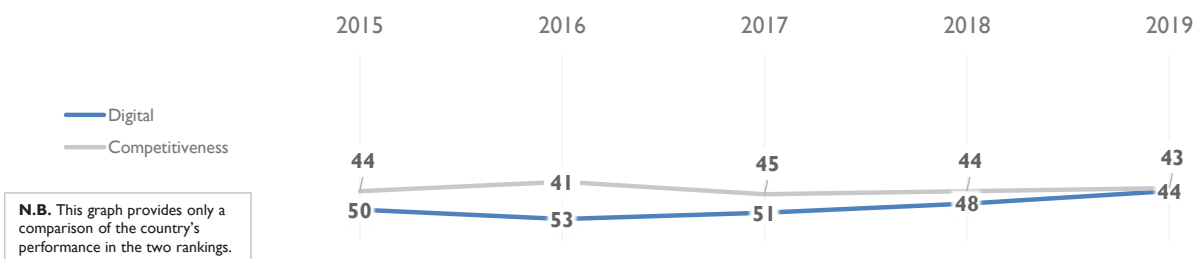
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	50	53	51	48	44
Knowledge	37	39	37	46	38
Technology	58	57	59	53	49
Future readiness	53	54	51	48	46

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	39	38	43	43	38
Training & education	45	56	57	59	47
Scientific concentration	21	21	6	26	28

Talent	Rank
Educational assessment PISA - Math	-
International experience	34
Foreign highly-skilled personnel	40
Management of cities	51
Digital/Technological skills	22
Net flow of international students	40

Training & education	Rank
Employee training	39
Total public expenditure on education	36
Higher education achievement	59
Pupil-teacher ratio (tertiary education)	56
► Graduates in Sciences	4
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	47
Total R&D personnel per capita	55
Female researchers	-
► R&D productivity by publication	2
Scientific and technical employment	-
High-tech patent grants	26
Robots in Education and R&D	17

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	59	56	59	56	55
Capital	34	30	28	3	3
Technological framework	61	61	63	62	62

Regulatory framework	Rank
Starting a business	59
▷ Enforcing contracts	62
Immigration laws	32
Development and application of techn	28
Scientific research legislation	32
Intellectual property rights	46

Capital	Rank
► IT & media stock market capitalization	13
Funding for technological development	35
Banking and financial services	27
Country credit rating	47
Venture capital	30
► Investment in Telecommunications	1

Technological framework	Rank
Communications technology	40
▷ Mobile Broadband subscribers	62
▷ Wireless broadband	63
▷ Internet users	63
Internet bandwidth speed	59
High-tech exports (%)	49

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	56	57	59	54	54
Business agility	37	35	29	33	29
IT integration	53	54	56	56	56

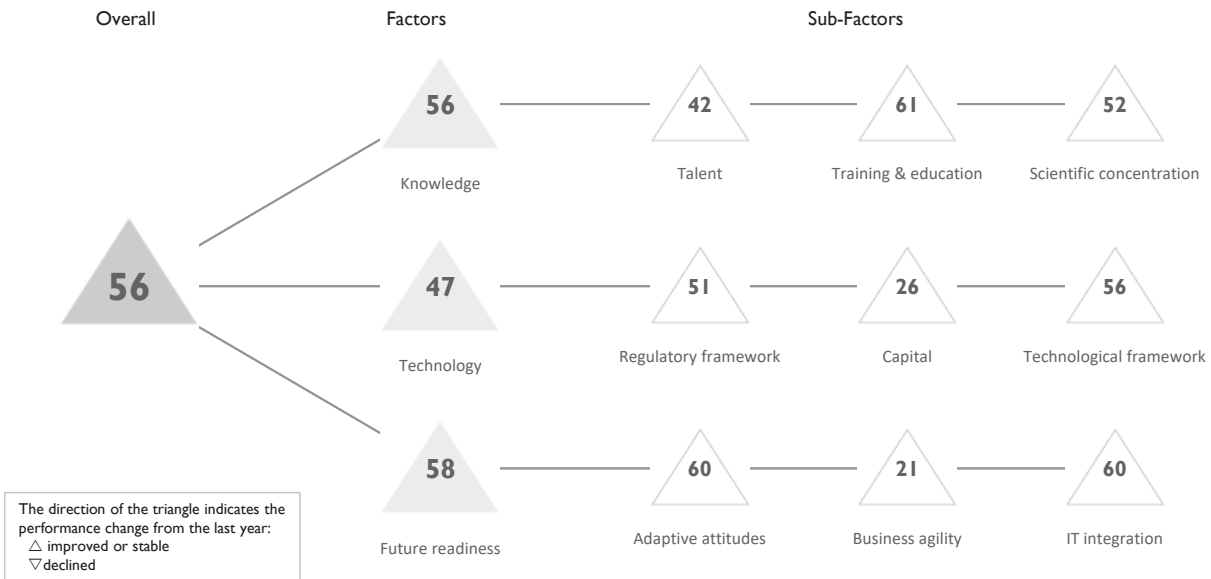
Adaptive attitudes	Rank
E-Participation	15
Internet retailing	55
▷ Tablet possession	61
Smartphone possession	55
Attitudes toward globalization	22

Business agility	Rank
Opportunities and threats	25
► World robots distribution	13
Agility of companies	32
Use of big data and analytics	30
Knowledge transfer	42

IT integration	Rank
E-Government	58
Public-private partnerships	27
Cyber security	37
Software piracy	48

# INDONESIA

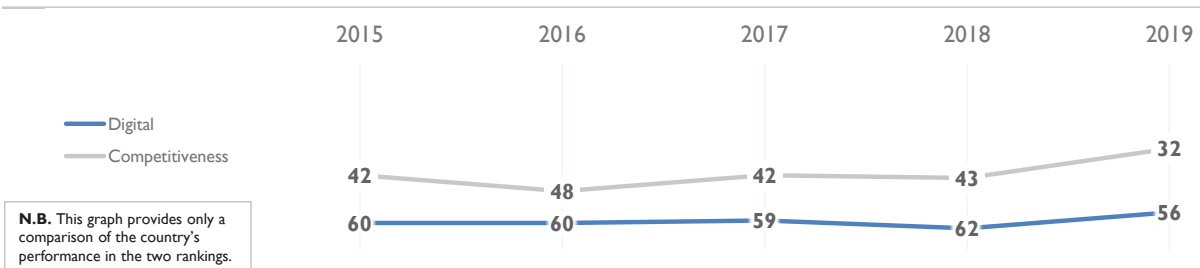
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	60	60	59	62	56
Knowledge	60	60	58	61	56
Technology	57	58	56	59	47
Future readiness	58	60	62	62	58

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	52	54	48	51	42
Training & education	59	60	59	61	61
Scientific concentration	56	53	54	58	52

Talent	Rank
Educational assessment PISA - Math	54
International experience	19
Foreign highly-skilled personnel	19
Management of cities	37
Digital/Technological skills	41
Net flow of international students	39

Training & education	Rank
Employee training	17
Total public expenditure on education	57
Higher education achievement	58
Pupil-teacher ratio (tertiary education)	58
Graduates in Sciences	50
Women with degrees	53

Scientific concentration	Rank
Total expenditure on R&D (%)	58
Total R&D personnel per capita	49
Female researchers	14
► R&D productivity by publication	9
Scientific and technical employment	-
High-tech patent grants	57
Robots in Education and R&D	45

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	60	60	61	57	51
Capital	35	42	37	34	26
Technological framework	59	57	58	60	56

Regulatory framework	Rank
Starting a business	57
Enforcing contracts	59
Immigration laws	34
Development and application of techn	26
Scientific research legislation	33
Intellectual property rights	42

Capital	Rank
IT & media stock market capitalization	18
Funding for technological development	20
► Banking and financial services	6
Country credit rating	42
► Venture capital	13
Investment in Telecommunications	35

Technological framework	Rank
Communications technology	44
Mobile Broadband subscribers	49
Wireless broadband	18
▷ Internet users	61
▷ Internet bandwidth speed	61
High-tech exports (%)	54

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	61	61	63	61	60
Business agility	41	48	35	46	21
IT integration	59	59	61	60	60

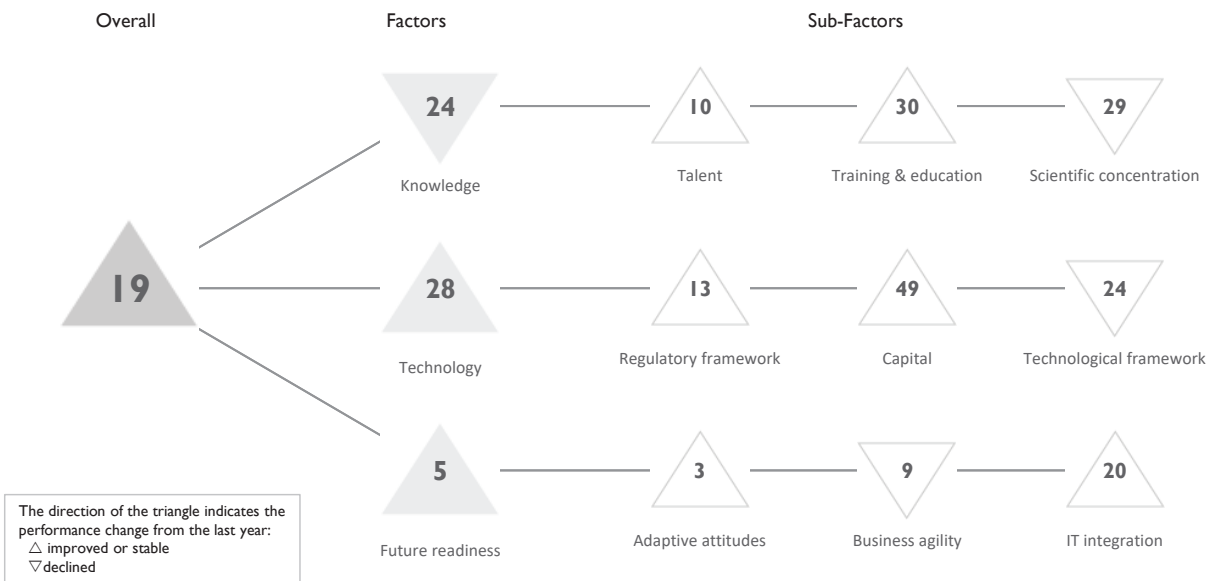
Adaptive attitudes	Rank
E-Participation	58
Internet retailing	58
▷ Tablet possession	60
Smartphone possession	53
Attitudes toward globalization	17

Business agility	Rank
► Opportunities and threats	13
World robots distribution	25
Agility of companies	24
► Use of big data and analytics	8
Knowledge transfer	24

IT integration	Rank
▷ E-Government	61
Public-private partnerships	17
Cyber security	27
▷ Software piracy	61

# IRELAND

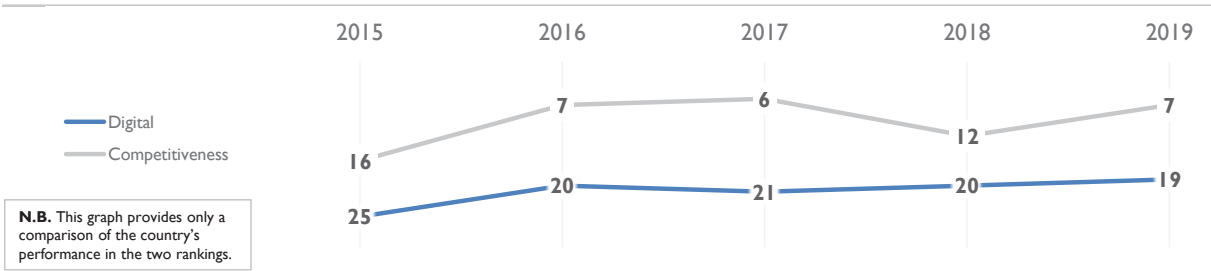
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	25	20	21	20	19
Knowledge	26	25	25	22	24
Technology	27	27	25	29	28
Future readiness	12	12	10	13	5

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	21	18	15	14	10
Training & education	29	25	34	34	30
Scientific concentration	34	32	31	24	29

Talent	Rank
Educational assessment PISA - Math	17
International experience	6
► Foreign highly-skilled personnel	3
Management of cities	36
Digital/Technological skills	24
Net flow of international students	28

Training & education	Rank
Employee training	19
▷ Total public expenditure on education	54
Higher education achievement	12
▷ Pupil-teacher ratio (tertiary education)	53
Graduates in Sciences	24
Women with degrees	13

Scientific concentration	Rank
Total expenditure on R&D (%)	35
Total R&D personnel per capita	21
Female researchers	29
R&D productivity by publication	42
Scientific and technical employment	17
High-tech patent grants	13
Robots in Education and R&D	37

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	13	18	14	20	13
Capital	51	49	49	53	49
Technological framework	21	18	13	13	24

Regulatory framework	Rank
Starting a business	6
▷ Enforcing contracts	50
Immigration laws	7
Development and application of techn	10
Scientific research legislation	8
Intellectual property rights	9

Capital	Rank
IT & media stock market capitalization	48
Funding for technological development	15
Banking and financial services	23
Country credit rating	30
Venture capital	12
▷ Investment in Telecommunications	61

Technological framework	Rank
▷ Communications technology	51
Mobile Broadband subscribers	28
Wireless broadband	23
Internet users	20
Internet bandwidth speed	33
High-tech exports (%)	10

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	14	13	12	10	3
Business agility	6	8	2	3	9
IT integration	24	22	24	24	20

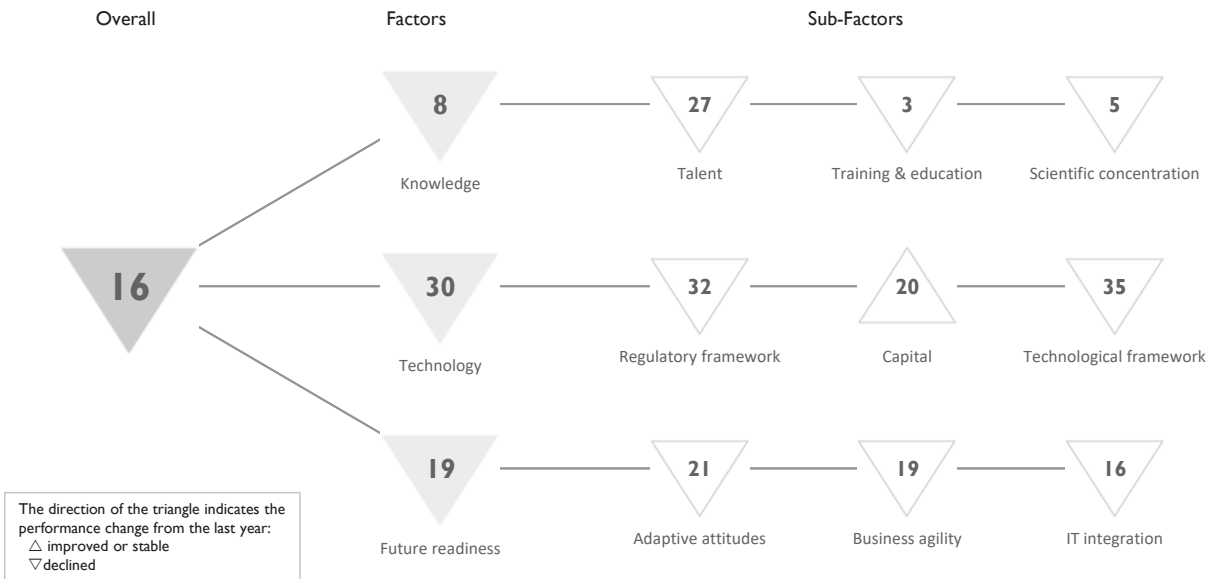
Adaptive attitudes	Rank
E-Participation	22
► Internet retailing	5
Tablet possession	18
Smartphone possession	8
► Attitudes toward globalization	1

Business agility	Rank
► Opportunities and threats	3
World robots distribution	43
► Agility of companies	2
Use of big data and analytics	18
Knowledge transfer	9

IT integration	Rank
E-Government	22
Public-private partnerships	16
Cyber security	21
Software piracy	19

# ISRAEL

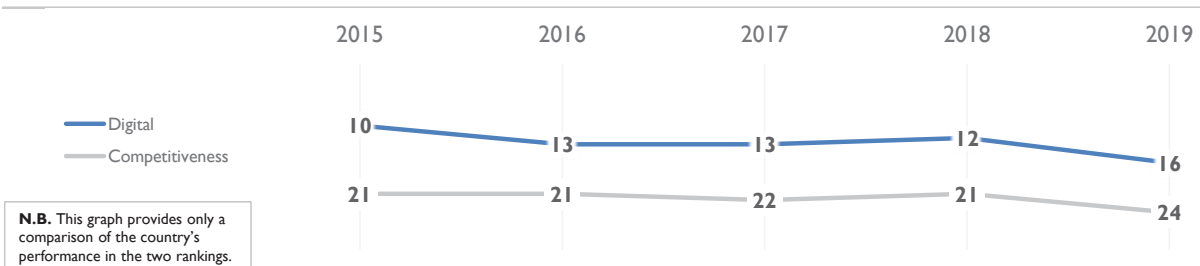
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	10	13	13	12	16
Knowledge	4	5	7	2	8
Technology	22	24	27	25	30
Future readiness	7	9	11	7	19

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	25	23	21	19	27
Training & education	7	6	11	2	3
Scientific concentration	2	2	2	2	5

Talent	Rank
Educational assessment PISA - Math	36
International experience	17
Foreign highly-skilled personnel	35
Management of cities	42
Digital/Technological skills	4
Net flow of international students	45

Training & education	Rank
▷ Employee training	46
Total public expenditure on education	4
Higher education achievement	18
Pupil-teacher ratio (tertiary education)	-
Graduates in Sciences	-
Women with degrees	6

Scientific concentration	Rank
► Total expenditure on R&D (%)	2
Total R&D personnel per capita	-
Female researchers	-
▷ R&D productivity by publication	54
Scientific and technical employment	9
High-tech patent grants	6
Robots in Education and R&D	40

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	26	26	26	30	32
Capital	18	20	27	20	20
Technological framework	25	26	28	20	35

Regulatory framework	Rank
Starting a business	27
▷ Enforcing contracts	47
▷ Immigration laws	58
Development and application of techn	17
Scientific research legislation	15
Intellectual property rights	21

Capital	Rank
IT & media stock market capitalization	21
► Funding for technological development	3
Banking and financial services	34
Country credit rating	25
► Venture capital	2
▷ Investment in Telecommunications	59

Technological framework	Rank
Communications technology	33
Mobile Broadband subscribers	45
Wireless broadband	20
Internet users	34
Internet bandwidth speed	34
High-tech exports (%)	26

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	17	17	18	17	21
Business agility	11	11	9	2	19
IT integration	2	3	7	4	16

Adaptive attitudes	Rank
E-Participation	39
Internet retailing	23
Tablet possession	17
Smartphone possession	14
Attitudes toward globalization	5

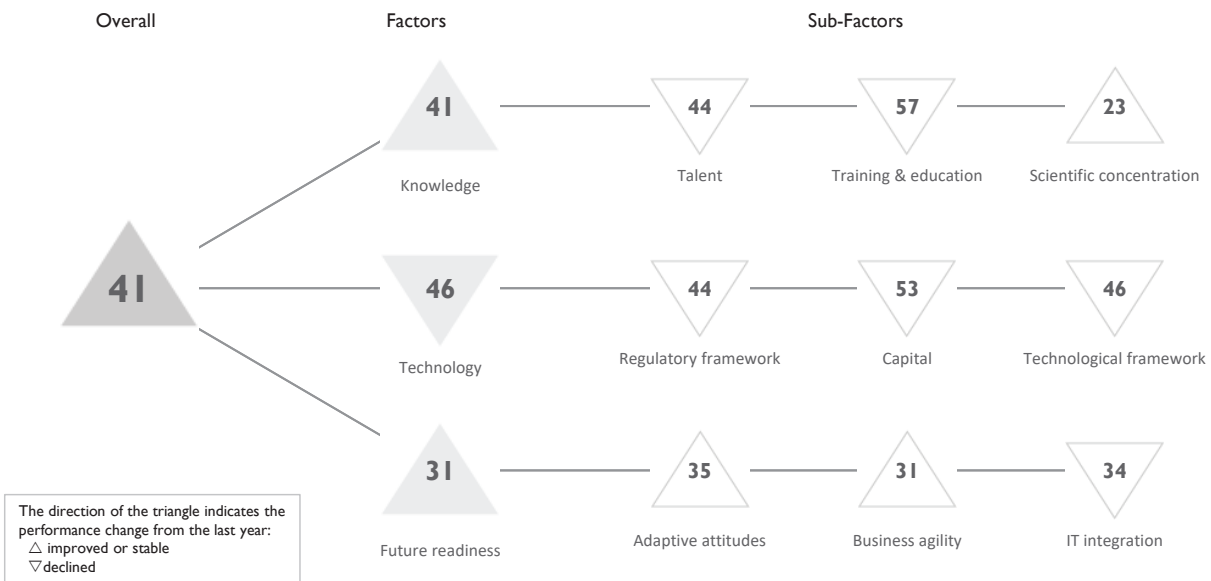
Business agility	Rank
Opportunities and threats	29
World robots distribution	39
Agility of companies	16
► Use of big data and analytics	3
Knowledge transfer	6

IT integration	Rank
E-Government	27
Public-private partnerships	24
► Cyber security	1
Software piracy	17



# ITALY

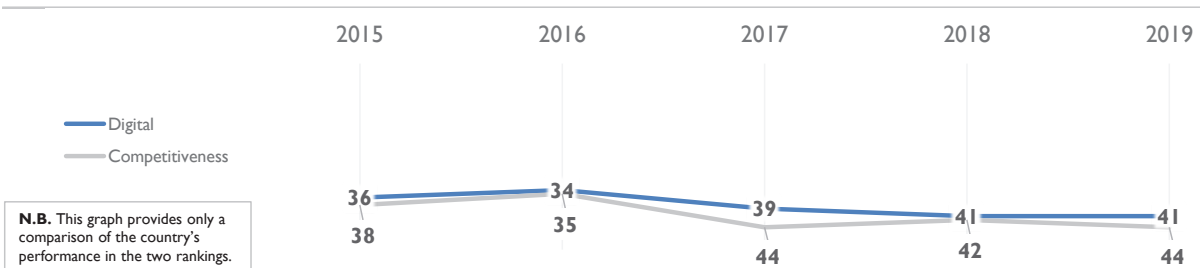
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	36	34	39	41	41
Knowledge	42	40	42	42	41
Technology	46	44	45	41	46
Future readiness	30	29	30	36	31

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	47	44	44	41	44
Training & education	49	48	46	56	57
Scientific concentration	30	29	32	28	23

Talent		Rank	Training & education		Rank	Scientific concentration		Rank
Educational assessment PISA - Math	28		Employee training	50		Total expenditure on R&D (%)	25	
International experience	43		Total public expenditure on education	43		Total R&D personnel per capita	25	
▷ Foreign highly-skilled personnel	55		▷ Higher education achievement	52		Female researchers	31	
Management of cities	47		▷ Pupil-teacher ratio (tertiary education)	52		▶ R&D productivity by publication	6	
▷ Digital/Technological skills	54		Graduates in Sciences	32		▶ Scientific and technical employment	13	
Net flow of international students	30		Women with degrees	48		High-tech patent grants	47	
						▶ Robots in Education and R&D	12	

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	43	41	42	41	44
Capital	52	51	53	49	53
Technological framework	43	43	42	44	46

Regulatory framework		Rank	Capital		Rank	Technological framework		Rank
Starting a business	33		IT & media stock market capitalization	41		Communications technology	52	
▷ Enforcing contracts	54		Funding for technological development	48		Mobile Broadband subscribers	46	
Immigration laws	30		Banking and financial services	51		Wireless broadband	42	
Development and application of techn	49		Country credit rating	46		Internet users	25	
Scientific research legislation	45		Venture capital	52		Internet bandwidth speed	39	
Intellectual property rights	32		Investment in Telecommunications	29		High-tech exports (%)	50	

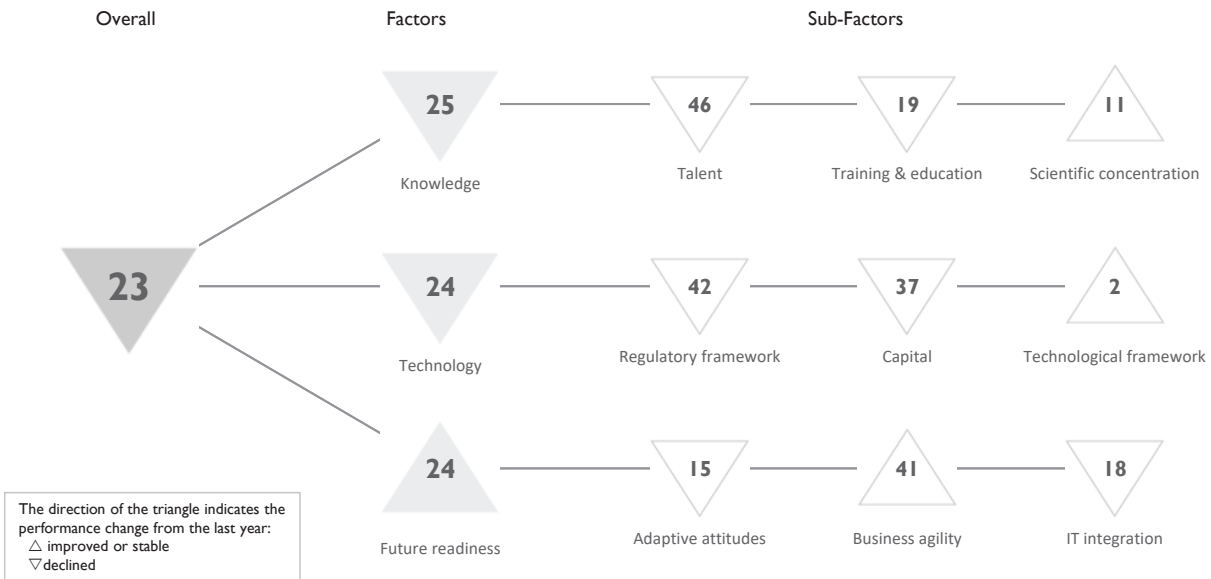
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	28	27	27	36	35
Business agility	20	16	30	32	31
IT integration	32	33	35	32	34

Adaptive attitudes		Rank	Business agility		Rank	IT integration		Rank
▶ E-Participation	15		Opportunities and threats	37		E-Government	24	
Internet retailing	27		▶ World robots distribution	6		Public-private partnerships	51	
Tablet possession	36		Agility of companies	46		Cyber security	45	
Smartphone possession	50		Use of big data and analytics	51		Software piracy	33	
Attitudes toward globalization	52		Knowledge transfer	37				

# JAPAN

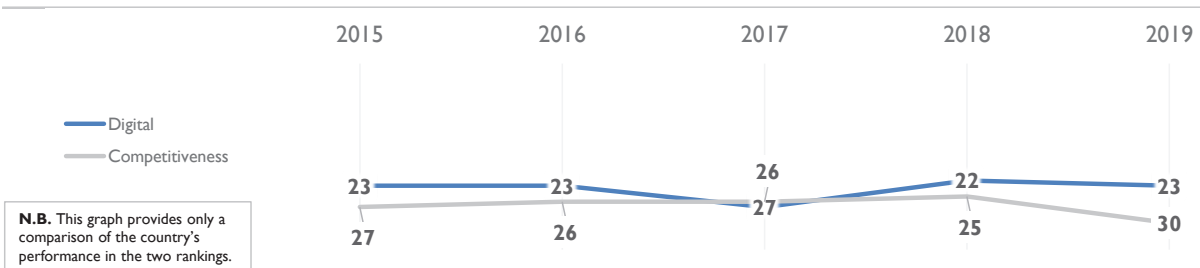
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	23	23	27	22	23
Knowledge	24	23	29	18	25
Technology	21	19	23	23	24
Future readiness	22	23	25	25	24

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	31	30	41	36	46
Training & education	27	28	31	14	19
Scientific concentration	14	14	16	12	11

Talent	Rank
Educational assessment PISA - Math	4
▷ International experience	63
Foreign highly-skilled personnel	51
Management of cities	11
▷ Digital/Technological skills	60
Net flow of international students	25

Training & education	Rank
Employee training	15
Total public expenditure on education	55
Higher education achievement	6
► Pupil-teacher ratio (tertiary education)	1
Graduates in Sciences	42
Women with degrees	8

Scientific concentration	Rank
Total expenditure on R&D (%)	6
Total R&D personnel per capita	16
Female researchers	54
R&D productivity by publication	15
Scientific and technical employment	36
High-tech patent grants	4
Robots in Education and R&D	4

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	39	37	37	40	42
Capital	26	29	33	33	37
Technological framework	3	3	6	4	2

Regulatory framework	Rank
Starting a business	42
Enforcing contracts	38
Immigration laws	56
Development and application of techn	37
Scientific research legislation	41
Intellectual property rights	31

Capital	Rank
IT & media stock market capitalization	17
Funding for technological development	32
Banking and financial services	45
Country credit rating	31
Venture capital	36
Investment in Telecommunications	57

Technological framework	Rank
Communications technology	36
► Mobile Broadband subscribers	1
► Wireless broadband	2
Internet users	5
Internet bandwidth speed	14
High-tech exports (%)	21

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	13	15	14	13	15
Business agility	35	33	57	55	41
IT integration	10	15	18	15	18

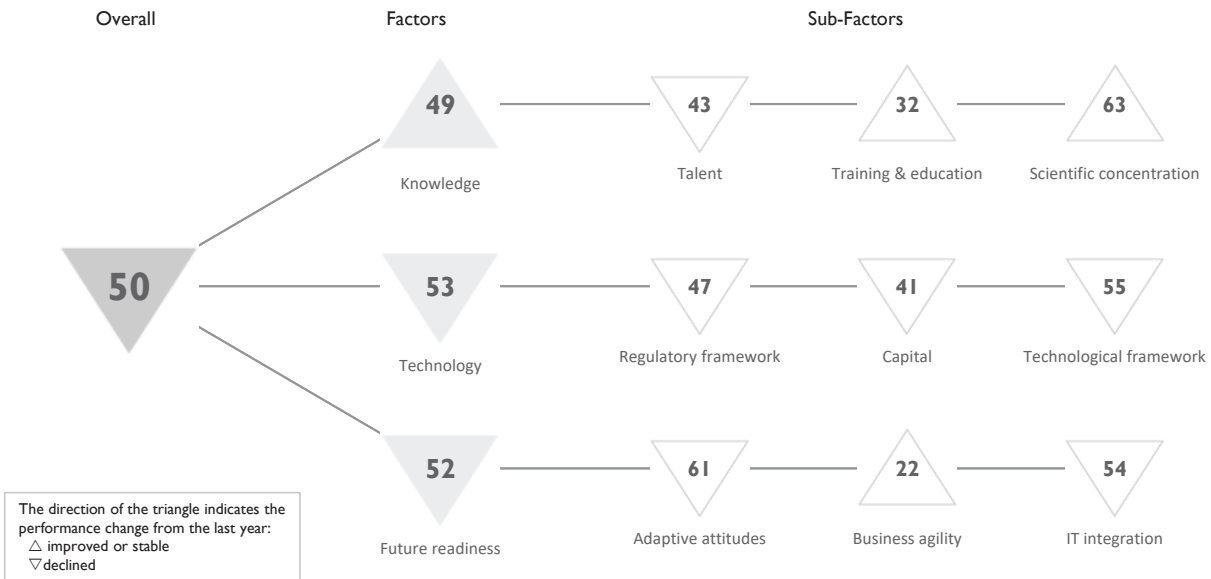
Adaptive attitudes	Rank
E-Participation	5
Internet retailing	16
Tablet possession	24
Smartphone possession	19
Attitudes toward globalization	44

Business agility	Rank
▷ Opportunities and threats	63
► World robots distribution	2
▷ Agility of companies	63
▷ Use of big data and analytics	63
Knowledge transfer	45

IT integration	Rank
E-Government	10
Public-private partnerships	37
Cyber security	41
► Software piracy	2

# JORDAN

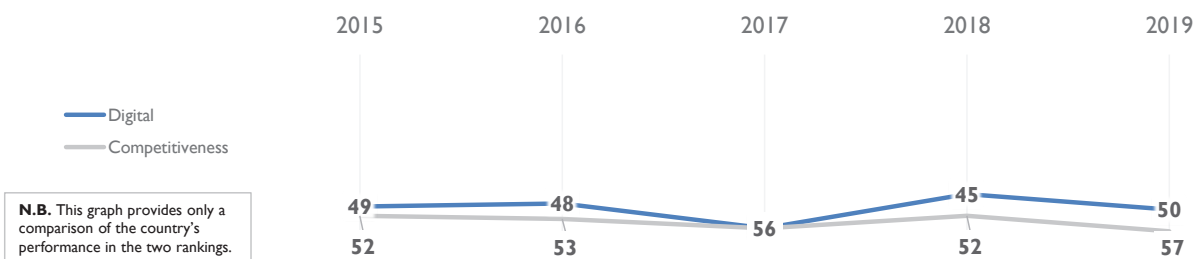
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	49	48	56	45	50
Knowledge	61	59	61	56	49
Technology	49	45	50	48	53
Future readiness	38	37	48	41	52

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	45	40	55	39	43
Training & education	60	59	58	41	32
Scientific concentration	60	61	62	63	63

Talent		Rank	Training & education		Rank	Scientific concentration		Rank
Educational assessment PISA - Math	55		Employee training	31		Total expenditure on R&D (%)	56	
▶ International experience	16		Total public expenditure on education	50		Total R&D personnel per capita	56	
Foreign highly-skilled personnel	36		Higher education achievement	-		Female researchers	52	
Management of cities	44		Pupil-teacher ratio (tertiary education)	21		R&D productivity by publication	47	
Digital/Technological skills	28		▶ Graduates in Sciences	18		Scientific and technical employment	44	
▶ Net flow of international students	19		Women with degrees	-		High-tech patent grants	50	
						Robots in Education and R&D	-	

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	45	50	53	43	47
Capital	29	24	30	39	41
Technological framework	54	50	53	54	55

Regulatory framework		Rank	Capital		Rank	Technological framework		Rank
Starting a business	46		IT & media stock market capitalization	-		Communications technology	42	
Enforcing contracts	52		Funding for technological development	38		Mobile Broadband subscribers	30	
Immigration laws	47		Banking and financial services	30		Wireless broadband	25	
Development and application of techn	31		Country credit rating	58		▷ Internet users	60	
Scientific research legislation	36		Venture capital	24		Internet bandwidth speed	48	
Intellectual property rights	41		Investment in Telecommunications	27		▷ High-tech exports (%)	62	

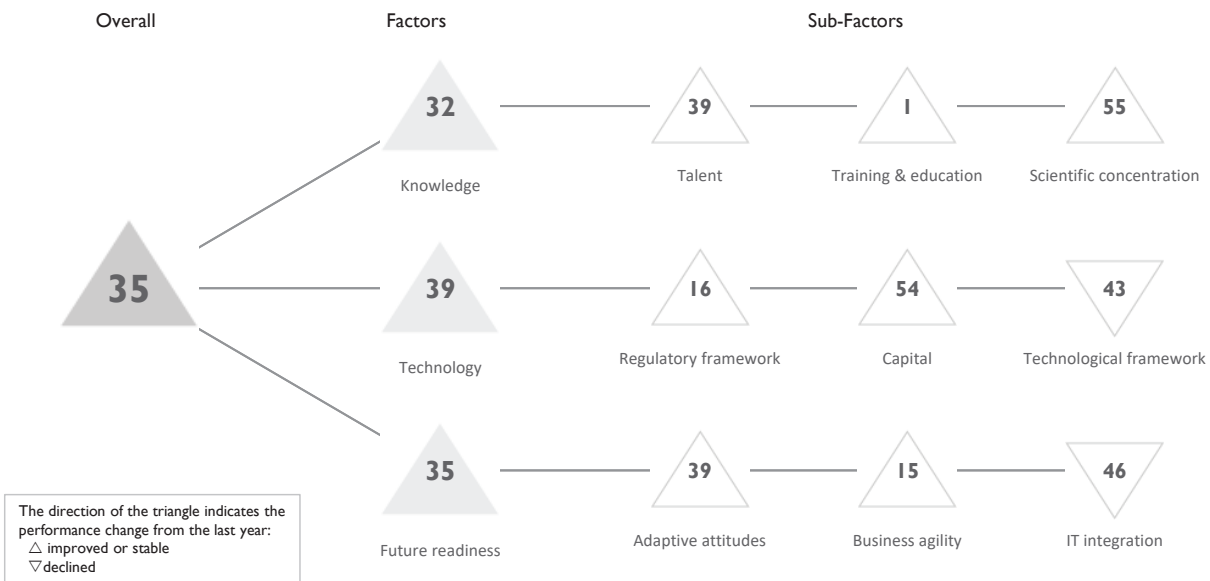
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	44	43	55	58	61
Business agility	28	31	34	23	22
IT integration	48	40	50	42	54

Adaptive attitudes		Rank	Business agility		Rank	IT integration		Rank
▷ E-Participation	60		Opportunities and threats	32		▷ E-Government	59	
▷ Internet retailing	60		World robots distribution	-		Public-private partnerships	30	
Tablet possession	58		Agility of companies	31		▶ Cyber security	19	
Smartphone possession	26		▶ Use of big data and analytics	5		Software piracy	46	
Attitudes toward globalization	37		Knowledge transfer	29				

# KAZAKHSTAN

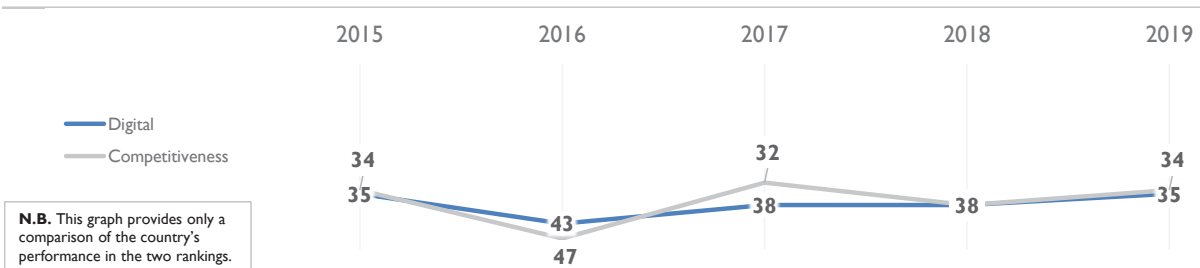
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	35	43	38	38	35
Knowledge	41	47	40	35	32
Technology	34	42	35	39	39
Future readiness	35	41	38	40	35

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## KAZAKHSTAN

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	37	45	36	44	39
Training & education	25	31	21	6	1
Scientific concentration	55	55	56	55	55

**Talent** Rank

Educational assessment PISA - Math	39
International experience	26
Foreign highly-skilled personnel	23
Management of cities	28
Digital/Technological skills	51

## ▷ Net flow of international students 58

**Training & education** Rank

Employee training	7
Total public expenditure on education	52
► Higher education achievement	1
Pupil-teacher ratio (tertiary education)	25
Graduates in Sciences	33
▷ Women with degrees	1

**Scientific concentration** Rank

▷ Total expenditure on R&D (%)	61
Total R&D personnel per capita	50
► Female researchers	2
R&D productivity by publication	29
Scientific and technical employment	43
▷ High-tech patent grants	62
Robots in Education and R&D	-

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	25	27	18	22	16
Capital	50	56	51	59	54
Technological framework	32	37	35	42	43

**Regulatory framework** Rank

Starting a business	21
► Enforcing contracts	4
Immigration laws	17
Development and application of techn	25
Scientific research legislation	30
Intellectual property rights	40

**Capital** Rank

IT & media stock market capitalization	-
Funding for technological development	26
Banking and financial services	37
Country credit rating	47
Venture capital	41
▷ Investment in Telecommunications	62

**Technological framework** Rank

Communications technology	46
Mobile Broadband subscribers	37
Wireless broadband	53
Internet users	52
Internet bandwidth speed	47
High-tech exports (%)	8

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	41	41	48	47	39
Business agility	29	36	27	43	15
IT integration	40	45	39	44	46

**Adaptive attitudes** Rank

E-Participation	38
Internet retailing	53
Tablet possession	43
Smartphone possession	30
Attitudes toward globalization	31

**Business agility** Rank

Opportunities and threats	22
World robots distribution	-
Agility of companies	20
► Use of big data and analytics	4
Knowledge transfer	27

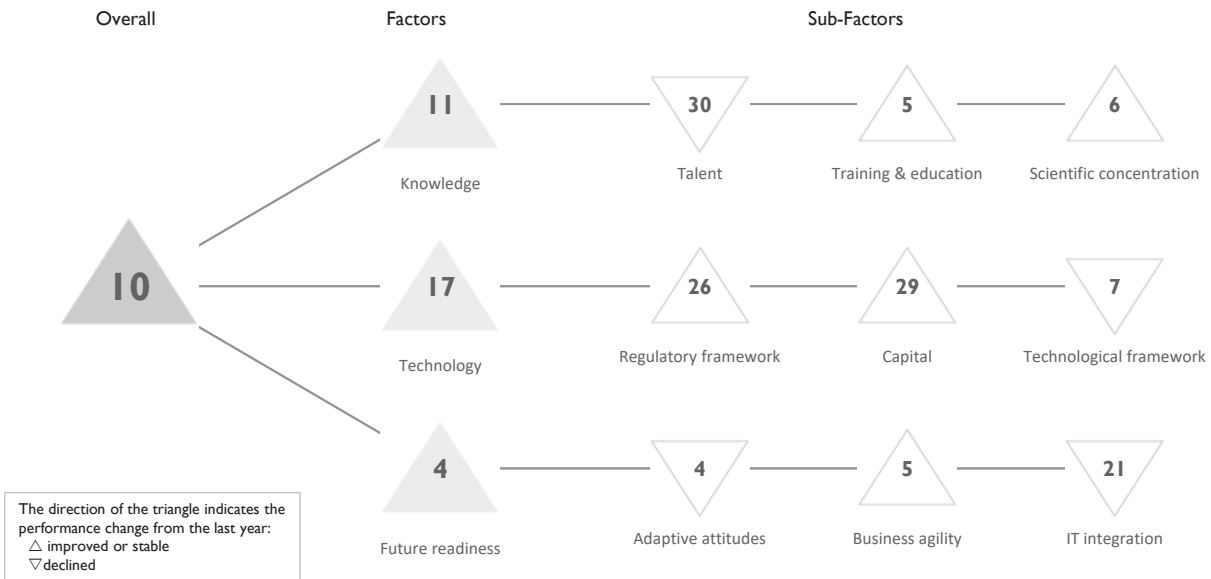
**IT integration** Rank

E-Government	33
Public-private partnerships	21
Cyber security	42
▷ Software piracy	59



# KOREA REP.

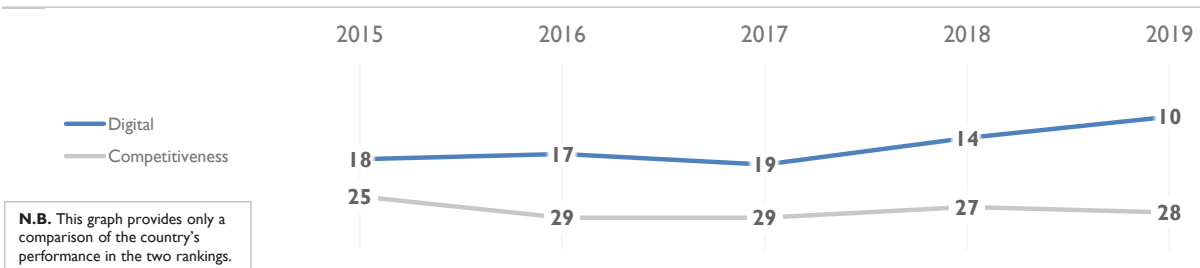
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	18	17	19	14	10
Knowledge	13	15	14	11	11
Technology	16	13	17	17	17
Future readiness	24	25	24	17	4

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## KOREA REP.

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	23	27	25	26	30
Training & education	10	14	13	8	5
Scientific concentration	9	8	9	7	6

Talent	Rank
Educational assessment PISA - Math	6
▷ International experience	52
Foreign highly-skilled personnel	49
Management of cities	17
Digital/Technological skills	26
Net flow of international students	50

Training & education	Rank
Employee training	33
Total public expenditure on education	22
Higher education achievement	3
Pupil-teacher ratio (tertiary education)	34
Graduates in Sciences	9
Women with degrees	20

Scientific concentration	Rank
► Total expenditure on R&D (%)	1
Total R&D personnel per capita	5
▷ Female researchers	53
R&D productivity by publication	25
Scientific and technical employment	30
High-tech patent grants	3
Robots in Education and R&D	13

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	23	28	28	27	26
Capital	32	35	41	44	29
Technological framework	2	2	2	2	7

Regulatory framework	Rank
Starting a business	7
► Enforcing contracts	2
▷ Immigration laws	61
▷ Development and application of techn	50
Scientific research legislation	34
Intellectual property rights	37

Capital	Rank
IT & media stock market capitalization	3
Funding for technological development	42
▷ Banking and financial services	54
Country credit rating	19
Venture capital	48
Investment in Telecommunications	46

Technological framework	Rank
Communications technology	12
Mobile Broadband subscribers	10
Wireless broadband	19
Internet users	16
► Internet bandwidth speed	2
High-tech exports (%)	19

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	8	8	10	3	4
Business agility	38	43	48	47	5
IT integration	17	21	23	20	21

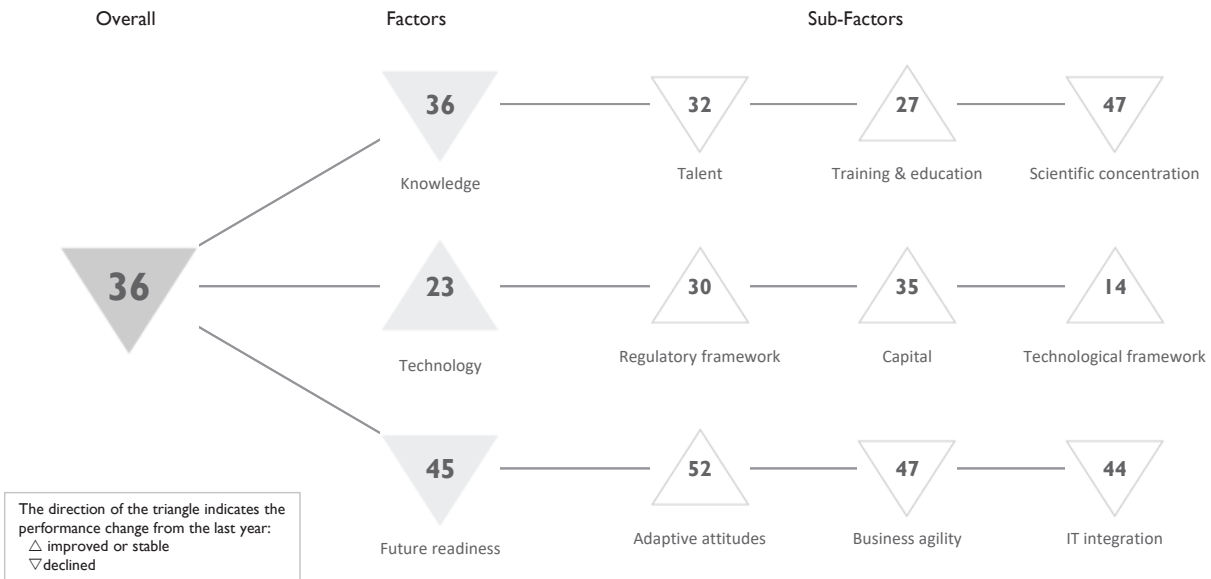
Adaptive attitudes	Rank
► E-Participation	1
► Internet retailing	1
Tablet possession	13
Smartphone possession	17
Attitudes toward globalization	19

Business agility	Rank
Opportunities and threats	43
World robots distribution	3
Agility of companies	28
Use of big data and analytics	40
Knowledge transfer	35

IT integration	Rank
E-Government	3
Public-private partnerships	41
Cyber security	23
Software piracy	20

# LATVIA

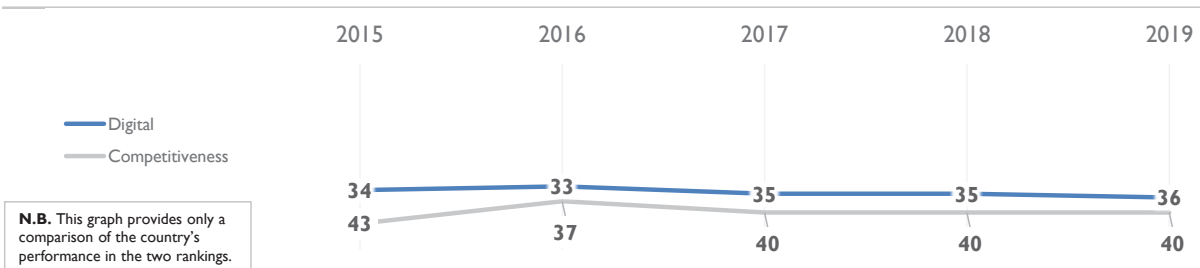
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	34	33	35	35	36
Knowledge	32	33	34	34	36
Technology	32	33	32	32	23
Future readiness	37	39	41	39	45

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	30	28	29	28	32
Training & education	14	12	20	28	27
Scientific concentration	49	48	47	46	47

Talent	Rank
Educational assessment PISA - Math	32
International experience	32
Foreign highly-skilled personnel	41
Management of cities	34
Digital/Technological skills	18
Net flow of international students	33

Training & education	Rank
Employee training	42
► Total public expenditure on education	12
Higher education achievement	33
Pupil-teacher ratio (tertiary education)	18
Graduates in Sciences	44
Women with degrees	22

Scientific concentration	Rank
Total expenditure on R&D (%)	50
Total R&D personnel per capita	37
► Female researchers	5
▷ R&D productivity by publication	53
Scientific and technical employment	28
High-tech patent grants	31
Robots in Education and R&D	49

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	37	35	34	31	30
Capital	39	45	31	36	35
Technological framework	29	23	24	26	14

Regulatory framework	Rank
Starting a business	14
Enforcing contracts	19
Immigration laws	49
Development and application of techn	23
Scientific research legislation	43
Intellectual property rights	35

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	25
Banking and financial services	43
Country credit rating	36
Venture capital	33
Investment in Telecommunications	32

Technological framework	Rank
► Communications technology	10
Mobile Broadband subscribers	24
► Wireless broadband	11
► Internet users	14
Internet bandwidth speed	21
High-tech exports (%)	14

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	35	38	46	52	52
Business agility	43	46	41	41	47
IT integration	34	38	36	37	44

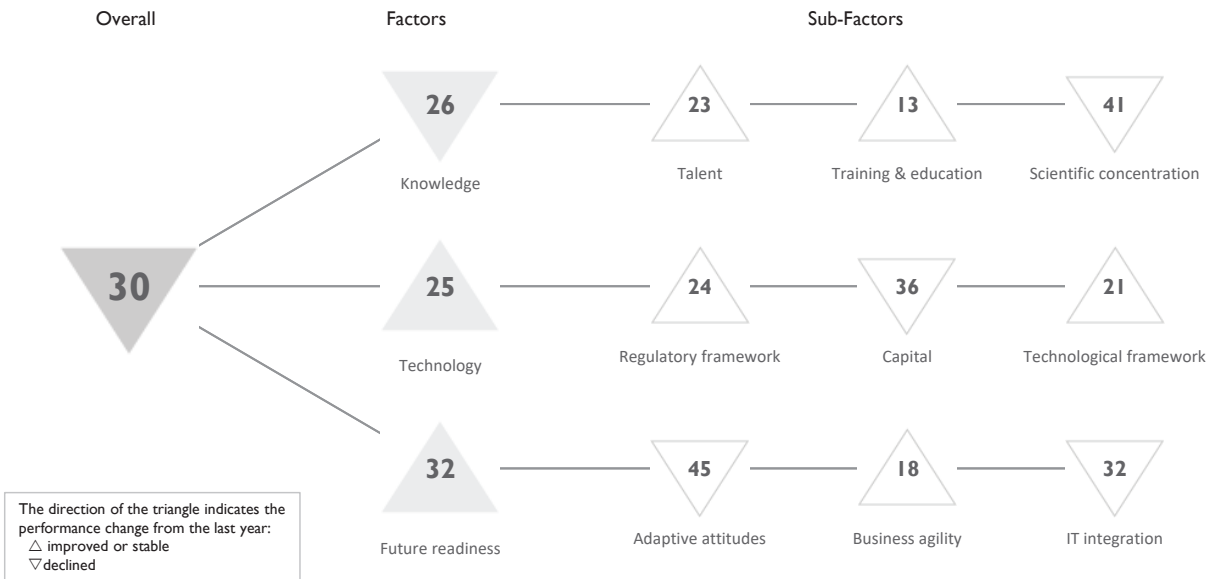
Adaptive attitudes	Rank
▷ E-Participation	53
Internet retailing	34
Tablet possession	34
▷ Smartphone possession	52
Attitudes toward globalization	38

Business agility	Rank
Opportunities and threats	35
▷ World robots distribution	56
Agility of companies	33
Use of big data and analytics	42
Knowledge transfer	48

IT integration	Rank
E-Government	47
▷ Public-private partnerships	52
Cyber security	31
Software piracy	40

# LITHUANIA

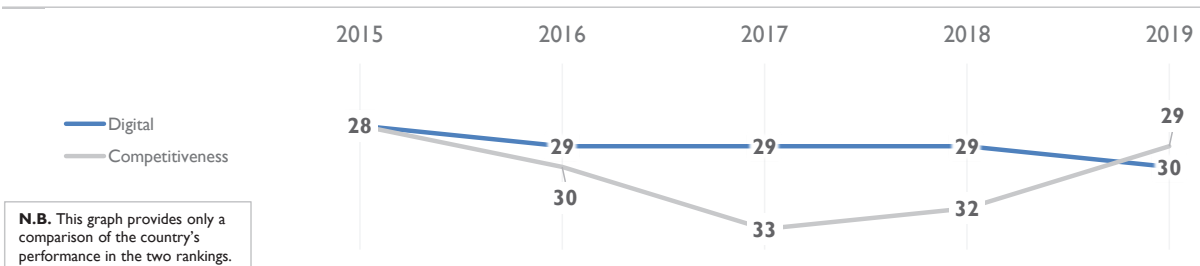
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	28	29	29	29	30
Knowledge	18	18	21	23	26
Technology	28	29	29	30	25
Future readiness	34	33	31	33	32

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	28	29	33	27	23
Training & education	3	5	6	16	13
Scientific concentration	25	24	28	31	41

**Talent** Rank

Educational assessment PISA - Math	33
International experience	15
Foreign highly-skilled personnel	39
Management of cities	27
► Digital/Technological skills	1
▷ Net flow of international students	54

**Training & education** Rank

Employee training	21
Total public expenditure on education	26
Higher education achievement	11
Pupil-teacher ratio (tertiary education)	12
Graduates in Sciences	29
Women with degrees	16

**Scientific concentration** Rank

Total expenditure on R&D (%)	41
Total R&D personnel per capita	31
► Female researchers	6
▷ R&D productivity by publication	55
Scientific and technical employment	32
High-tech patent grants	30
Robots in Education and R&D	46

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	28	24	27	28	24
Capital	30	37	42	35	36
Technological framework	28	25	17	22	21

**Regulatory framework** Rank

Starting a business	18
► Enforcing contracts	7
▷ Immigration laws	53
Development and application of techn	30
Scientific research legislation	27
Intellectual property rights	27

**Capital** Rank

IT & media stock market capitalization	-
Funding for technological development	28
Banking and financial services	38
Country credit rating	33
Venture capital	21
▷ Investment in Telecommunications	48

**Technological framework** Rank

► Communications technology	4
Mobile Broadband subscribers	34
Wireless broadband	39
Internet users	32
Internet bandwidth speed	17
High-tech exports (%)	32

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	36	37	35	41	45
Business agility	42	39	28	24	18
IT integration	28	29	29	31	32

**Adaptive attitudes** Rank

E-Participation	45
Internet retailing	29
Tablet possession	46
▷ Smartphone possession	56
Attitudes toward globalization	28

**Business agility** Rank

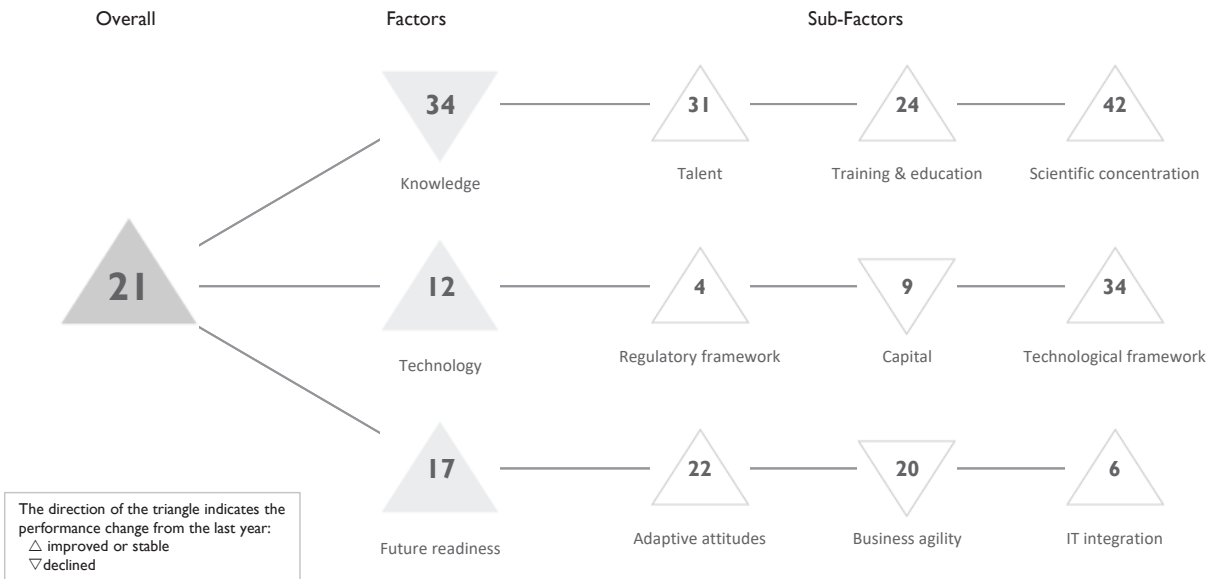
Opportunities and threats	7
World robots distribution	46
► Agility of companies	4
Use of big data and analytics	11
Knowledge transfer	25

**IT integration** Rank

E-Government	34
Public-private partnerships	25
Cyber security	15
Software piracy	43

# LUXEMBOURG

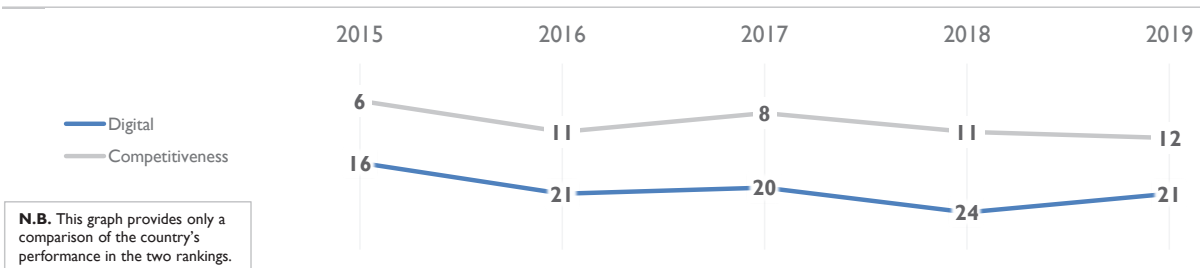
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	16	21	20	24	21
Knowledge	23	29	27	32	34
Technology	2	11	12	15	12
Future readiness	23	24	23	21	17

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## LUXEMBOURG

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	27	33	31	33	31
Training & education	13	29	30	26	24
Scientific concentration	27	25	23	44	42

**Talent** Rank

Educational assessment PISA - Math	31
International experience	8
Foreign highly-skilled personnel	6
Management of cities	12
Digital/Technological skills	37
▷ Net flow of international students	60

**Training & education** Rank

Employee training	12
Total public expenditure on education	30
Higher education achievement	15
Pupil-teacher ratio (tertiary education)	7
▷ Graduates in Sciences	55
Women with degrees	24

**Scientific concentration** Rank

Total expenditure on R&D (%)	31
Total R&D personnel per capita	6
Female researchers	44
▷ R&D productivity by publication	61
Scientific and technical employment	26
High-tech patent grants	23
Robots in Education and R&D	-

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	4	8	10	9	4
Capital	1	3	3	4	9
Technological framework	22	28	32	35	34

**Regulatory framework** Rank

Starting a business	35
Enforcing contracts	14
► Immigration laws	2
Development and application of technc	16
► Scientific research legislation	4
Intellectual property rights	16

**Capital** Rank

► IT & media stock market capitalization	1
Funding for technological development	14
Banking and financial services	21
► Country credit rating	1
Venture capital	29
▷ Investment in Telecommunications	54

**Technological framework** Rank

Communications technology	16
▷ Mobile Broadband subscribers	55
Wireless broadband	40
Internet users	9
Internet bandwidth speed	9
High-tech exports (%)	51

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	34	34	33	29	22
Business agility	17	19	16	17	20
IT integration	7	12	5	13	6

**Adaptive attitudes** Rank

E-Participation	19
Internet retailing	-
Tablet possession	-
Smartphone possession	-
Attitudes toward globalization	26

**Business agility** Rank

Opportunities and threats	21
World robots distribution	-
Agility of companies	14
Use of big data and analytics	32
Knowledge transfer	21

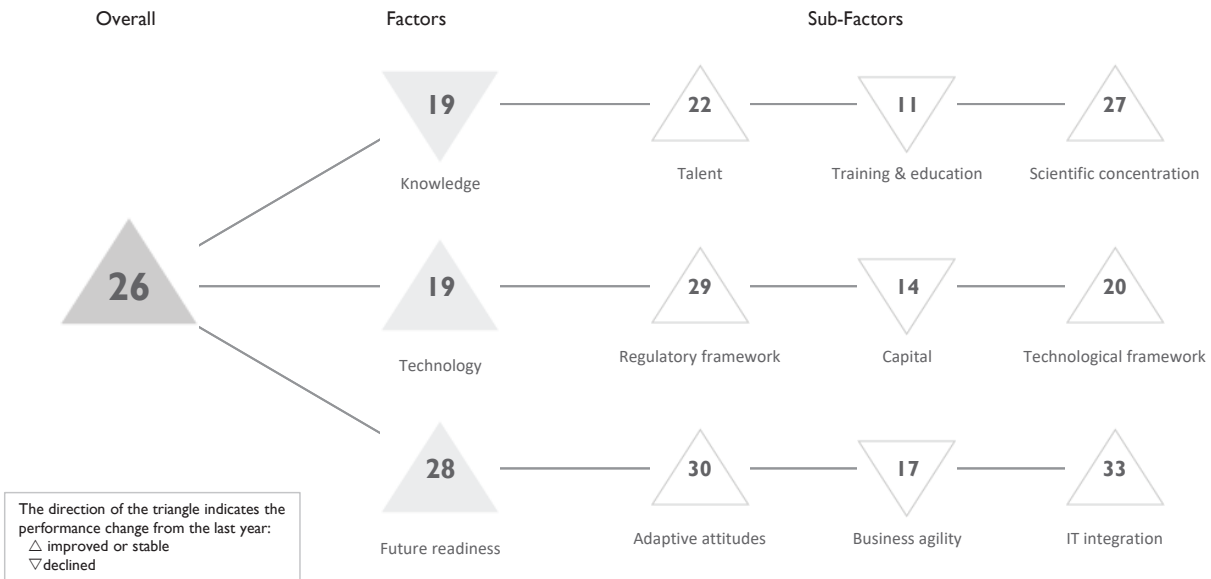
**IT integration** Rank

E-Government	18
Public-private partnerships	13
Cyber security	9
► Software piracy	4



# MALAYSIA

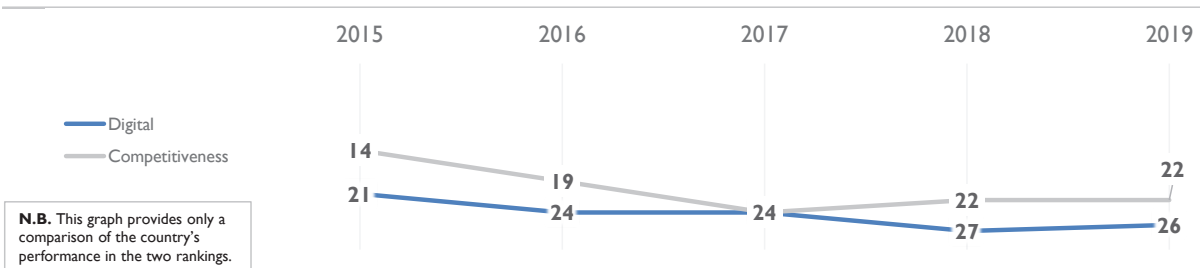
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	21	24	24	27	26
Knowledge	25	22	17	17	19
Technology	14	16	18	22	19
Future readiness	27	28	27	29	28

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	26	26	27	24	22
Training & education	17	11	3	10	11
Scientific concentration	28	27	26	30	27

Talent		Rank	Training & education		Rank	Scientific concentration		Rank
▷	Educational assessment PISA - Math	41	Employee training		18	Total expenditure on R&D (%)		24
	International experience	12	Total public expenditure on education		33	Total R&D personnel per capita		36
	Foreign highly-skilled personnel	16	Higher education achievement		37	Female researchers		10
	Management of cities	20	Pupil-teacher ratio (tertiary education)		29	R&D productivity by publication		27
	Digital/Technological skills	21	▶ Graduates in Sciences		6	▷ Scientific and technical employment		41
	Net flow of international students	23	▶ Women with degrees		4	High-tech patent grants		18
						Robots in Education and R&D		19

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	21	21	30	29	29
Capital	7	7	9	12	14
Technological framework	17	21	19	32	20

Regulatory framework		Rank	Capital		Rank	Technological framework		Rank
▷	Starting a business	52	IT & media stock market capitalization		22	Communications technology		38
	Enforcing contracts	28	Funding for technological development		18	Mobile Broadband subscribers		29
	Immigration laws	19	Banking and financial services		19	Wireless broadband		15
	Development and application of techn	20	Country credit rating		36	Internet users		41
	Scientific research legislation	25	Venture capital		20	Internet bandwidth speed		36
	Intellectual property rights	28	▶ Investment in Telecommunications		6	▶ High-tech exports (%)		4

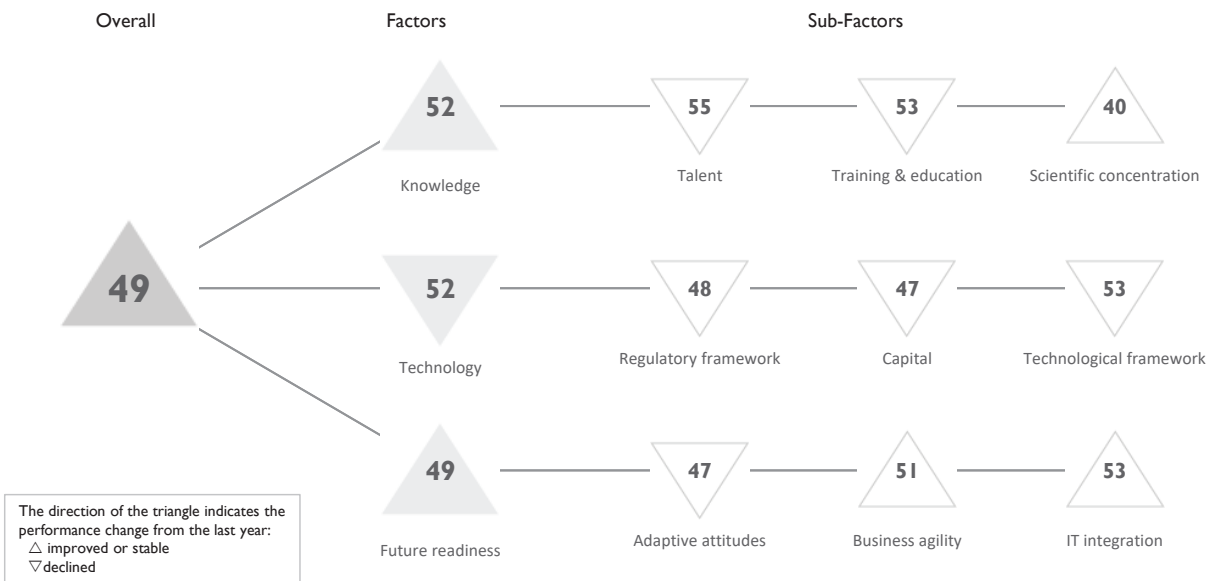
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	27	29	28	30	30
Business agility	15	17	12	15	17
IT integration	29	30	34	35	33

Adaptive attitudes		Rank	Business agility		Rank	IT integration		Rank
	E-Participation	31	Opportunities and threats		14	E-Government		40
▷	Internet retailing	48	World robots distribution		22	▶ Public-private partnerships		9
	Tablet possession	26	Agility of companies		19	Cyber security		20
	Smartphone possession	27	Use of big data and analytics		9	▷ Software piracy		45
	Attitudes toward globalization	16	Knowledge transfer		20			

# MEXICO

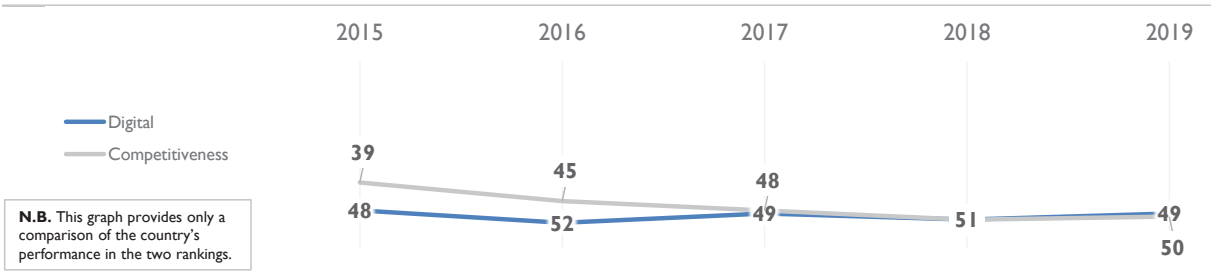
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

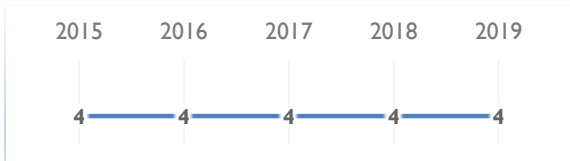
	2015	2016	2017	2018	2019
OVERALL	48	52	49	51	49
Knowledge	51	52	54	54	52
Technology	47	49	48	46	52
Future readiness	54	56	50	50	49

### COMPETITIVENESS & DIGITAL RANKINGS

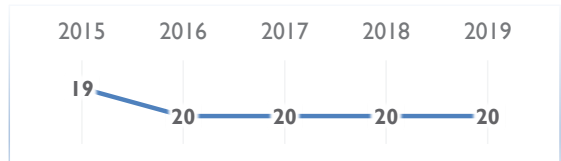


### PEER GROUPS RANKINGS

#### THE AMERICAS (9 countries)



#### POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	44	51	53	52	55
Training & education	43	42	44	51	53
Scientific concentration	57	56	57	53	40

Talent	Rank
Educational assessment PISA - Math	50
International experience	22
Foreign highly-skilled personnel	31
Management of cities	55
▷ Digital/Technological skills	58
Net flow of international students	36

Training & education	Rank
Employee training	49
Total public expenditure on education	56
Higher education achievement	53
▶ Pupil-teacher ratio (tertiary education)	15
Graduates in Sciences	22
Women with degrees	52

Scientific concentration	Rank
Total expenditure on R&D (%)	53
Total R&D personnel per capita	54
Female researchers	30
▶ R&D productivity by publication	16
Scientific and technical employment	-
High-tech patent grants	52
▶ Robots in Education and R&D	11

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	41	42	39	45	48
Capital	40	44	45	42	47
Technological framework	51	52	52	50	53

Regulatory framework	Rank
Starting a business	43
Enforcing contracts	33
Immigration laws	35
Development and application of techn	56
Scientific research legislation	55
Intellectual property rights	53

Capital	Rank
▶ IT & media stock market capitalization	16
Funding for technological development	56
Banking and financial services	52
Country credit rating	40
Venture capital	53
Investment in Telecommunications	36

Technological framework	Rank
▷ Communications technology	58
Mobile Broadband subscribers	39
▷ Wireless broadband	58
Internet users	57
Internet bandwidth speed	53
High-tech exports (%)	17

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	53	53	40	40	47
Business agility	57	58	55	57	51
IT integration	45	49	52	53	53

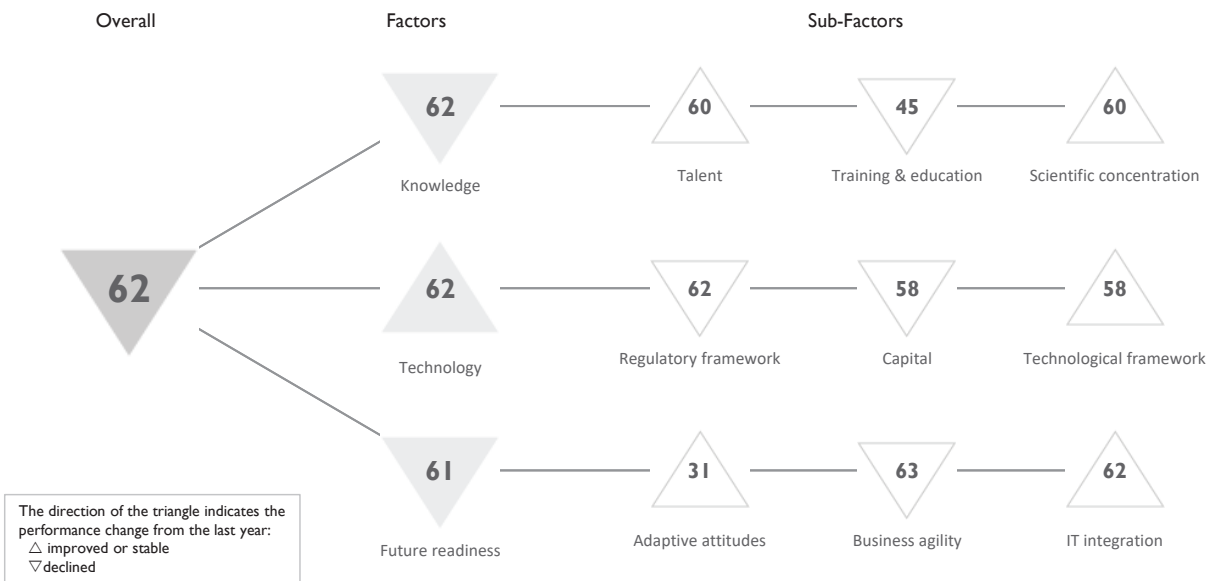
Adaptive attitudes	Rank
E-Participation	17
Internet retailing	49
Tablet possession	49
Smartphone possession	56
Attitudes toward globalization	35

Business agility	Rank
▷ Opportunities and threats	58
▶ World robots distribution	11
Agility of companies	53
Use of big data and analytics	56
Knowledge transfer	53

IT integration	Rank
E-Government	49
Public-private partnerships	47
▷ Cyber security	59
Software piracy	42

# MONGOLIA

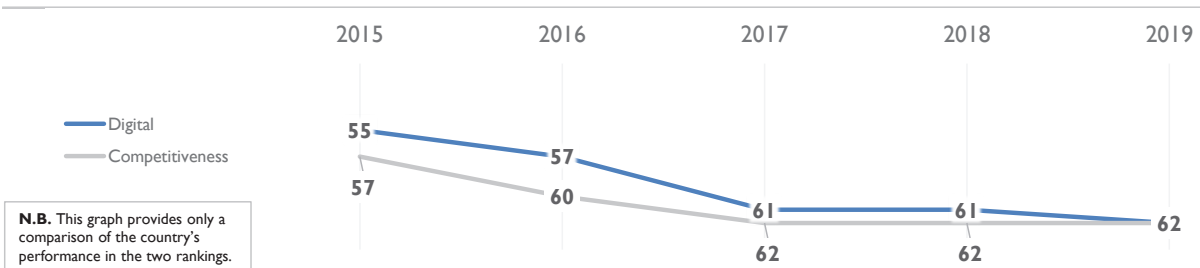
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

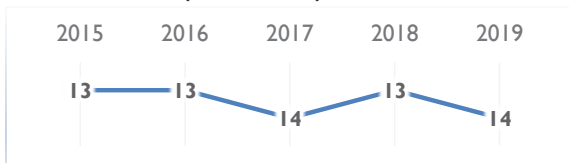
	2015	2016	2017	2018	2019
OVERALL	55	57	61	61	62
Knowledge	56	55	59	53	62
Technology	54	55	61	62	62
Future readiness	46	52	60	59	61

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	56	57	62	60	60
Training & education	35	36	38	24	45
Scientific concentration	59	60	60	60	60

Talent	Rank
Educational assessment PISA - Math	-
International experience	61
Foreign highly-skilled personnel	56
Management of cities	62
Digital/Technological skills	56
Net flow of international students	56

Training & education	Rank
► Employee training	24
Total public expenditure on education	34
Higher education achievement	44
Pupil-teacher ratio (tertiary education)	46
Graduates in Sciences	48
Women with degrees	32

Scientific concentration	Rank
Total expenditure on R&D (%)	60
Total R&D personnel per capita	47
► Female researchers	9
▷ R&D productivity by publication	62
Scientific and technical employment	46
▷ High-tech patent grants	63
Robots in Education and R&D	-

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	50	53	57	58	62
Capital	54	52	61	55	58
Technological framework	53	53	59	61	58

Regulatory framework	Rank
Starting a business	41
Enforcing contracts	44
Immigration laws	54
Development and application of techn	61
Scientific research legislation	62
Intellectual property rights	62

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	62
Banking and financial services	60
Country credit rating	61
Venture capital	60
► Investment in Telecommunications	3

Technological framework	Rank
Communications technology	56
Mobile Broadband subscribers	58
Wireless broadband	45
▷ Internet users	62
Internet bandwidth speed	50
► High-tech exports (%)	15

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	30	32	39	31	31
Business agility	48	54	63	61	63
IT integration	58	58	62	62	62

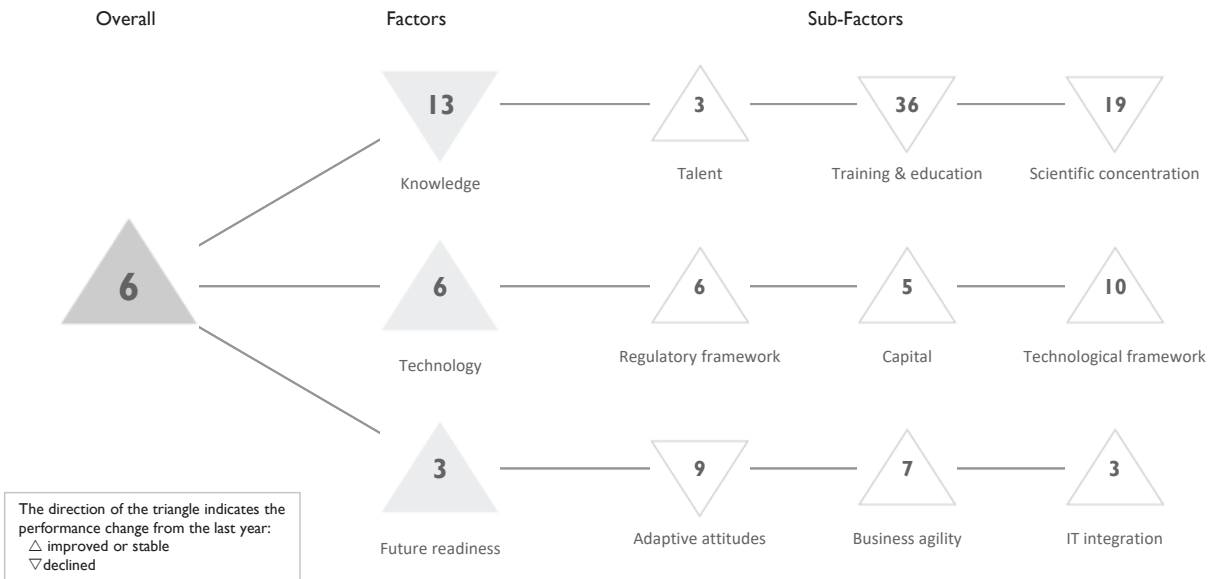
Adaptive attitudes	Rank
E-Participation	48
Internet retailing	-
Tablet possession	-
► Smartphone possession	6
Attitudes toward globalization	56

Business agility	Rank
Opportunities and threats	61
World robots distribution	-
Agility of companies	61
Use of big data and analytics	57
▷ Knowledge transfer	63

IT integration	Rank
E-Government	57
Public-private partnerships	62
▷ Cyber security	63
Software piracy	-

# NETHERLANDS

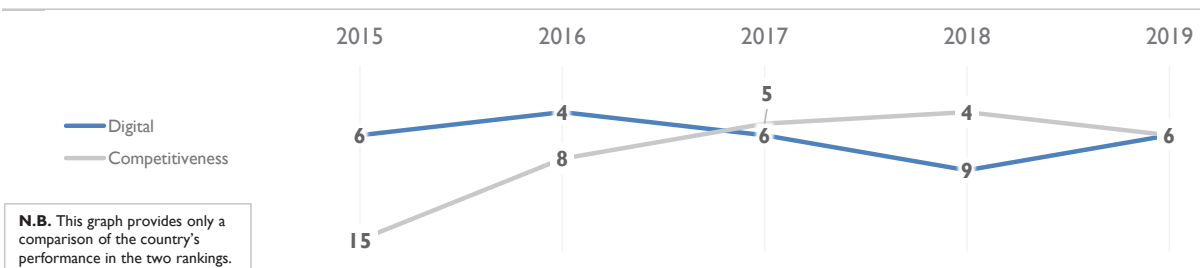
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	6	4	6	9	6
Knowledge	14	13	11	12	13
Technology	15	10	9	8	6
Future readiness	1	2	3	4	3

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## NETHERLANDS

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	5	4	3	3	3
Training & education	33	33	32	31	36
Scientific concentration	15	16	18	16	19

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	10	Employee training	8	Total expenditure on R&D (%)	17
► International experience	3	Total public expenditure on education	18	Total R&D personnel per capita	12
Foreign highly-skilled personnel	4	Higher education achievement	22	▷ Female researchers	48
Management of cities	4	Pupil-teacher ratio (tertiary education)	24	R&D productivity by publication	24
Digital/Technological skills	5	▷ Graduates in Sciences	60	Scientific and technical employment	12
Net flow of international students	9	Women with degrees	30	High-tech patent grants	16
				Robots in Education and R&D	27

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	17	14	9	10	6
Capital	12	9	5	7	5
Technological framework	16	13	14	14	10

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	12	IT & media stock market capitalization	8	► Communications technology	3
▷ Enforcing contracts	46	Funding for technological development	6	Mobile Broadband subscribers	15
► Immigration laws	3	Banking and financial services	5	▷ Wireless broadband	34
Development and application of techn	5	► Country credit rating	1	Internet users	4
Scientific research legislation	9	Venture capital	4	Internet bandwidth speed	8
Intellectual property rights	5	▷ Investment in Telecommunications	44	High-tech exports (%)	12

## FUTURE READINESS

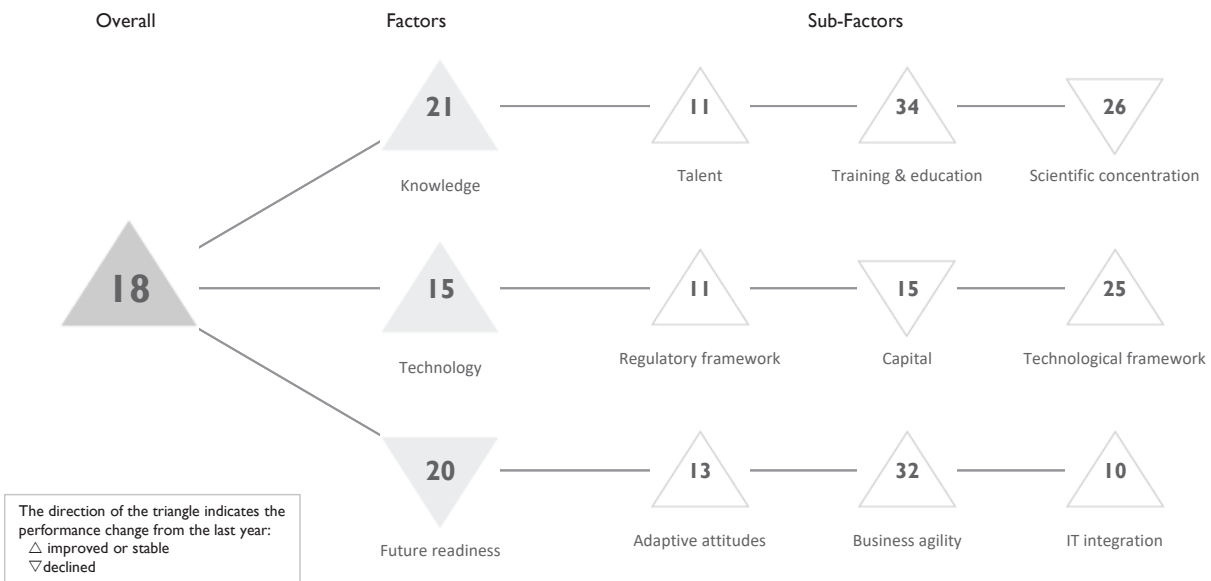
Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	3	3	5	7	9
Business agility	3	2	7	12	7
IT integration	5	2	3	7	3

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	4	Opportunities and threats	10	E-Government	13
Internet retailing	6	World robots distribution	18	Public-private partnerships	3
Tablet possession	13	Agility of companies	10	Cyber security	8
Smartphone possession	24	Use of big data and analytics	10	Software piracy	13
Attitudes toward globalization	6	► Knowledge transfer	2		



# NEW ZEALAND

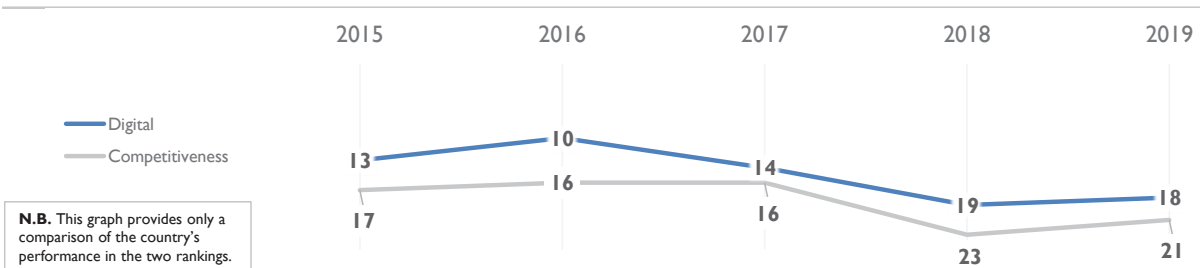
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	13	10	14	19	18
Knowledge	15	14	20	21	21
Technology	8	6	11	16	15
Future readiness	16	15	20	18	20

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## NEW ZEALAND

- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	9	9	14	16	11
Training & education	30	32	36	37	34
Scientific concentration	18	17	20	15	26

**Talent** Rank

Educational assessment PISA - Math	20
International experience	24
Foreign highly-skilled personnel	15
Management of cities	33
Digital/Technological skills	35
▶ Net flow of international students	2

**Training & education** Rank

Employee training	36
Total public expenditure on education	16
Higher education achievement	28
Pupil-teacher ratio (tertiary education)	38
Graduates in Sciences	40
Women with degrees	26

**Scientific concentration** Rank

Total expenditure on R&D (%)	29
Total R&D personnel per capita	22
Female researchers	-
▷ R&D productivity by publication	43
▶ Scientific and technical employment	1
▷ High-tech patent grants	48
▷ Robots in Education and R&D	46

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	2	1	7	13	11
Capital	3	4	4	14	15
Technological framework	23	20	20	25	25

**Regulatory framework** Rank

▶ Starting a business	1
Enforcing contracts	20
Immigration laws	22
Development and application of techn	14
Scientific research legislation	21
Intellectual property rights	20

**Capital** Rank

IT & media stock market capitalization	24
Funding for technological development	34
Banking and financial services	12
Country credit rating	14
Venture capital	35
Investment in Telecommunications	12

**Technological framework** Rank

Communications technology	27
Mobile Broadband subscribers	31
Wireless broadband	21
Internet users	23
Internet bandwidth speed	20
▷ High-tech exports (%)	42

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	22	24	20	14	13
Business agility	16	14	26	35	32
IT integration	8	6	17	17	10

**Adaptive attitudes** Rank

▶ E-Participation	5
Internet retailing	18
Tablet possession	19
Smartphone possession	17
Attitudes toward globalization	21

**Business agility** Rank

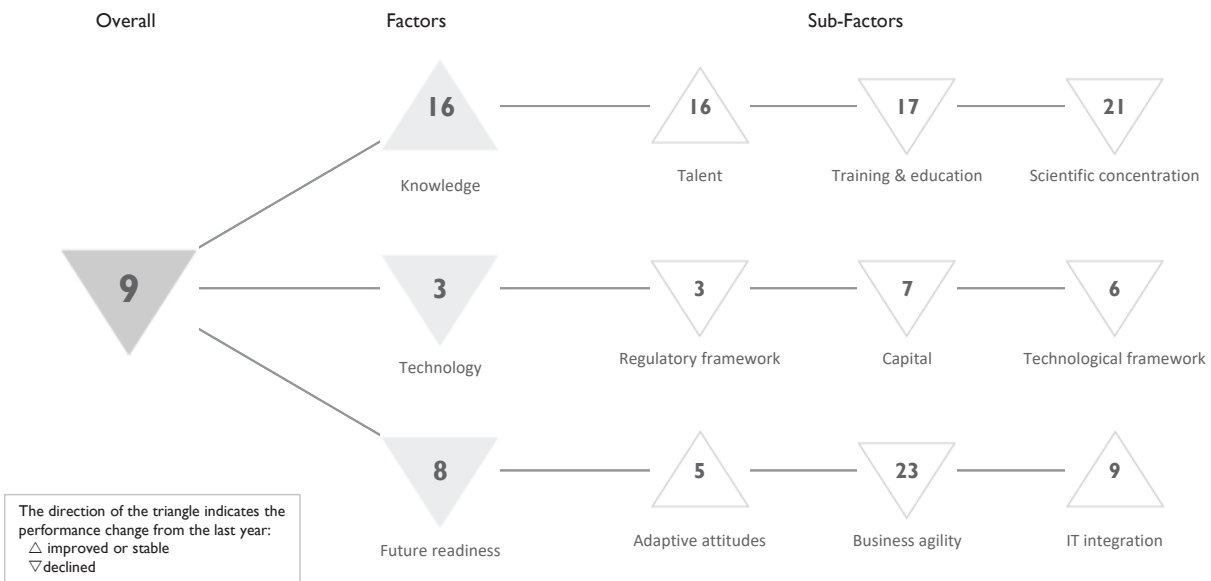
Opportunities and threats	26
▷ World robots distribution	42
Agility of companies	29
Use of big data and analytics	21
Knowledge transfer	23

**IT integration** Rank

E-Government	8
Public-private partnerships	32
Cyber security	25
▶ Software piracy	2

# NORWAY

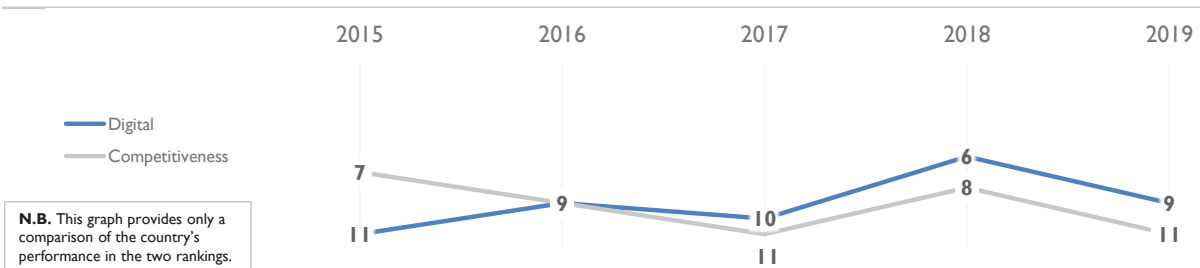
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	11	9	10	6	9
Knowledge	17	17	15	16	16
Technology	3	3	2	2	3
Future readiness	14	13	12	6	8

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	16	20	20	20	16
Training & education	11	15	12	11	17
Scientific concentration	24	23	22	20	21

**Talent** Rank

Educational assessment PISA - Math	18
International experience	18
Foreign highly-skilled personnel	12
Management of cities	10
Digital/Technological skills	12

## ▷ Net flow of international students 53

**Training & education** Rank

Employee training	6
Total public expenditure on education	15
Higher education achievement	17
Pupil-teacher ratio (tertiary education)	9
Graduates in Sciences	45
Women with degrees	15

**Scientific concentration** Rank

Total expenditure on R&D (%)	16
Total R&D personnel per capita	8
Female researchers	24
R&D productivity by publication	45
Scientific and technical employment	15
High-tech patent grants	29
Robots in Education and R&D	30

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	1	5	3	1	3
Capital	11	8	7	2	7
Technological framework	7	4	3	3	6

**Regulatory framework** Rank

Starting a business	12
Enforcing contracts	3
Immigration laws	8
Development and application of techn	13
Scientific research legislation	12
Intellectual property rights	15

**Capital** Rank

IT & media stock market capitalization	11
Funding for technological development	12
Banking and financial services	10
Country credit rating	1
Venture capital	10
Investment in Telecommunications	31

**Technological framework** Rank

Communications technology	19
Mobile Broadband subscribers	7
Wireless broadband	17
Internet users	2
Internet bandwidth speed	4
High-tech exports (%)	13

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	7	7	8	8	5
Business agility	27	28	20	14	23
IT integration	14	9	14	9	9

**Adaptive attitudes** Rank

E-Participation	11
Internet retailing	7
Tablet possession	5
Smartphone possession	3
Attitudes toward globalization	23

**Business agility** Rank

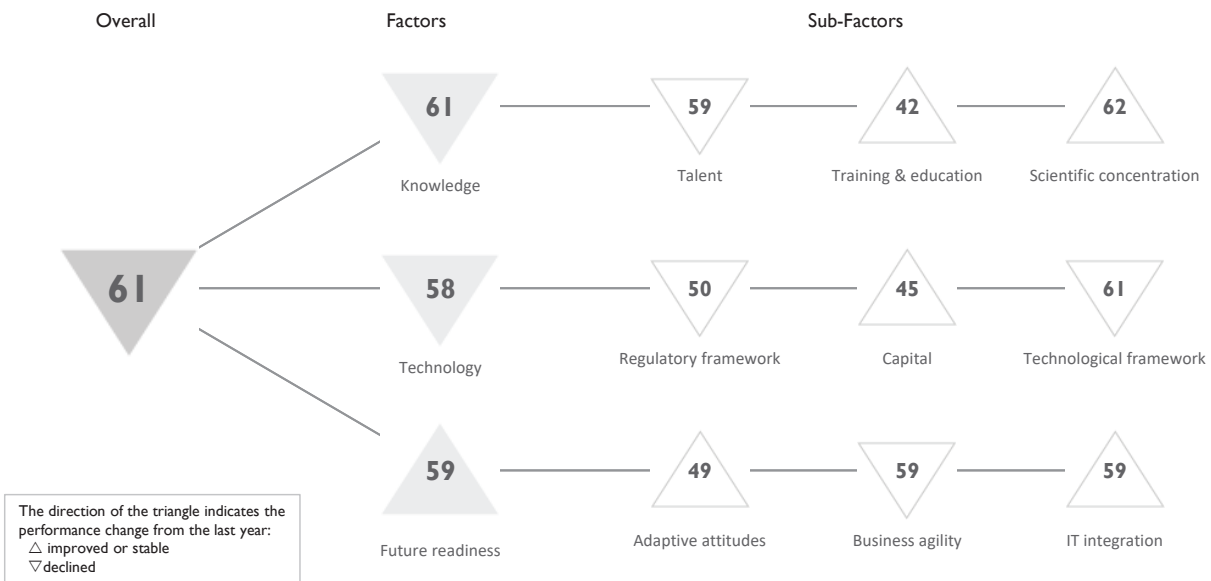
Opportunities and threats	17
World robots distribution	41
Agility of companies	11
Use of big data and analytics	15
Knowledge transfer	18

**IT integration** Rank

E-Government	14
Public-private partnerships	10
Cyber security	24
Software piracy	10

# PERU

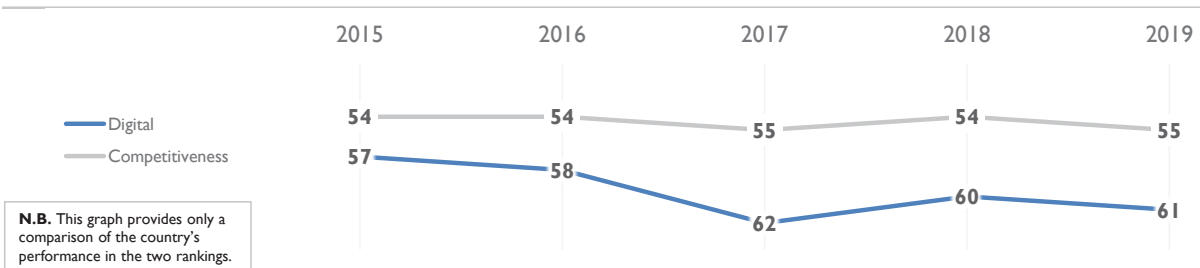
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	57	58	62	60	61
Knowledge	58	61	62	60	61
Technology	52	53	57	57	58
Future readiness	56	55	58	60	59

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### THE AMERICAS (9 countries)



#### POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	58	60	61	58	59
Training & education	58	58	60	43	42
Scientific concentration		59	63	62	62

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	53	▷ Employee training	61	▷ Total expenditure on R&D (%)	62
International experience	44	Total public expenditure on education	42	Total R&D personnel per capita	58
▶ Foreign highly-skilled personnel	26	▶ Higher education achievement	7	Female researchers	39
▷ Management of cities	61	Pupil-teacher ratio (tertiary education)	43	R&D productivity by publication	36
Digital/Technological skills	59	Graduates in Sciences	30	Scientific and technical employment	52
Net flow of international students	-	Women with degrees	37	▷ High-tech patent grants	61
				Robots in Education and R&D	43

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	48	49	51	49	50
Capital	38	40	48	47	45
Technological framework	58	60	61	59	61

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	54	IT & media stock market capitalization	34	Communications technology	59
Enforcing contracts	45	Funding for technological development	58	Mobile Broadband subscribers	52
▶ Immigration laws	6	Banking and financial services	44	Wireless broadband	59
Development and application of techn	58	Country credit rating	39	Internet users	55
Scientific research legislation	57	Venture capital	42	Internet bandwidth speed	56
Intellectual property rights	54	▶ Investment in Telecommunications	20	High-tech exports (%)	57

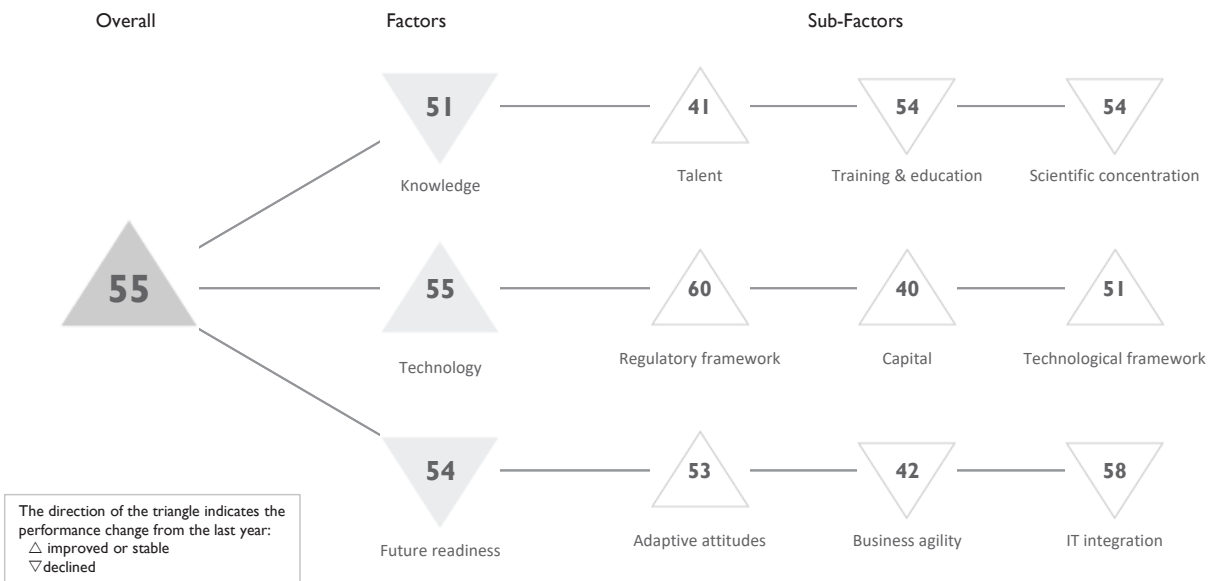
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	50	52	61	59	49
Business agility	53	49	50	50	59
IT integration	55	56	59	59	59

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	34	Opportunities and threats	51	E-Government	55
Internet retailing	57	World robots distribution	54	Public-private partnerships	50
Tablet possession	54	Agility of companies	49	▷ Cyber security	61
Smartphone possession	47	Use of big data and analytics	59	Software piracy	53
▶ Attitudes toward globalization	20	Knowledge transfer	54		

# PHILIPPINES

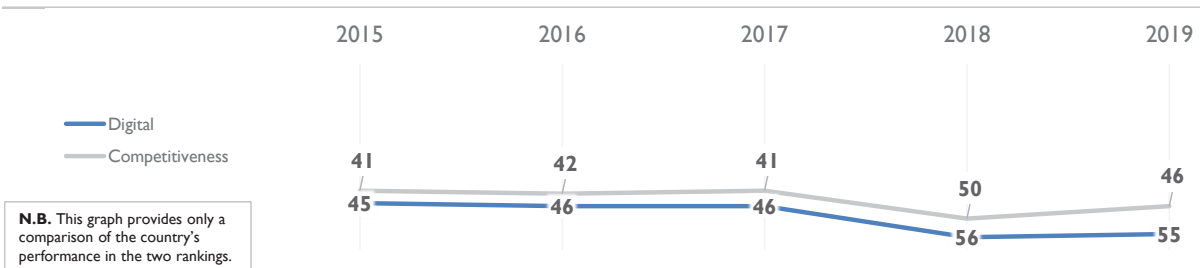
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	45	46	46	56	55
Knowledge	49	50	53	50	51
Technology	50	50	51	58	55
Future readiness	40	40	43	52	54

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## PHILIPPINES

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	32	32	39	48	41
Training & education	57	55	54	52	54
Scientific concentration	46	49	53	50	54

Talent	Rank
Educational assessment PISA - Math	-
International experience	31
Foreign highly-skilled personnel	32
Management of cities	53
Digital/Technological skills	48
Net flow of international students	35

Training & education	Rank
Employee training	27
Total public expenditure on education	49
Higher education achievement	54
Pupil-teacher ratio (tertiary education)	55
▶ Graduates in Sciences	13
▶ Women with degrees	49

Scientific concentration	Rank
▷ Total expenditure on R&D (%)	59
Total R&D personnel per capita	57
▶ Female researchers	7
R&D productivity by publication	34
Scientific and technical employment	48
▶ High-tech patent grants	12
Robots in Education and R&D	52

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	58	59	62	61	60
Capital	33	28	29	43	40
Technological framework	47	48	50	52	51

Regulatory framework	Rank
▷ Starting a business	62
▷ Enforcing contracts	61
Immigration laws	20
Development and application of techn	46
Scientific research legislation	46
Intellectual property rights	56

Capital	Rank
IT & media stock market capitalization	40
Funding for technological development	53
Banking and financial services	29
Country credit rating	43
Venture capital	43
▶ Investment in Telecommunications	15

Technological framework	Rank
▷ Communications technology	62
Mobile Broadband subscribers	51
Wireless broadband	41
Internet users	58
▷ Internet bandwidth speed	62
▶ High-tech exports (%)	1

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	48	46	50	60	53
Business agility	23	23	23	31	42
IT integration	56	57	57	57	58

Adaptive attitudes	Rank
E-Participation	19
Internet retailing	59
Tablet possession	55
Smartphone possession	58
Attitudes toward globalization	25

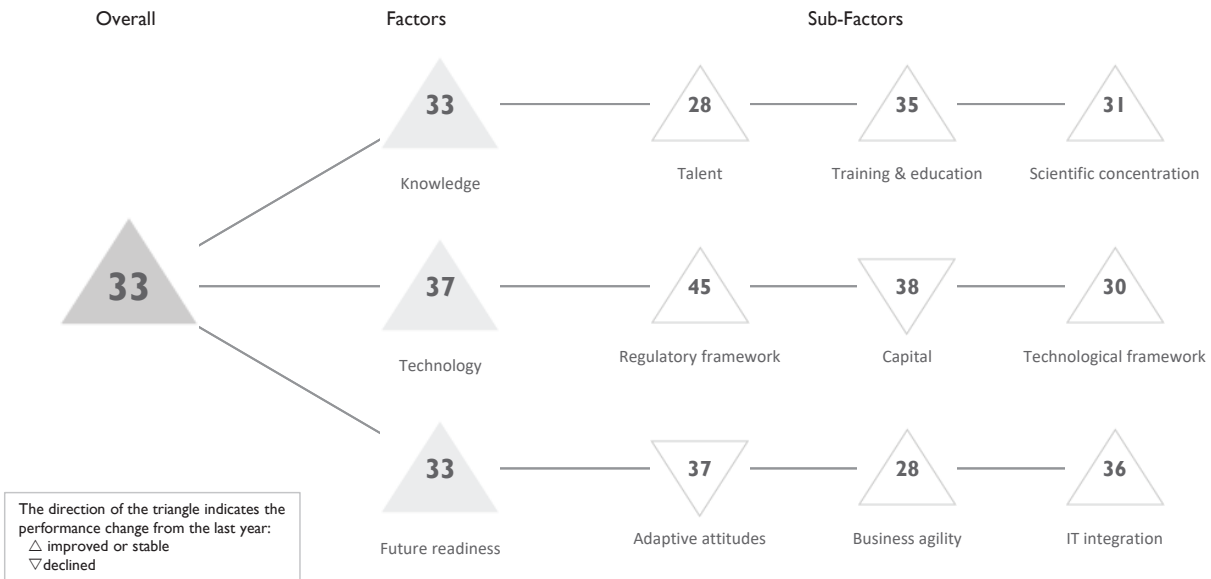
Business agility	Rank
Opportunities and threats	28
World robots distribution	40
Agility of companies	34
Use of big data and analytics	39
Knowledge transfer	41

IT integration	Rank
E-Government	54
Public-private partnerships	35
Cyber security	49
Software piracy	55



# POLAND

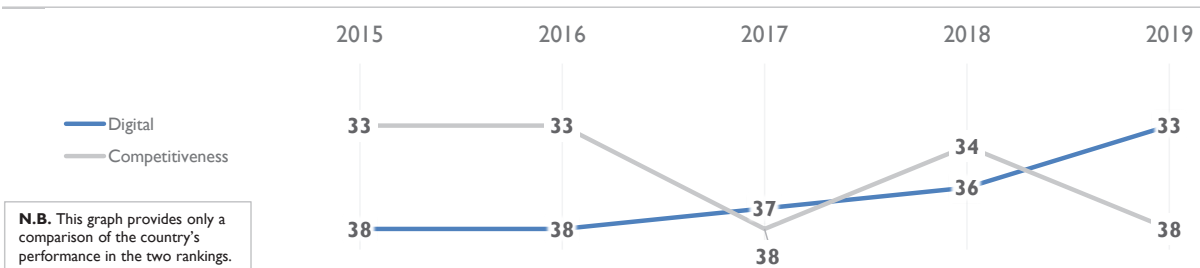
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	38	38	37	36	33
Knowledge	31	27	32	33	33
Technology	36	36	39	37	37
Future readiness	49	51	39	37	33

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	22	17	28	30	28
Training & education	34	22	23	35	35
Scientific concentration	41	39	40	38	31

**Talent** Rank

► Educational assessment PISA - Math	16
International experience	25
Foreign highly-skilled personnel	45
Management of cities	25
Digital/Technological skills	46
Net flow of international students	26

**Training & education** Rank

Employee training	23
Total public expenditure on education	25
Higher education achievement	29
Pupil-teacher ratio (tertiary education)	42
Graduates in Sciences	35
Women with degrees	33

**Scientific concentration** Rank

Total expenditure on R&D (%)	36
Total R&D personnel per capita	34
Female researchers	28
► R&D productivity by publication	12
Scientific and technical employment	33
High-tech patent grants	36
► Robots in Education and R&D	16

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	38	45	47	46	45
Capital	28	32	32	32	38
Technological framework	34	39	39	37	30

**Regulatory framework** Rank

▷ Starting a business	51
Enforcing contracts	39
▷ Immigration laws	50
Development and application of techn	42
Scientific research legislation	40
Intellectual property rights	38

**Capital** Rank

IT & media stock market capitalization	35
Funding for technological development	40
Banking and financial services	22
Country credit rating	34
Venture capital	23
Investment in Telecommunications	42

**Technological framework** Rank

Communications technology	39
Mobile Broadband subscribers	40
► Wireless broadband	3
Internet users	38
Internet bandwidth speed	30
High-tech exports (%)	45

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	52	51	38	33	37
Business agility	55	55	45	40	28
IT integration	41	41	41	40	36

**Adaptive attitudes** Rank

E-Participation	30
Internet retailing	33
Tablet possession	32
▷ Smartphone possession	46
▷ Attitudes toward globalization	51

**Business agility** Rank

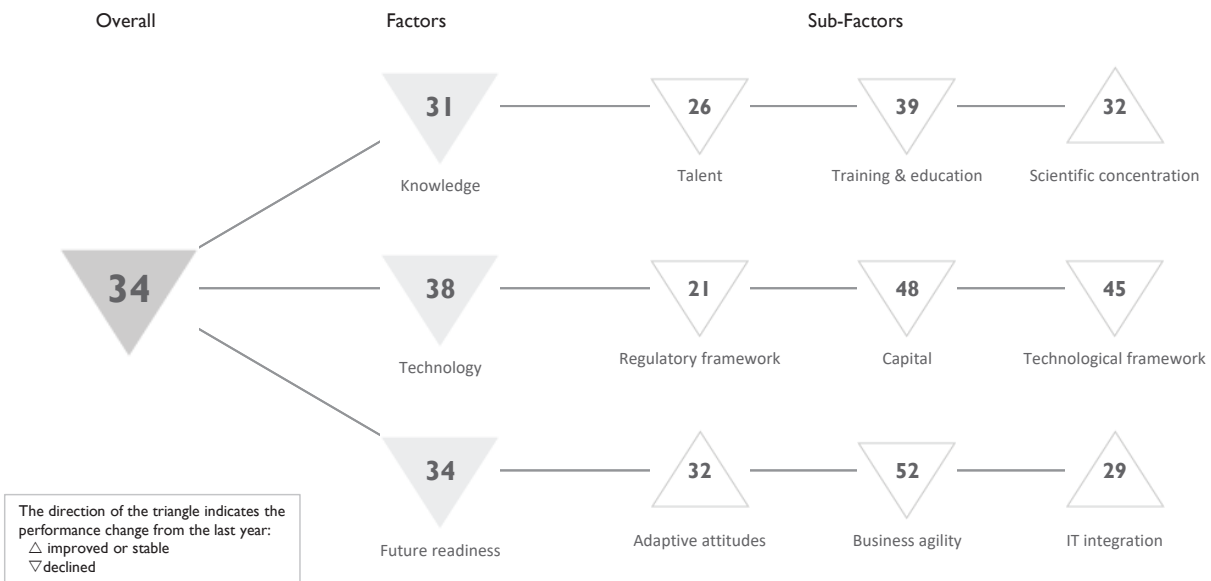
Opportunities and threats	27
World robots distribution	21
► Agility of companies	17
Use of big data and analytics	27
Knowledge transfer	38

**IT integration** Rank

E-Government	29
▷ Public-private partnerships	48
Cyber security	40
Software piracy	36

# PORTUGAL

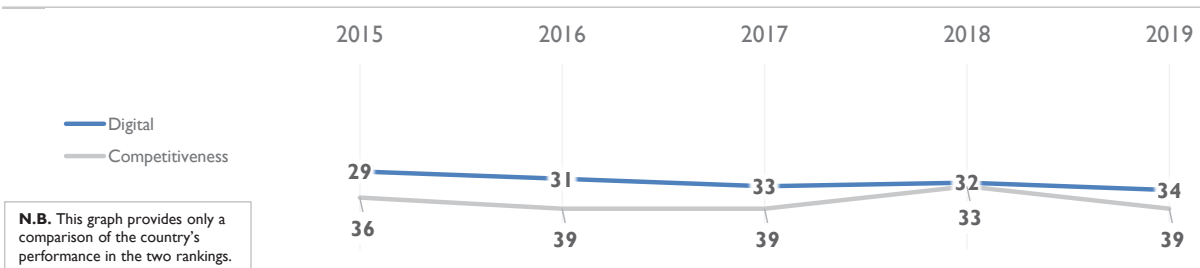
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	29	31	33	32	34
Knowledge	29	31	31	27	31
Technology	30	35	37	36	38
Future readiness	31	31	35	32	34

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	29	31	30	23	26
Training & education	20	21	18	27	39
Scientific concentration	37	35	36	34	32

**Talent** Rank

Educational assessment PISA - Math	27
▷ International experience	54
Foreign highly-skilled personnel	25
Management of cities	21
Digital/Technological skills	13
Net flow of international students	31

**Training & education** Rank

▷ Employee training	58
Total public expenditure on education	23
Higher education achievement	39
► Pupil-teacher ratio (tertiary education)	13
► Graduates in Sciences	11
Women with degrees	38

**Scientific concentration** Rank

Total expenditure on R&D (%)	27
Total R&D personnel per capita	24
Female researchers	18
R&D productivity by publication	31
Scientific and technical employment	31
High-tech patent grants	44
Robots in Education and R&D	34

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	20	20	19	19	21
Capital	44	50	50	45	48
Technological framework	40	38	43	39	45

**Regulatory framework** Rank

Starting a business	31
Enforcing contracts	29
► Immigration laws	5
Development and application of techn	19
Scientific research legislation	35
Intellectual property rights	33

**Capital** Rank

IT & media stock market capitalization	27
Funding for technological development	30
Banking and financial services	49
Country credit rating	49
Venture capital	44
Investment in Telecommunications	49

**Technological framework** Rank

► Communications technology	11
▷ Mobile Broadband subscribers	59
Wireless broadband	52
► Internet users	12
Internet bandwidth speed	22
▷ High-tech exports (%)	56

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	33	31	34	35	32
Business agility	25	27	40	27	52
IT integration	30	32	32	30	29

**Adaptive attitudes** Rank

E-Participation	29
Internet retailing	35
Tablet possession	33
Smartphone possession	43
Attitudes toward globalization	24

**Business agility** Rank

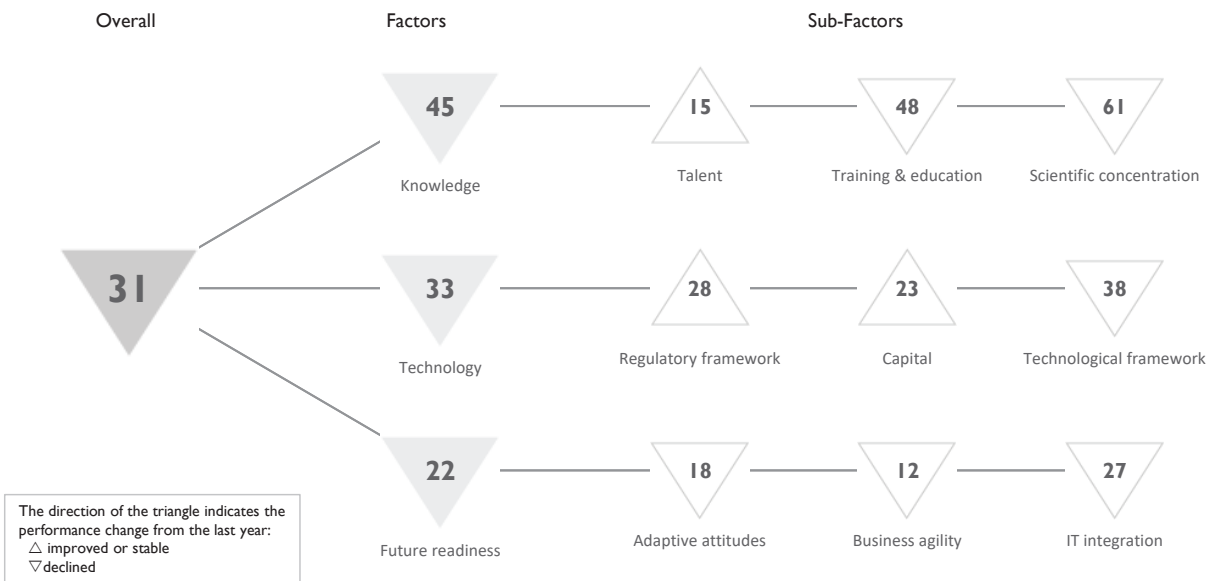
Opportunities and threats	52
World robots distribution	31
▷ Agility of companies	54
Use of big data and analytics	45
Knowledge transfer	33

**IT integration** Rank

E-Government	26
Public-private partnerships	33
Cyber security	43
Software piracy	28

# QATAR

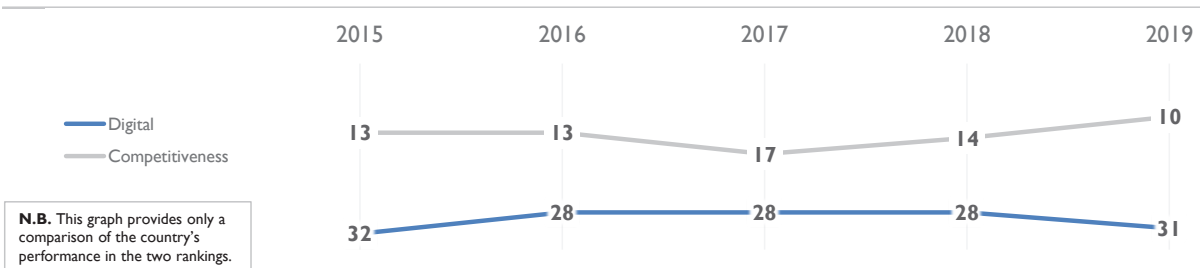
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	32	28	28	28	31
Knowledge	39	37	35	37	45
Technology	38	31	31	27	33
Future readiness	28	21	19	16	22

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	34	25	19	15	15
Training & education	24	27	24	38	48
Scientific concentration	53	54	55	59	61

Talent	Rank
Educational assessment PISA - Math	51
► International experience	4
Foreign highly-skilled personnel	9
Management of cities	8
Digital/Technological skills	6
Net flow of international students	17

Training & education	Rank
Employee training	16
▷ Total public expenditure on education	58
▷ Higher education achievement	56
Pupil-teacher ratio (tertiary education)	26
Graduates in Sciences	34
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	49
Total R&D personnel per capita	48
Female researchers	40
R&D productivity by publication	56
Scientific and technical employment	45
High-tech patent grants	35
Robots in Education and R&D	54

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	46	33	31	32	28
Capital	25	18	17	24	23
Technological framework	36	42	36	30	38

Regulatory framework	Rank
Starting a business	39
▷ Enforcing contracts	56
Immigration laws	15
Development and application of techn	9
Scientific research legislation	13
Intellectual property rights	22

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	8
Banking and financial services	17
Country credit rating	22
Venture capital	16
Investment in Telecommunications	56

Technological framework	Rank
Communications technology	13
Mobile Broadband subscribers	35
Wireless broadband	12
Internet users	36
Internet bandwidth speed	35
▷ High-tech exports (%)	61

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	10	12	15	16	18
Business agility	32	26	15	8	12
IT integration	37	28	27	26	27

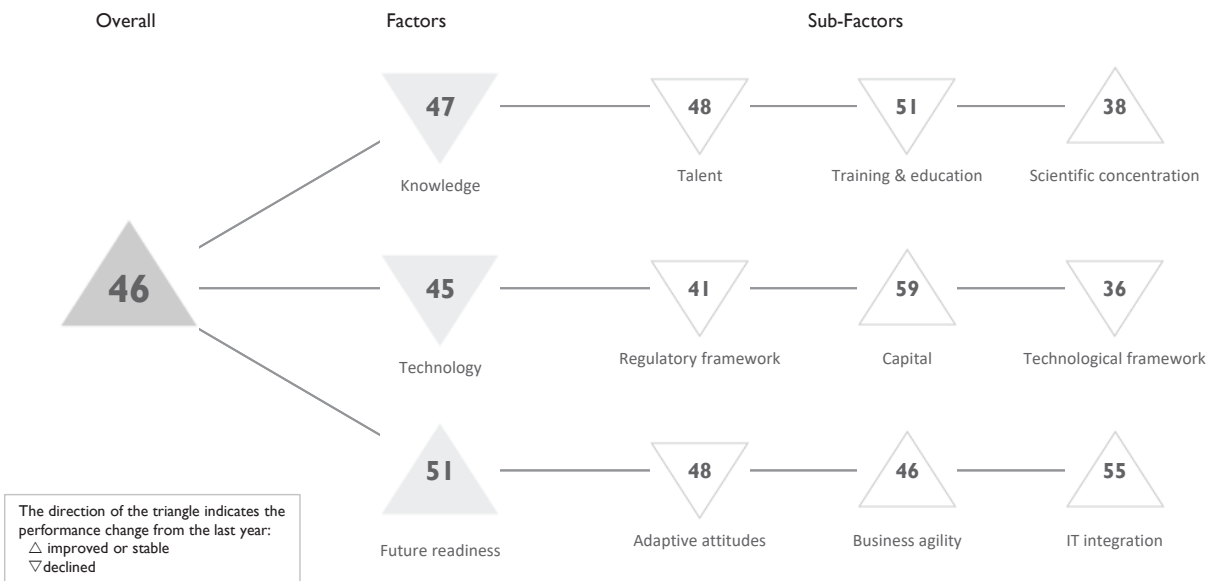
Adaptive attitudes	Rank
E-Participation	49
Internet retailing	47
► Tablet possession	1
► Smartphone possession	1
Attitudes toward globalization	15

Business agility	Rank
Opportunities and threats	6
▷ World robots distribution	58
Agility of companies	8
► Use of big data and analytics	2
Knowledge transfer	13

IT integration	Rank
E-Government	42
Public-private partnerships	7
► Cyber security	3
Software piracy	38

# ROMANIA

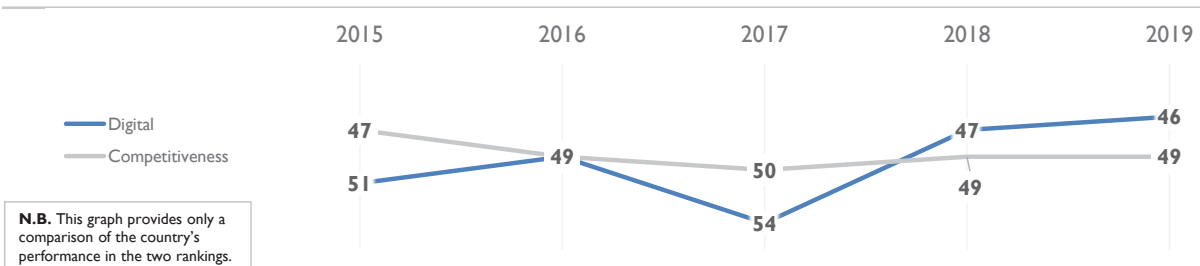
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

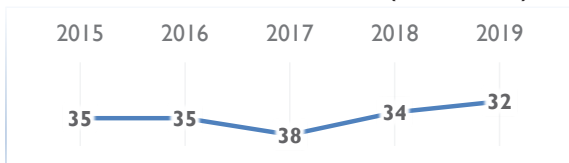
	2015	2016	2017	2018	2019
OVERALL	51	49	54	47	46
Knowledge	50	48	47	45	47
Technology	45	46	46	44	45
Future readiness	57	57	59	57	51

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	49	49	45	45	48
Training & education	48	45	52	50	51
Scientific concentration	43	42	41	43	38

Talent	Rank
Educational assessment PISA - Math	42
International experience	42
Foreign highly-skilled personnel	46
▷ Management of cities	59
Digital/Technological skills	23
Net flow of international students	44

Training & education	Rank
Employee training	43
▷ Total public expenditure on education	59
Higher education achievement	50
Pupil-teacher ratio (tertiary education)	49
▶ Graduates in Sciences	12
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	51
Total R&D personnel per capita	45
▶ Female researchers	13
▶ R&D productivity by publication	20
Scientific and technical employment	42
High-tech patent grants	27
Robots in Education and R&D	36

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	29	31	41	39	41
Capital	58	58	60	62	59
Technological framework	37	36	33	31	36

Regulatory framework	Rank
Starting a business	47
▶ Enforcing contracts	16
Immigration laws	45
Development and application of techn	48
Scientific research legislation	47
Intellectual property rights	45

Capital	Rank
IT & media stock market capitalization	47
Funding for technological development	45
▷ Banking and financial services	55
Country credit rating	51
Venture capital	51
Investment in Telecommunications	50

Technological framework	Rank
Communications technology	32
Mobile Broadband subscribers	47
Wireless broadband	43
Internet users	43
▶ Internet bandwidth speed	6
High-tech exports (%)	39

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	58	59	60	46	48
Business agility	59	56	60	60	46
IT integration	47	42	58	58	55

Adaptive attitudes	Rank
▷ E-Participation	51
Internet retailing	40
Tablet possession	36
Smartphone possession	39
Attitudes toward globalization	49

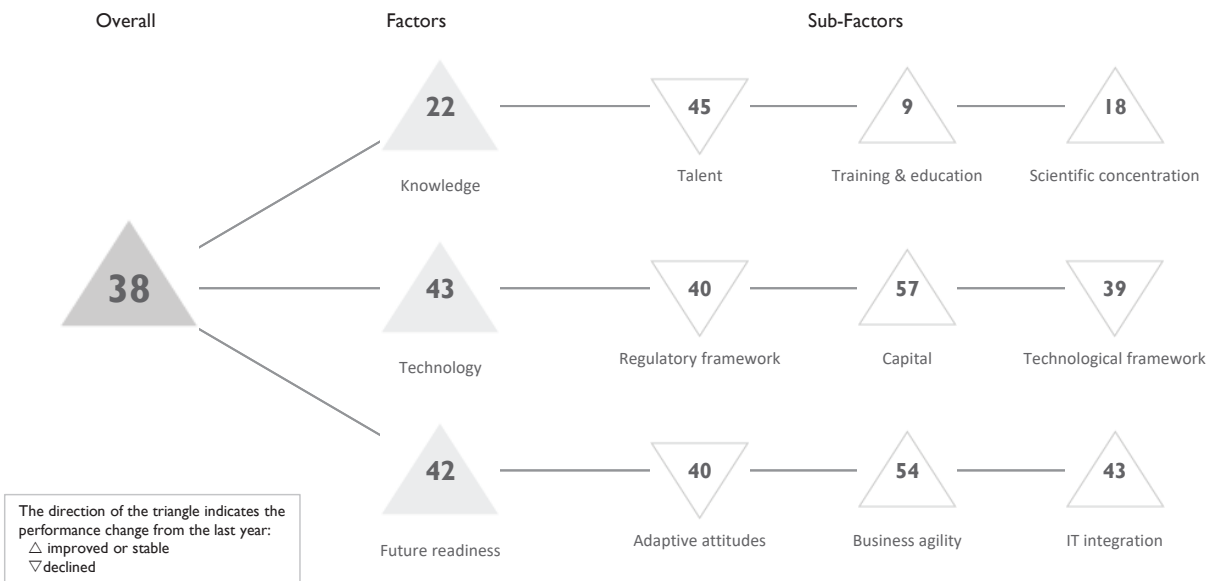
Business agility	Rank
Opportunities and threats	49
World robots distribution	35
Agility of companies	43
Use of big data and analytics	34
Knowledge transfer	50

IT integration	Rank
E-Government	51
▷ Public-private partnerships	60
Cyber security	32
Software piracy	51



# RUSSIA

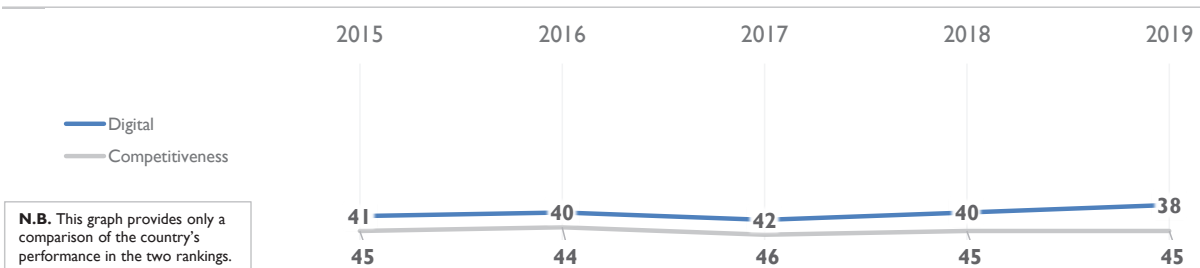
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

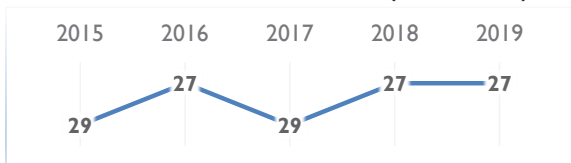
	2015	2016	2017	2018	2019
OVERALL	41	40	42	40	38
Knowledge	27	28	24	24	22
Technology	44	47	44	43	43
Future readiness	55	53	52	51	42

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	36	37	35	40	45
Training & education	19	17	14	12	9
Scientific concentration	23	26	25	23	18

Talent		Rank	Training & education		Rank	Scientific concentration		Rank
Educational assessment PISA - Math	21		Employee training	45		Total expenditure on R&D (%)	34	
▷ International experience	59		Total public expenditure on education	48		Total R&D personnel per capita	23	
Foreign highly-skilled personnel	54		► Higher education achievement	9		Female researchers	21	
Management of cities	52		Pupil-teacher ratio (tertiary education)	10		► R&D productivity by publication	5	
Digital/Technological skills	42		► Graduates in Sciences	7		Scientific and technical employment	-	
Net flow of international students	22		► Women with degrees	3		High-tech patent grants	33	
						► Robots in Education and R&D	8	

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	36	36	36	38	40
Capital	56	57	57	58	57
Technological framework	41	35	37	38	39

Regulatory framework		Rank	Capital		Rank	Technological framework		Rank
Starting a business	19		IT & media stock market capitalization	43		Communications technology	43	
Enforcing contracts	17		Funding for technological development	51		Mobile Broadband subscribers	33	
Immigration laws	38		▷ Banking and financial services	57		Wireless broadband	36	
Development and application of techn	51		Country credit rating	52		Internet users	45	
Scientific research legislation	51		Venture capital	56		Internet bandwidth speed	43	
Intellectual property rights	52		Investment in Telecommunications	33		High-tech exports (%)	34	

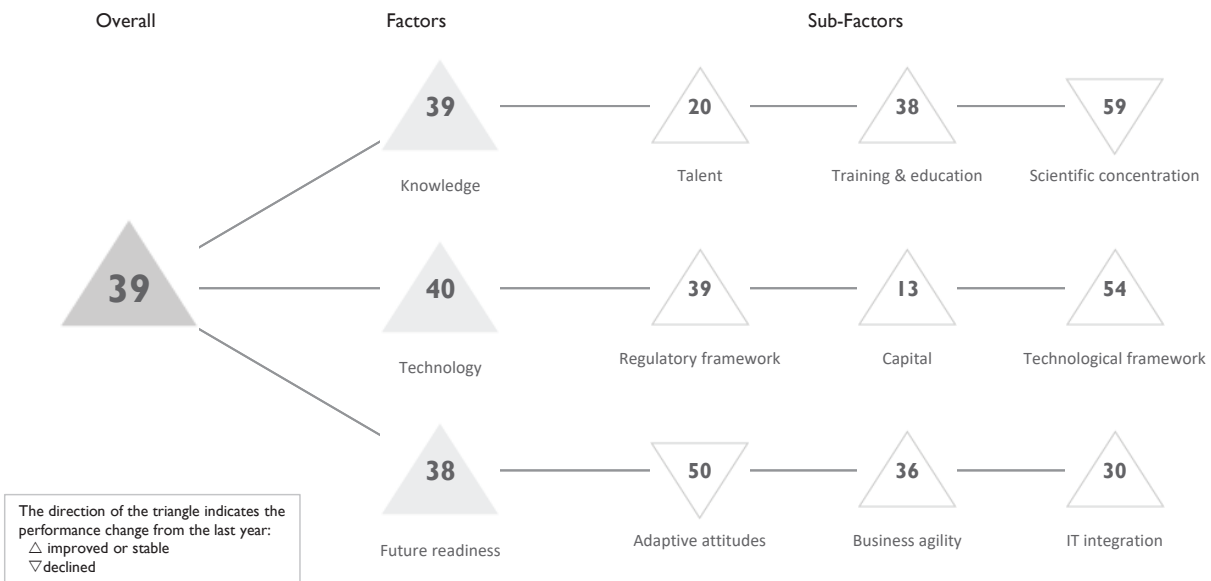
## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	42	40	44	39	40
Business agility	61	61	59	62	54
IT integration	42	39	43	43	43

Adaptive attitudes		Rank	Business agility		Rank	IT integration		Rank
E-Participation	23		Opportunities and threats	46		E-Government	28	
Internet retailing	41		World robots distribution	34		Public-private partnerships	46	
Tablet possession	39		▷ Agility of companies	60		Cyber security	44	
Smartphone possession	30		Use of big data and analytics	31		Software piracy	53	
▷ Attitudes toward globalization	60		▷ Knowledge transfer	57				

# SAUDI ARABIA

## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL			36	42	39
Knowledge			39	40	39
Technology			41	50	40
Future readiness			32	38	38

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## SAUDI ARABIA

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent			22	38	20
Training & education			16	39	38
Scientific concentration			61	49	59

Talent	Rank
Educational assessment PISA - Math	-
► International experience	11
► Foreign highly-skilled personnel	14
Management of cities	29
Digital/Technological skills	20
Net flow of international students	41

Training & education	Rank
Employee training	32
► Total public expenditure on education	1
Higher education achievement	50
Pupil-teacher ratio (tertiary education)	51
Graduates in Sciences	38
Women with degrees	46

Scientific concentration	Rank
Total expenditure on R&D (%)	43
Total R&D personnel per capita	-
Female researchers	49
R&D productivity by publication	33
Scientific and technical employment	-
High-tech patent grants	51
▷ Robots in Education and R&D	54

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework			48	50	39
Capital			36	31	13
Technological framework			41	56	54

Regulatory framework	Rank
▷ Starting a business	61
Enforcing contracts	43
Immigration laws	37
Development and application of techn	18
Scientific research legislation	29
Intellectual property rights	34

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	22
Banking and financial services	20
Country credit rating	27
Venture capital	25
► Investment in Telecommunications	10

Technological framework	Rank
Communications technology	31
▷ Mobile Broadband subscribers	56
Wireless broadband	28
Internet users	47
Internet bandwidth speed	51
▷ High-tech exports (%)	59

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes			29	43	50
Business agility			38	48	36
IT integration			31	33	30

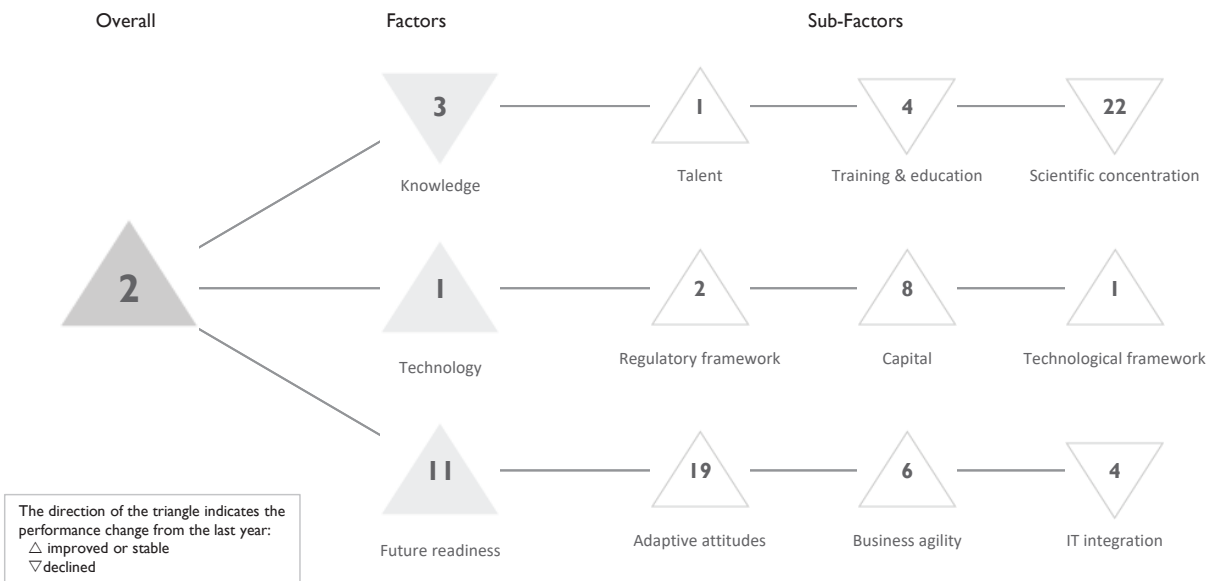
Adaptive attitudes	Rank
E-Participation	49
Internet retailing	45
Tablet possession	44
Smartphone possession	41
Attitudes toward globalization	29

Business agility	Rank
Opportunities and threats	42
▷ World robots distribution	52
Agility of companies	27
Use of big data and analytics	22
Knowledge transfer	28

IT integration	Rank
E-Government	43
Public-private partnerships	14
► Cyber security	7
Software piracy	38

# SINGAPORE

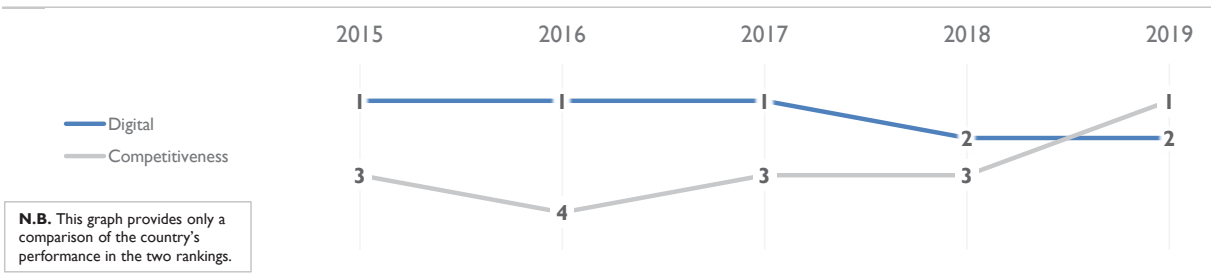
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	1	1	1	2	2
Knowledge	1	1	1	1	3
Technology	1	1	1	1	1
Future readiness	5	4	6	15	11

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS < 20 MILLION (34 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	1	1	1	1	1
Training & education	5	9	9	1	4
Scientific concentration	13	11	8	19	22

Talent	Rank
▶ Educational assessment PISA - Math	1
International experience	9
Foreign highly-skilled personnel	2
▶ Management of cities	1
Digital/Technological skills	8
Net flow of international students	7

Training & education	Rank
Employee training	28
▷ Total public expenditure on education	60
Higher education achievement	2
Pupil-teacher ratio (tertiary education)	31
Graduates in Sciences	2
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	18
Total R&D personnel per capita	13
▷ Female researchers	42
▷ R&D productivity by publication	44
▷ Scientific and technical employment	51
▶ High-tech patent grants	1
Robots in Education and R&D	32

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	3	2	1	2	2
Capital	10	10	14	8	8
Technological framework	1	1	1	1	1

Regulatory framework	Rank
Starting a business	2
▶ Enforcing contracts	1
▷ Immigration laws	48
Development and application of techn	1
Scientific research legislation	1
Intellectual property rights	6

Capital	Rank
IT & media stock market capitalization	26
Funding for technological development	1
Banking and financial services	2
Country credit rating	1
Venture capital	5
Investment in Telecommunications	40

Technological framework	Rank
Communications technology	5
Mobile Broadband subscribers	1
Wireless broadband	5
Internet users	1
▶ Internet bandwidth speed	1
High-tech exports (%)	2

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	12	11	11	20	19
Business agility	12	13	14	18	6
IT integration	1	1	1	3	4

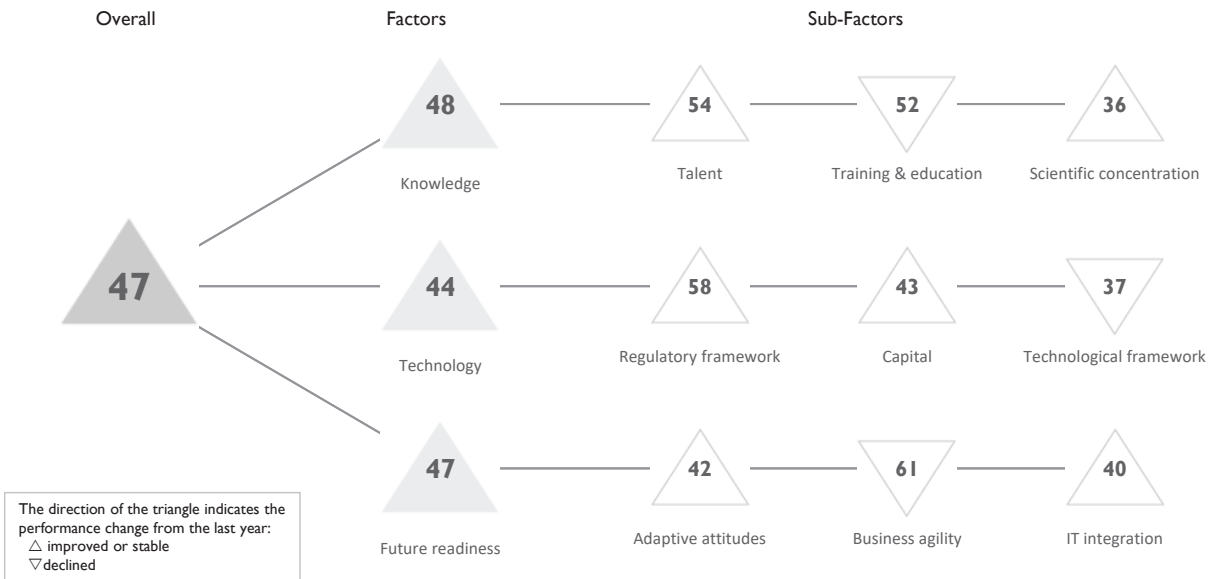
Adaptive attitudes	Rank
E-Participation	13
Internet retailing	26
Tablet possession	15
Smartphone possession	32
Attitudes toward globalization	2

Business agility	Rank
Opportunities and threats	9
World robots distribution	15
Agility of companies	7
Use of big data and analytics	15
Knowledge transfer	5

IT integration	Rank
E-Government	7
Public-private partnerships	2
Cyber security	6
Software piracy	17

# SLOVAK REPUBLIC

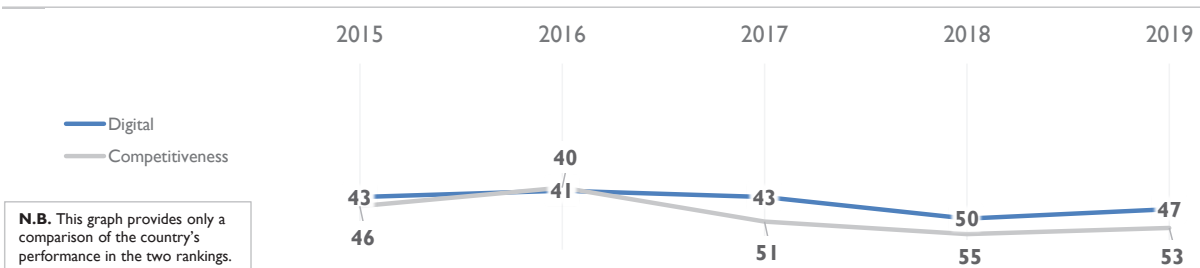
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	43	41	43	50	47
Knowledge	43	41	43	49	48
Technology	40	41	43	47	44
Future readiness	44	43	46	53	47

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## SLOVAK REPUBLIC

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	50	48	50	56	54
Training & education	40	35	40	47	52
Scientific concentration	45	44	39	42	36

Talent	Rank
Educational assessment PISA - Math	35
International experience	56
▷ Foreign highly-skilled personnel	60
Management of cities	45
► Digital/Technological skills	25
Net flow of international students	57

Training & education	Rank
Employee training	54
Total public expenditure on education	44
Higher education achievement	38
Pupil-teacher ratio (tertiary education)	33
Graduates in Sciences	41
Women with degrees	40

Scientific concentration	Rank
Total expenditure on R&D (%)	40
Total R&D personnel per capita	33
► Female researchers	19
R&D productivity by publication	38
Scientific and technical employment	35
High-tech patent grants	28
Robots in Education and R&D	33

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	52	52	55	60	58
Capital	41	34	39	46	43
Technological framework	33	33	38	34	37

Regulatory framework	Rank
Starting a business	55
Enforcing contracts	35
Immigration laws	59
▷ Development and application of techn	60
Scientific research legislation	58
Intellectual property rights	59

Capital	Rank
IT & media stock market capitalization	-
▷ Funding for technological development	61
Banking and financial services	50
Country credit rating	29
Venture capital	50
► Investment in Telecommunications	16

Technological framework	Rank
Communications technology	29
Mobile Broadband subscribers	44
Wireless broadband	37
► Internet users	27
Internet bandwidth speed	29
High-tech exports (%)	35

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	39	39	52	51	42
Business agility	56	53	52	58	61
IT integration	38	34	37	45	40

Adaptive attitudes	Rank
E-Participation	44
Internet retailing	31
Tablet possession	38
Smartphone possession	36
Attitudes toward globalization	59

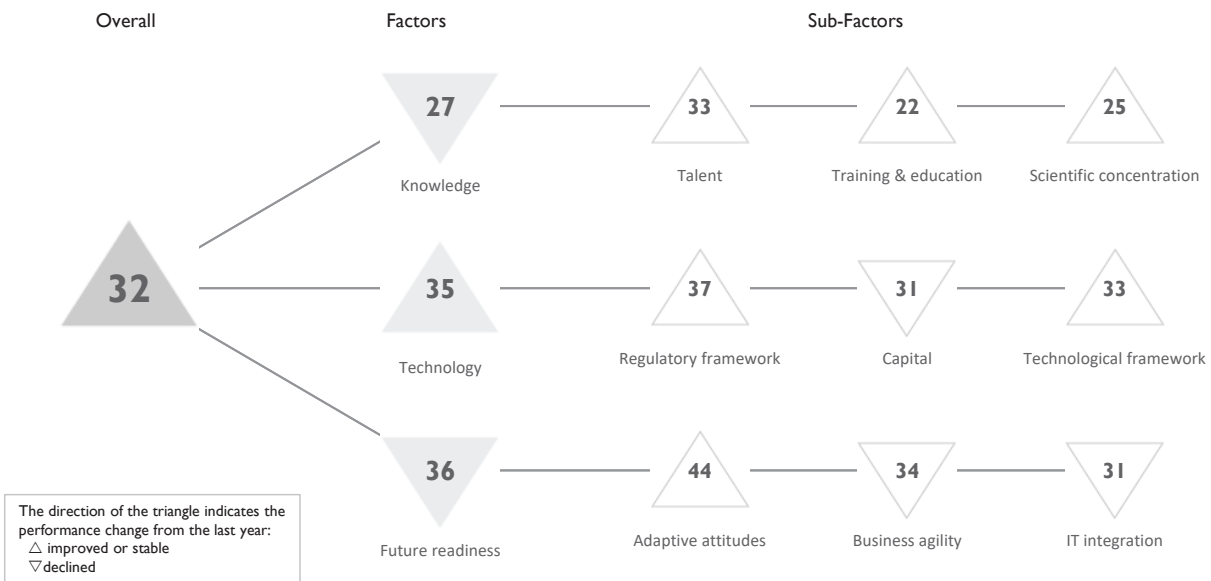
Business agility	Rank
▷ Opportunities and threats	60
World robots distribution	28
Agility of companies	58
Use of big data and analytics	48
▷ Knowledge transfer	60

IT integration	Rank
E-Government	41
Public-private partnerships	55
Cyber security	57
► Software piracy	26



# SLOVENIA

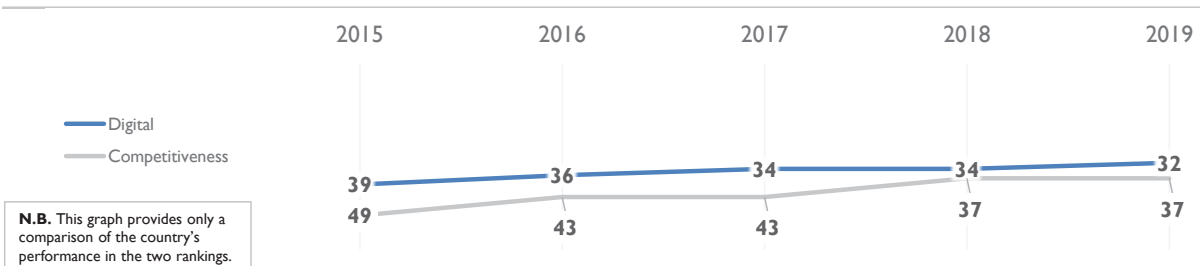
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	39	36	34	34	32
Knowledge	28	26	26	26	27
Technology	43	40	40	38	35
Future readiness	41	35	36	35	36

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	43	39	37	35	33
Training & education	18	16	17	23	22
Scientific concentration	20	20	24	25	25

Talent	Rank
► Educational assessment PISA - Math	13
International experience	49
▷ Foreign highly-skilled personnel	53
Management of cities	30
Digital/Technological skills	16
Net flow of international students	37

Training & education	Rank
Employee training	26
Total public expenditure on education	28
Higher education achievement	26
Pupil-teacher ratio (tertiary education)	14
Graduates in Sciences	25
Women with degrees	27

Scientific concentration	Rank
Total expenditure on R&D (%)	20
Total R&D personnel per capita	15
Female researchers	32
▷ R&D productivity by publication	59
Scientific and technical employment	25
► High-tech patent grants	7
Robots in Education and R&D	29

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	49	44	44	42	37
Capital	46	41	40	29	31
Technological framework	42	41	44	45	33

Regulatory framework	Rank
Starting a business	22
▷ Enforcing contracts	53
Immigration laws	29
Development and application of techn	40
Scientific research legislation	28
Intellectual property rights	26

Capital	Rank
IT & media stock market capitalization	29
Funding for technological development	31
Banking and financial services	35
Country credit rating	34
Venture capital	46
► Investment in Telecommunications	9

Technological framework	Rank
Communications technology	18
► Mobile Broadband subscribers	12
Wireless broadband	51
Internet users	33
Internet bandwidth speed	27
▷ High-tech exports (%)	52

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	45	45	37	44	44
Business agility	49	37	43	30	34
IT integration	33	31	30	29	31

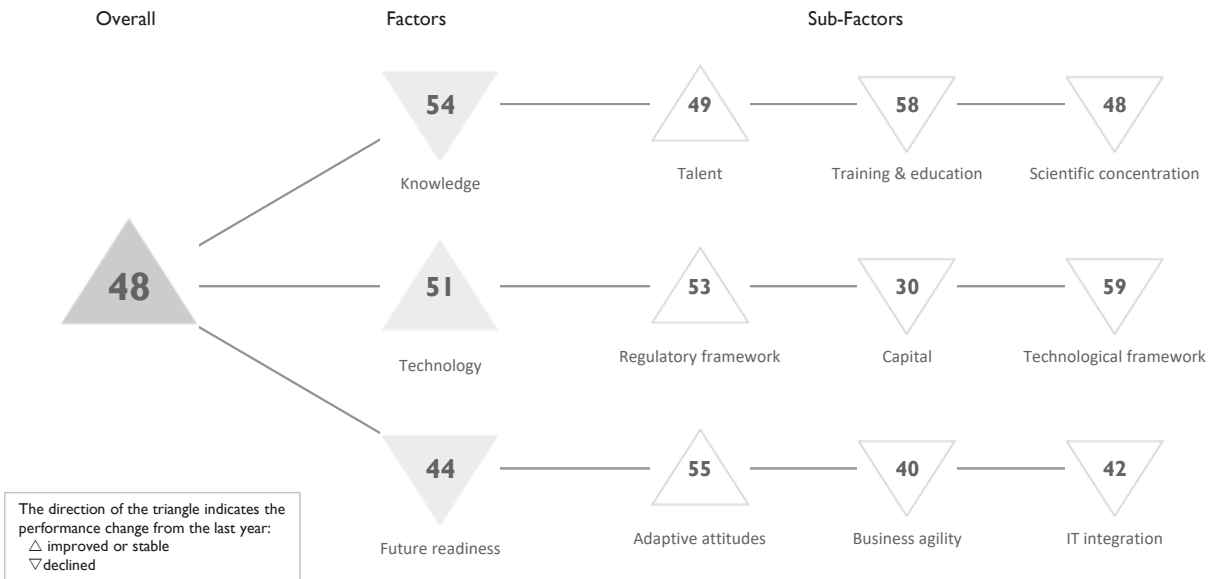
Adaptive attitudes	Rank
E-Participation	43
Internet retailing	36
Tablet possession	30
▷ Smartphone possession	54
Attitudes toward globalization	48

Business agility	Rank
Opportunities and threats	24
World robots distribution	37
Agility of companies	22
Use of big data and analytics	33
Knowledge transfer	34

IT integration	Rank
E-Government	32
Public-private partnerships	45
► Cyber security	13
Software piracy	30

# SOUTH AFRICA

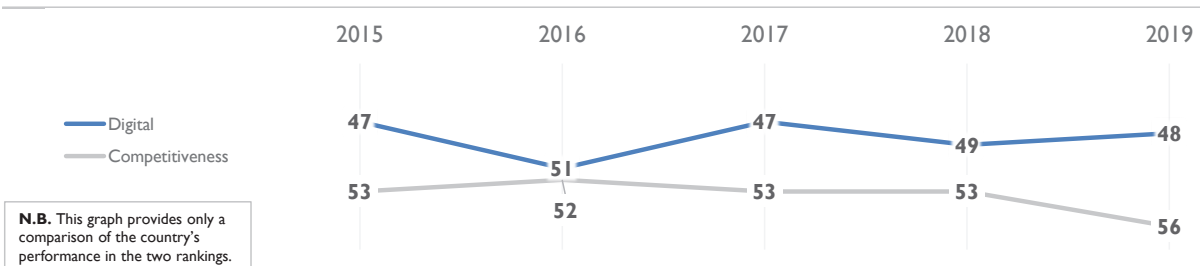
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	47	51	47	49	48
Knowledge	47	49	49	52	54
Technology	53	51	53	52	51
Future readiness	48	47	42	43	44

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## SOUTH AFRICA

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	48	53	52	54	49
Training & education	36	38	37	54	58
Scientific concentration	51	50	49	47	48

Talent	Rank
Educational assessment PISA - Math	-
International experience	53
Foreign highly-skilled personnel	33
Management of cities	56
Digital/Technological skills	53
Net flow of international students	27

Training & education	Rank
Employee training	30
► Total public expenditure on education	3
▷ Higher education achievement	60
Pupil-teacher ratio (tertiary education)	47
Graduates in Sciences	52
Women with degrees	54

Scientific concentration	Rank
Total expenditure on R&D (%)	45
Total R&D personnel per capita	53
► Female researchers	15
R&D productivity by publication	26
Scientific and technical employment	-
High-tech patent grants	53
Robots in Education and R&D	38

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	53	54	54	53	53
Capital	45	33	35	27	30
Technological framework	55	56	57	58	59

Regulatory framework	Rank
Starting a business	57
Enforcing contracts	55
Immigration laws	57
Development and application of techn	38
Scientific research legislation	31
Intellectual property rights	30

Capital	Rank
► IT & media stock market capitalization	4
Funding for technological development	50
Banking and financial services	36
Country credit rating	53
Venture capital	45
► Investment in Telecommunications	7

Technological framework	Rank
Communications technology	57
Mobile Broadband subscribers	48
Wireless broadband	47
▷ Internet users	59
▷ Internet bandwidth speed	58
▷ High-tech exports (%)	58

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	55	55	54	56	55
Business agility	36	38	37	38	40
IT integration	46	47	42	39	42

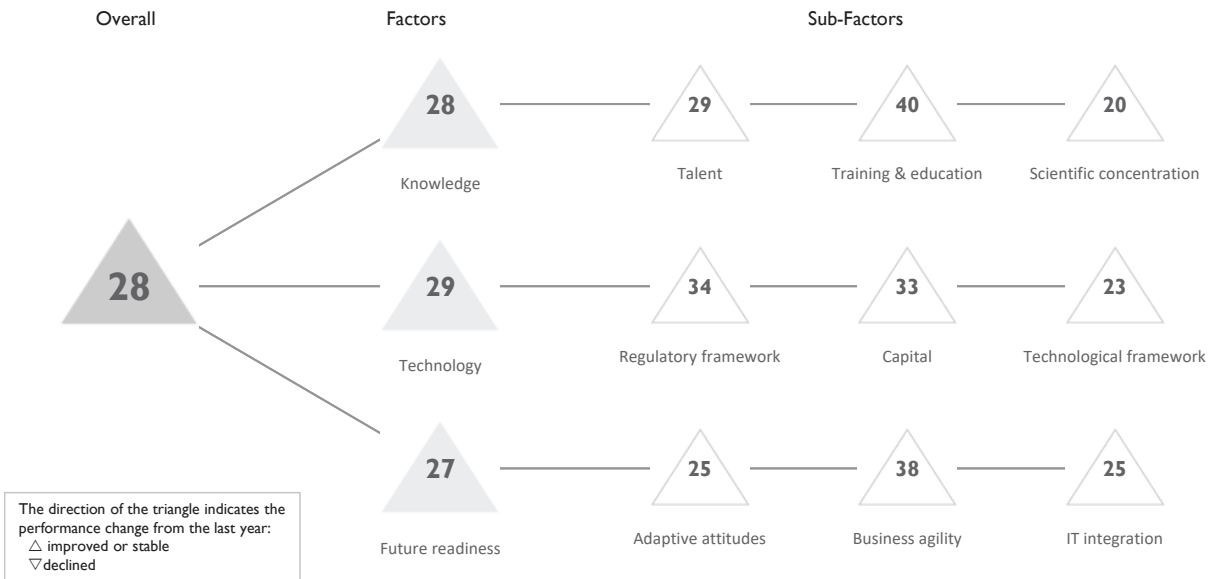
Adaptive attitudes	Rank
E-Participation	36
Internet retailing	56
▷ Tablet possession	57
Smartphone possession	40
Attitudes toward globalization	43

Business agility	Rank
Opportunities and threats	45
World robots distribution	32
Agility of companies	37
Use of big data and analytics	20
Knowledge transfer	47

IT integration	Rank
E-Government	52
Public-private partnerships	54
Cyber security	47
► Software piracy	20

# SPAIN

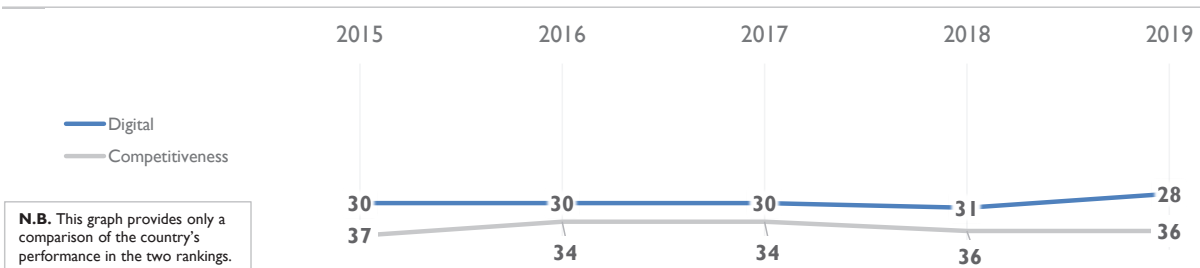
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	30	30	30	31	28
Knowledge	35	36	33	31	28
Technology	35	32	33	33	29
Future readiness	29	30	29	30	27

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	33	34	32	32	29
Training & education	41	43	42	40	40
Scientific concentration	26	28	29	27	20

Talent	Rank
Educational assessment PISA - Math	30
International experience	39
Foreign highly-skilled personnel	24
Management of cities	31
Digital/Technological skills	31
Net flow of international students	32

Training & education	Rank
▷ Employee training	47
Total public expenditure on education	39
Higher education achievement	31
Pupil-teacher ratio (tertiary education)	17
Graduates in Sciences	28
Women with degrees	28

Scientific concentration	Rank
Total expenditure on R&D (%)	32
Total R&D personnel per capita	26
Female researchers	20
► R&D productivity by publication	7
Scientific and technical employment	22
High-tech patent grants	41
► Robots in Education and R&D	7

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	33	34	35	36	34
Capital	48	38	34	37	33
Technological framework	27	27	23	29	23

Regulatory framework	Rank
Starting a business	40
Enforcing contracts	22
Immigration laws	18
Development and application of techn	35
▷ Scientific research legislation	48
Intellectual property rights	29

Capital	Rank
IT & media stock market capitalization	15
Funding for technological development	44
Banking and financial services	32
Country credit rating	38
Venture capital	28
Investment in Telecommunications	28

Technological framework	Rank
Communications technology	22
► Mobile Broadband subscribers	14
Wireless broadband	29
Internet users	26
Internet bandwidth speed	15
▷ High-tech exports (%)	48

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	26	26	24	26	25
Business agility	31	30	47	44	38
IT integration	26	26	26	27	25

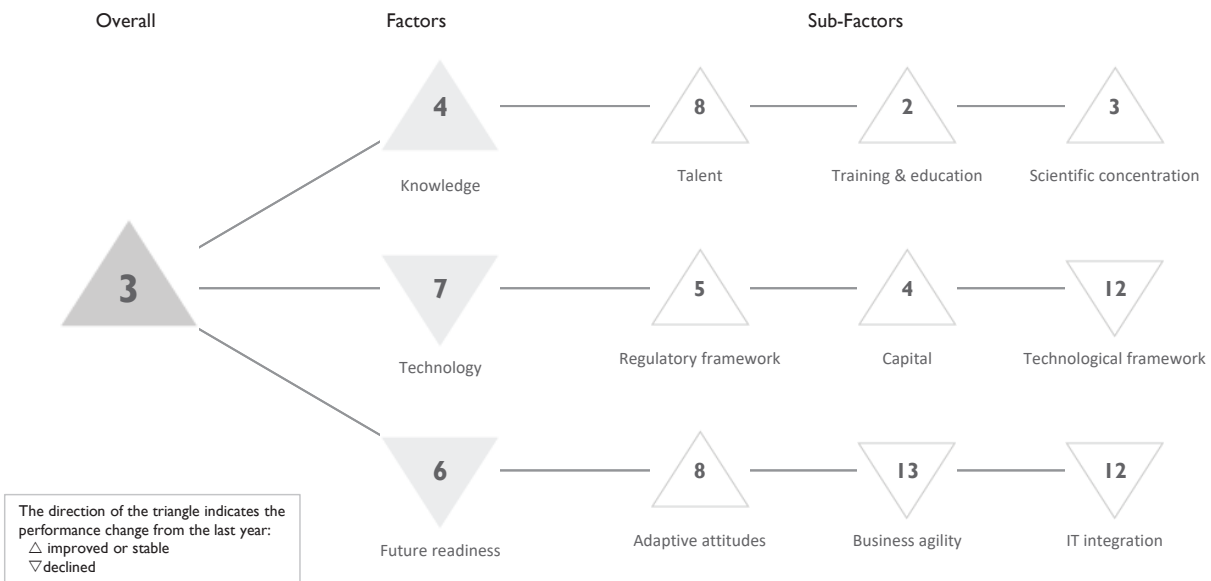
Adaptive attitudes	Rank
► E-Participation	5
Internet retailing	30
Tablet possession	15
Smartphone possession	25
Attitudes toward globalization	40

Business agility	Rank
Opportunities and threats	44
► World robots distribution	9
Agility of companies	38
▷ Use of big data and analytics	55
▷ Knowledge transfer	44

IT integration	Rank
E-Government	17
Public-private partnerships	28
Cyber security	38
Software piracy	32

# SWEDEN

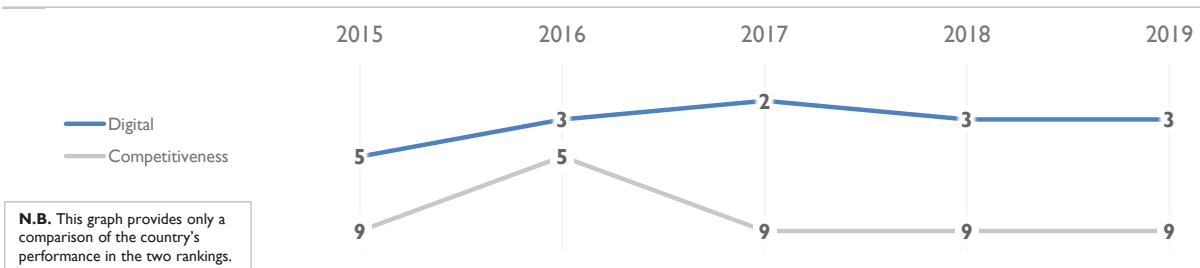
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	5	3	2	3	3
Knowledge	2	2	2	7	4
Technology	9	4	5	5	7
Future readiness	9	8	5	5	6

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	12	14	11	10	8
Training & education	2	1	1	5	2
Scientific concentration	5	5	5	3	3

Talent	Rank
Educational assessment PISA - Math	22
International experience	5
Foreign highly-skilled personnel	21
Management of cities	14
Digital/Technological skills	10
Net flow of international students	24

Training & education	Rank
Employee training	10
Total public expenditure on education	5
Higher education achievement	21
Pupil-teacher ratio (tertiary education)	20
Graduates in Sciences	17
Women with degrees	14

Scientific concentration	Rank
► Total expenditure on R&D (%)	4
Total R&D personnel per capita	10
▷ Female researchers	34
▷ R&D productivity by publication	41
► Scientific and technical employment	4
High-tech patent grants	8
Robots in Education and R&D	22

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	5	3	4	12	5
Capital	14	11	13	10	4
Technological framework	5	5	7	7	12

Regulatory framework	Rank
Starting a business	9
Enforcing contracts	31
Immigration laws	14
► Development and application of techn	4
Scientific research legislation	10
Intellectual property rights	7

Capital	Rank
IT & media stock market capitalization	12
Funding for technological development	7
Banking and financial services	8
► Country credit rating	1
Venture capital	6
▷ Investment in Telecommunications	34

Technological framework	Rank
Communications technology	8
Mobile Broadband subscribers	32
Wireless broadband	13
Internet users	7
Internet bandwidth speed	5
High-tech exports (%)	25

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	11	10	7	9	8
Business agility	13	10	13	10	13
IT integration	12	11	4	11	12

Adaptive attitudes	Rank
E-Participation	19
Internet retailing	15
Tablet possession	6
Smartphone possession	5
► Attitudes toward globalization	4

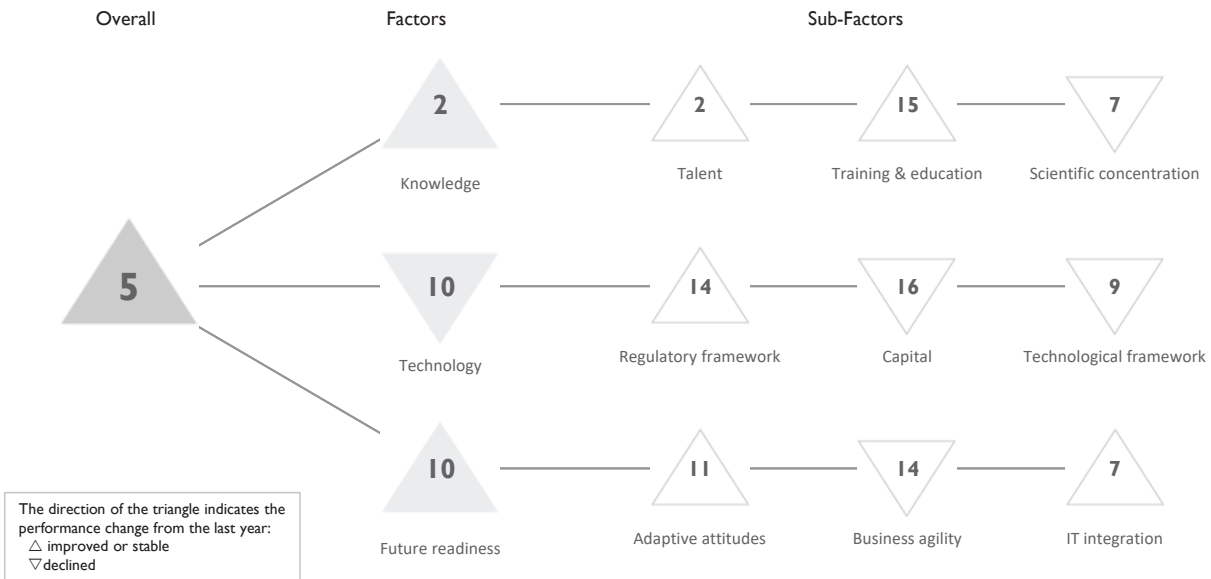
Business agility	Rank
Opportunities and threats	12
▷ World robots distribution	17
Agility of companies	12
Use of big data and analytics	7
Knowledge transfer	14

IT integration	Rank
E-Government	5
Public-private partnerships	22
Cyber security	36
Software piracy	6



# SWITZERLAND

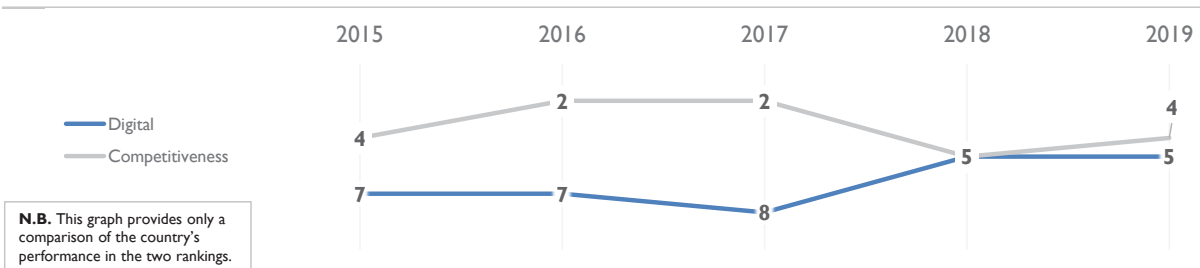
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	7	7	8	5	5
Knowledge	5	3	4	6	2
Technology	11	9	8	9	10
Future readiness	10	10	13	10	10

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



## SWITZERLAND

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	2	2	2	2	2
Training & education	21	18	25	15	15
Scientific concentration	12	13	13	6	7

Talent	Rank
Educational assessment PISA - Math	7
► International experience	2
► Foreign highly-skilled personnel	1
Management of cities	5
Digital/Technological skills	17
Net flow of international students	8

Training & education	Rank
Employee training	5
Total public expenditure on education	24
Higher education achievement	16
Pupil-teacher ratio (tertiary education)	5
Graduates in Sciences	26
Women with degrees	29

Scientific concentration	Rank
Total expenditure on R&D (%)	3
Total R&D personnel per capita	3
▷ Female researchers	35
▷ R&D productivity by publication	39
Scientific and technical employment	3
High-tech patent grants	34
Robots in Education and R&D	15

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	14	10	13	15	14
Capital	13	12	11	15	16
Technological framework	12	9	10	8	9

Regulatory framework	Rank
Starting a business	36
▷ Enforcing contracts	41
Immigration laws	26
Development and application of techn	7
Scientific research legislation	2
Intellectual property rights	2

Capital	Rank
▷ IT & media stock market capitalization	42
Funding for technological development	10
Banking and financial services	11
► Country credit rating	1
Venture capital	15
Investment in Telecommunications	23

Technological framework	Rank
Communications technology	9
Mobile Broadband subscribers	22
Wireless broadband	26
Internet users	22
Internet bandwidth speed	7
High-tech exports (%)	5

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	24	21	23	12	11
Business agility	2	3	4	7	14
IT integration	13	14	13	16	7

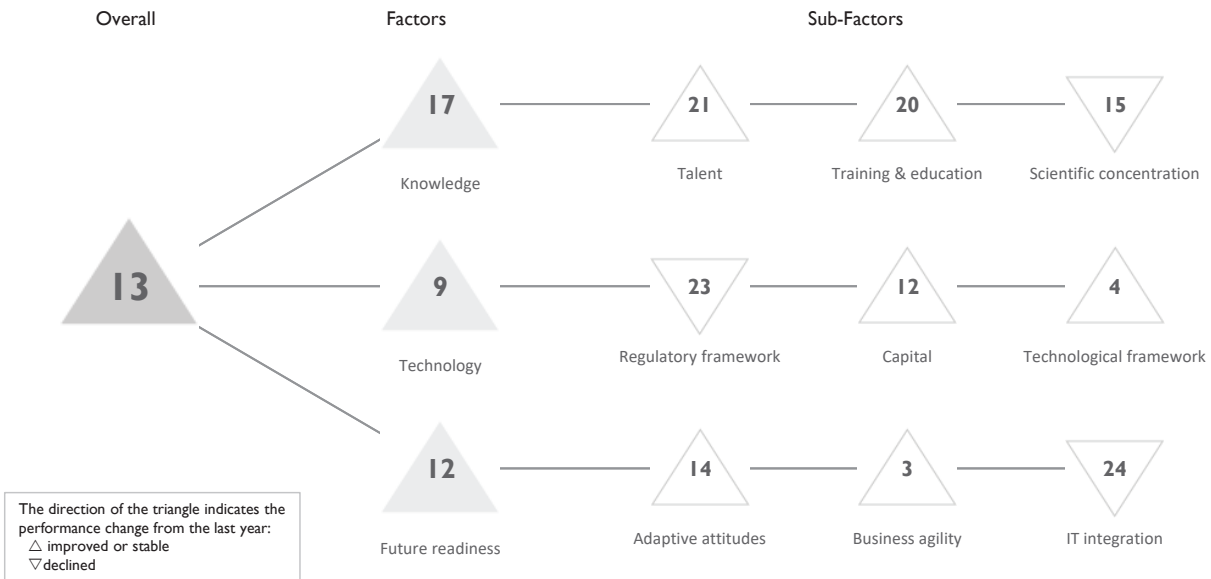
Adaptive attitudes	Rank
▷ E-Participation	37
Internet retailing	10
Tablet possession	8
► Smartphone possession	2
Attitudes toward globalization	27

Business agility	Rank
Opportunities and threats	11
World robots distribution	27
Agility of companies	9
Use of big data and analytics	29
► Knowledge transfer	1

IT integration	Rank
E-Government	15
Public-private partnerships	5
Cyber security	11
Software piracy	10

# TAIWAN, CHINA

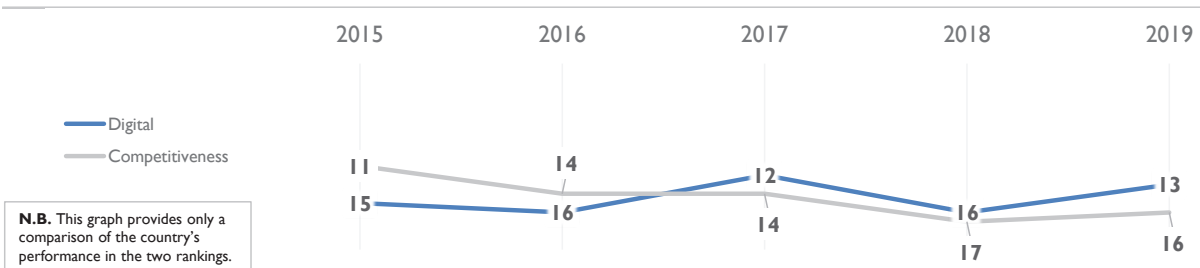
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	15	16	12	16	13
Knowledge	19	19	16	19	17
Technology	4	8	7	11	9
Future readiness	20	22	16	22	12

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## TAIWAN, CHINA

## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	19	19	18	25	21
Training & education	22	23	28	25	20
Scientific concentration	19	19	17	13	15

Talent	Rank
Educational assessment PISA - Math	3
International experience	36
▷ Foreign highly-skilled personnel	48
Management of cities	24
Digital/Technological skills	27
Net flow of international students	12

Training & education	Rank
Employee training	14
▷ Total public expenditure on education	45
Higher education achievement	4
▷ Pupil-teacher ratio (tertiary education)	54
▶ Graduates in Sciences	3
Women with degrees	35

Scientific concentration	Rank
Total expenditure on R&D (%)	5
▶ Total R&D personnel per capita	2
▷ Female researchers	50
R&D productivity by publication	35
Scientific and technical employment	37
High-tech patent grants	17
Robots in Education and R&D	21

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	22	25	24	21	23
Capital	6	6	8	13	12
Technological framework	4	6	4	10	4

Regulatory framework	Rank
Starting a business	11
Enforcing contracts	10
Immigration laws	39
Development and application of techn	36
Scientific research legislation	23
Intellectual property rights	24

Capital	Rank
▶ IT & media stock market capitalization	2
Funding for technological development	23
Banking and financial services	18
Country credit rating	22
Venture capital	27
▷ Investment in Telecommunications	45

Technological framework	Rank
Communications technology	24
▶ Mobile Broadband subscribers	1
Wireless broadband	16
Internet users	21
Internet bandwidth speed	18
▶ High-tech exports (%)	3

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	19	19	19	28	14
Business agility	19	24	6	13	3
IT integration	23	24	22	23	24

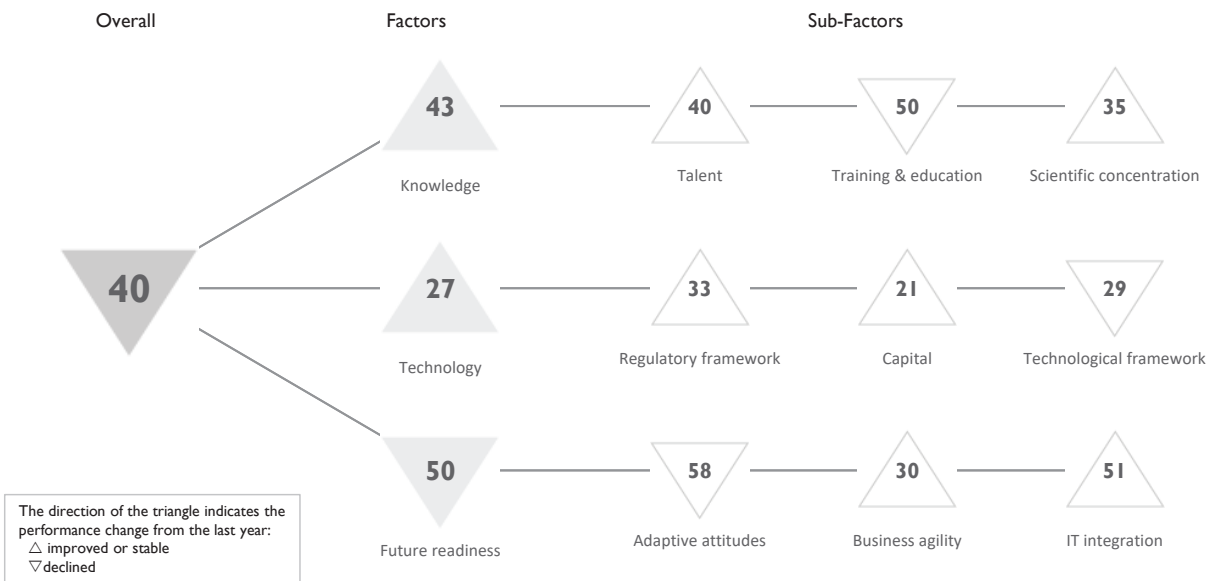
Adaptive attitudes	Rank
E-Participation	-
Internet retailing	20
Tablet possession	27
Smartphone possession	4
Attitudes toward globalization	11

Business agility	Rank
Opportunities and threats	4
World robots distribution	7
Agility of companies	3
Use of big data and analytics	14
Knowledge transfer	19

IT integration	Rank
E-Government	-
Public-private partnerships	18
Cyber security	12
Software piracy	25

# THAILAND

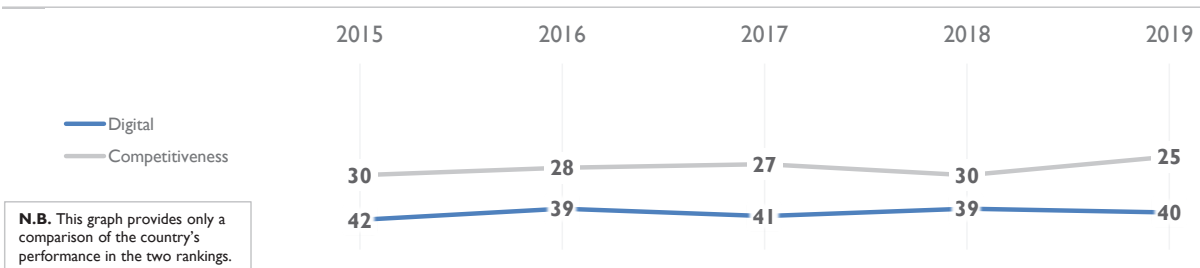
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	42	39	41	39	40
Knowledge	48	42	44	44	43
Technology	33	30	30	28	27
Future readiness	50	48	45	49	50

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### ASIA - PACIFIC (14 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	42	42	42	42	40
Training & education	54	44	47	44	50
Scientific concentration	44	41	43	45	35

Talent	Rank
Educational assessment PISA - Math	48
International experience	20
Foreign highly-skilled personnel	29
Management of cities	35
Digital/Technological skills	49
Net flow of international students	34

Training & education	Rank
Employee training	25
Total public expenditure on education	51
Higher education achievement	41
▷ Pupil-teacher ratio (tertiary education)	57
Graduates in Sciences	15
Women with degrees	45

Scientific concentration	Rank
Total expenditure on R&D (%)	37
Total R&D personnel per capita	39
► Female researchers	3
R&D productivity by publication	28
Scientific and technical employment	47
High-tech patent grants	49
Robots in Education and R&D	26

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	42	43	38	34	33
Capital	17	21	21	28	21
Technological framework	38	32	30	23	29

Regulatory framework	Rank
Starting a business	23
Enforcing contracts	29
Immigration laws	27
Development and application of techn	34
Scientific research legislation	37
Intellectual property rights	47

Capital	Rank
IT & media stock market capitalization	23
Funding for technological development	29
► Banking and financial services	7
Country credit rating	41
Venture capital	22
Investment in Telecommunications	19

Technological framework	Rank
Communications technology	23
► Mobile Broadband subscribers	4
Wireless broadband	22
▷ Internet users	54
Internet bandwidth speed	32
► High-tech exports (%)	9

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	47	47	51	55	58
Business agility	40	34	32	34	30
IT integration	57	55	53	55	51

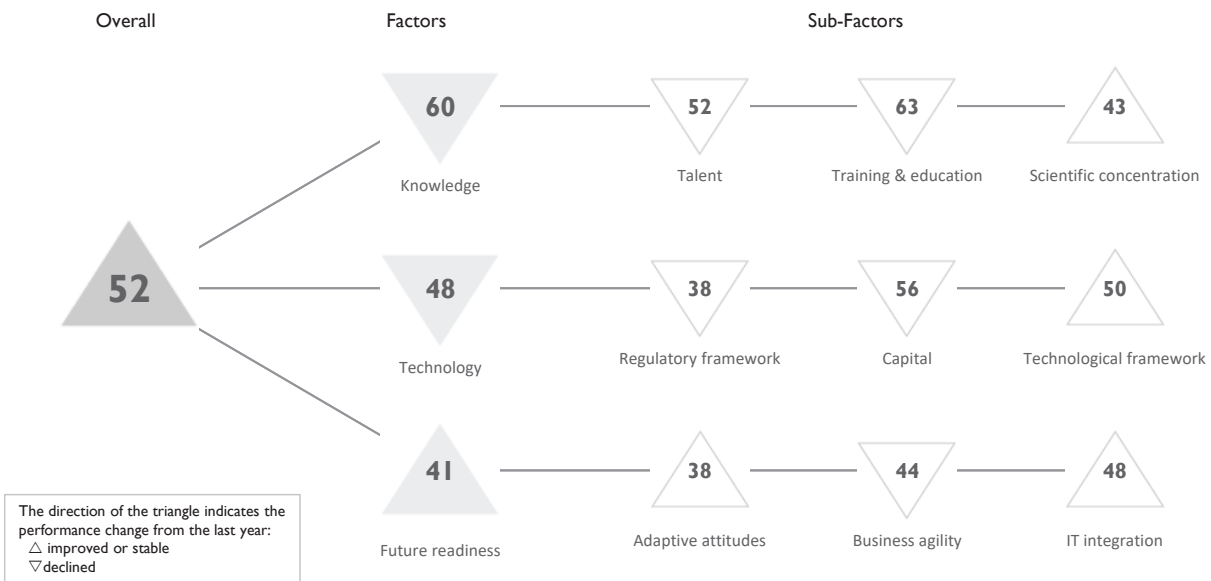
Adaptive attitudes	Rank
▷ E-Participation	56
Internet retailing	54
▷ Tablet possession	59
Smartphone possession	49
Attitudes toward globalization	18

Business agility	Rank
Opportunities and threats	33
► World robots distribution	10
Agility of companies	41
Use of big data and analytics	37
Knowledge transfer	32

IT integration	Rank
E-Government	53
Public-private partnerships	20
Cyber security	30
▷ Software piracy	56

# TURKEY

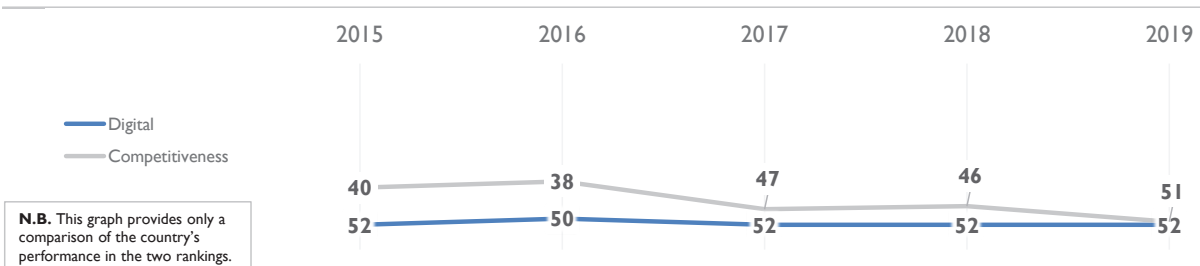
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	52	50	52	52	52
Knowledge	59	58	60	59	60
Technology	48	48	49	45	48
Future readiness	42	42	40	42	41

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	41	36	49	49	52
Training & education	61	61	63	62	63
Scientific concentration	52	52	48	48	43

Talent	Rank
Educational assessment PISA - Math	47
International experience	38
Foreign highly-skilled personnel	57
Management of cities	48
Digital/Technological skills	38
Net flow of international students	29

Training & education	Rank
▷ Employee training	59
Total public expenditure on education	37
Higher education achievement	45
▷ Pupil-teacher ratio (tertiary education)	60
Graduates in Sciences	51
Women with degrees	50

Scientific concentration	Rank
Total expenditure on R&D (%)	39
Total R&D personnel per capita	41
Female researchers	27
▶ R&D productivity by publication	10
Scientific and technical employment	38
High-tech patent grants	55
Robots in Education and R&D	28

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	44	40	40	37	38
Capital	36	46	47	41	56
Technological framework	50	51	51	51	50

Regulatory framework	Rank
Starting a business	37
▶ Enforcing contracts	18
Immigration laws	24
Development and application of techn	45
Scientific research legislation	42
▷ Intellectual property rights	58

Capital	Rank
▶ IT & media stock market capitalization	20
Funding for technological development	46
Banking and financial services	47
Country credit rating	57
Venture capital	54
Investment in Telecommunications	53

Technological framework	Rank
▶ Communications technology	20
▶ Mobile Broadband subscribers	9
Wireless broadband	55
Internet users	49
Internet bandwidth speed	55
▷ High-tech exports (%)	60

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	37	35	36	42	38
Business agility	44	41	39	42	44
IT integration	50	52	51	50	48

Adaptive attitudes	Rank
E-Participation	35
Internet retailing	43
Tablet possession	40
Smartphone possession	45
Attitudes toward globalization	30

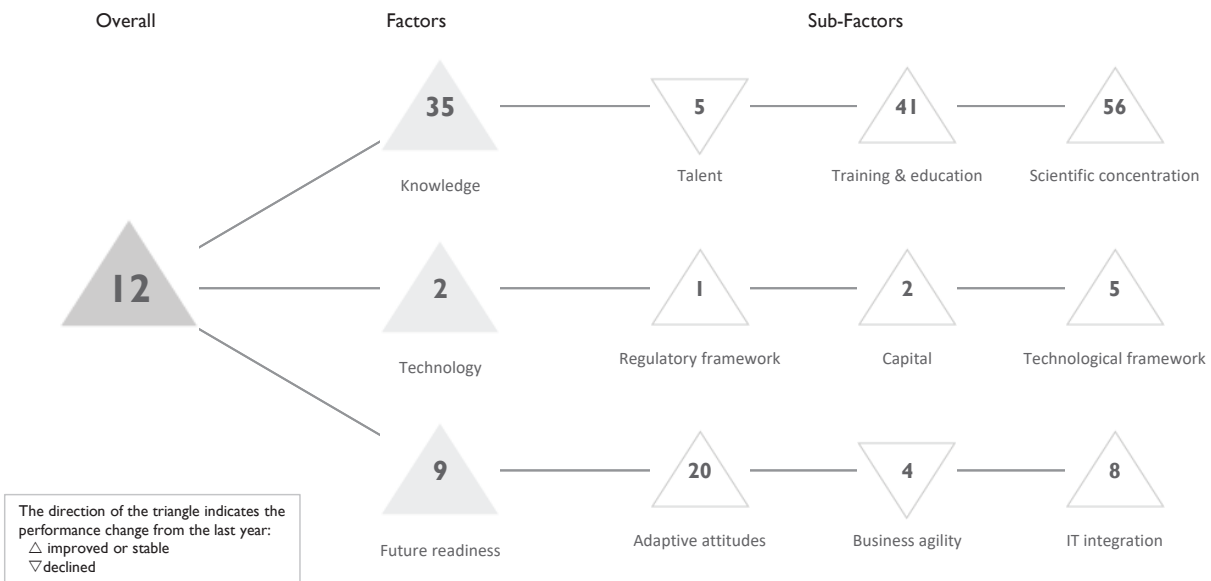
Business agility	Rank
Opportunities and threats	31
World robots distribution	20
Agility of companies	40
▷ Use of big data and analytics	58
Knowledge transfer	43

IT integration	Rank
E-Government	44
Public-private partnerships	39
Cyber security	50
Software piracy	48



# UAE

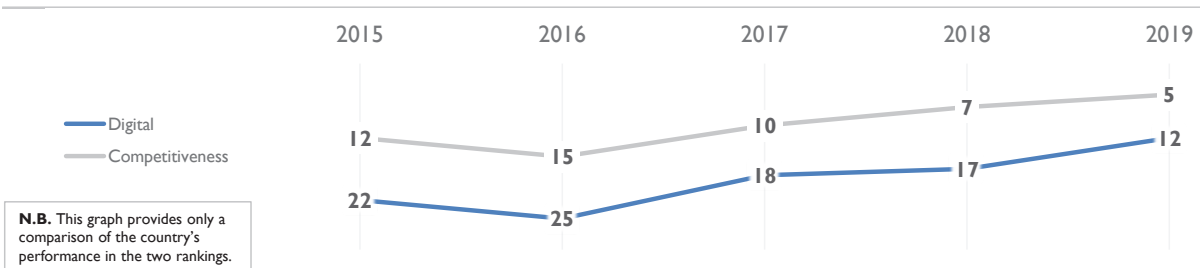
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	22	25	18	17	12
Knowledge	38	35	38	36	35
Technology	10	20	14	7	2
Future readiness	18	17	7	12	9

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS < 20 MILLION (34 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	6	5	5	4	5
Training & education	53	53	56	53	41
Scientific concentration	54	51	52	56	56

Talent	Rank
▷ Educational assessment PISA - Math	45
▶ International experience	1
Foreign highly-skilled personnel	5
Management of cities	2
Digital/Technological skills	7
Net flow of international students	3

Training & education	Rank
Employee training	4
▷ Total public expenditure on education	61
Higher education achievement	35
Pupil-teacher ratio (tertiary education)	41
Graduates in Sciences	37
Women with degrees	23

Scientific concentration	Rank
Total expenditure on R&D (%)	38
Total R&D personnel per capita	40
Female researchers	-
▷ R&D productivity by publication	57
Scientific and technical employment	-
High-tech patent grants	22
Robots in Education and R&D	40

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	19	16	5	3	1
Capital	4	14	12	11	2
Technological framework	19	31	29	16	5

Regulatory framework	Rank
Starting a business	15
Enforcing contracts	8
▶ Immigration laws	1
Development and application of technc	3
Scientific research legislation	7
Intellectual property rights	17

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	4
Banking and financial services	3
Country credit rating	16
Venture capital	3
Investment in Telecommunications	18

Technological framework	Rank
Communications technology	21
Mobile Broadband subscribers	15
▶ Wireless broadband	1
Internet users	35
Internet bandwidth speed	41
▷ High-tech exports (%)	43

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	15	14	17	21	20
Business agility	24	18	1	1	4
IT integration	21	18	8	14	8

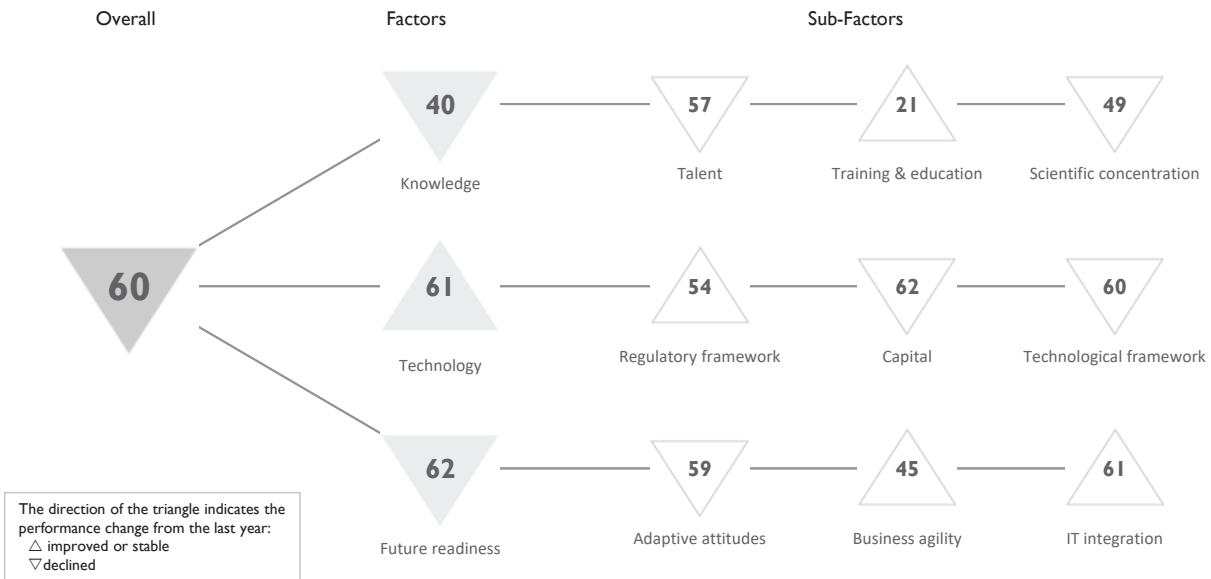
Adaptive attitudes	Rank
E-Participation	17
Internet retailing	32
Tablet possession	21
Smartphone possession	21
Attitudes toward globalization	3

Business agility	Rank
▶ Opportunities and threats	1
▷ World robots distribution	53
Agility of companies	1
▶ Use of big data and analytics	1
Knowledge transfer	3

IT integration	Rank
E-Government	21
Public-private partnerships	1
Cyber security	2
Software piracy	20

# UKRAINE

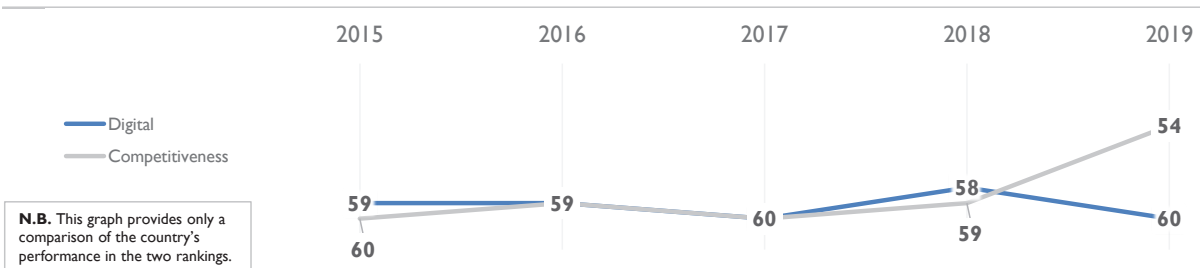
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

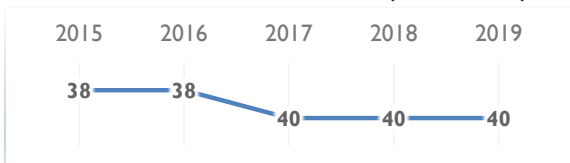
	2015	2016	2017	2018	2019
OVERALL	59	59	60	58	60
Knowledge	40	44	45	39	40
Technology	60	60	62	61	61
Future readiness	61	61	61	61	62

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	55	58	57	55	57
Training & education	15	20	26	22	21
Scientific concentration	39	45	45	40	49

Talent	Rank
Educational assessment PISA - Math	-
International experience	57
Foreign highly-skilled personnel	59
Management of cities	57
Digital/Technological skills	40
Net flow of international students	49

Training & education	Rank
Employee training	51
► Total public expenditure on education	10
Higher education achievement	-
► Pupil-teacher ratio (tertiary education)	11
Graduates in Sciences	27
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	54
Total R&D personnel per capita	43
► Female researchers	16
► R&D productivity by publication	23
Scientific and technical employment	40
High-tech patent grants	37
Robots in Education and R&D	48

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	55	55	56	54	54
Capital	60	60	62	61	62
Technological framework	60	58	60	57	60

Regulatory framework	Rank
Starting a business	30
Enforcing contracts	42
Immigration laws	41
Development and application of techn	57
▷ Scientific research legislation	61
▷ Intellectual property rights	61

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	52
Banking and financial services	59
▷ Country credit rating	62
▷ Venture capital	61
► Investment in Telecommunications	11

Technological framework	Rank
Communications technology	50
Mobile Broadband subscribers	60
Wireless broadband	60
Internet users	50
Internet bandwidth speed	42
High-tech exports (%)	55

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	60	60	58	53	59
Business agility	58	59	56	53	45
IT integration	61	60	60	61	61

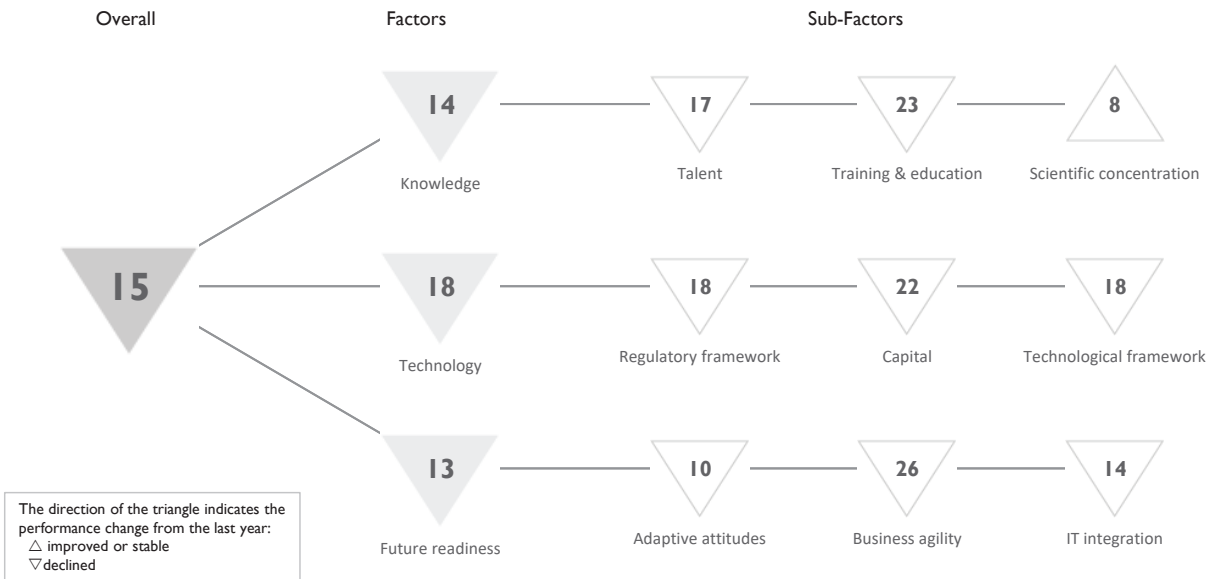
Adaptive attitudes	Rank
E-Participation	53
Internet retailing	51
Tablet possession	56
Smartphone possession	50
Attitudes toward globalization	50

Business agility	Rank
Opportunities and threats	30
World robots distribution	51
Agility of companies	47
Use of big data and analytics	23
Knowledge transfer	56

IT integration	Rank
E-Government	56
Public-private partnerships	59
Cyber security	60
▷ Software piracy	60

# UNITED KINGDOM

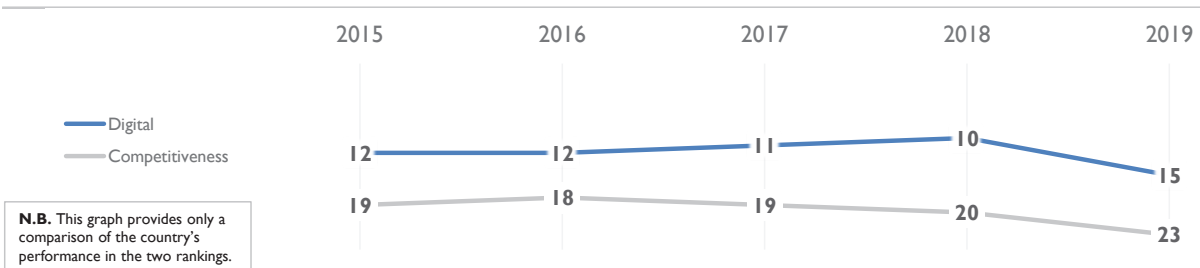
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	12	12	11	10	15
Knowledge	12	11	10	10	14
Technology	18	18	16	13	18
Future readiness	11	11	9	3	13

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### EUROPE - MIDDLE EAST - AFRICA (40 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## UNITED KINGDOM

- ▶ Overall top strengths
- ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	7	7	7	9	17
Training & education	23	19	19	20	23
Scientific concentration	11	10	11	8	8

**Talent** Rank

Educational assessment PISA - Math	25
International experience	28
Foreign highly-skilled personnel	22
Management of cities	19
Digital/Technological skills	30
▶ Net flow of international students	5

**Training & education** Rank

Employee training	37
Total public expenditure on education	32
Higher education achievement	14
Pupil-teacher ratio (tertiary education)	37
Graduates in Sciences	19
Women with degrees	17

**Scientific concentration** Rank

Total expenditure on R&D (%)	22
Total R&D personnel per capita	19
Female researchers	22
▶ R&D productivity by publication	4
Scientific and technical employment	8
High-tech patent grants	21
Robots in Education and R&D	6

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	10	11	12	7	18
Capital	22	25	24	17	22
Technological framework	15	16	16	17	18

**Regulatory framework** Rank

Starting a business	10
Enforcing contracts	27
▷ Immigration laws	40
Development and application of technc	21
Scientific research legislation	14
Intellectual property rights	12

**Capital** Rank

IT & media stock market capitalization	30
Funding for technological development	19
Banking and financial services	14
Country credit rating	18
Venture capital	7
▷ Investment in Telecommunications	58

**Technological framework** Rank

Communications technology	34
Mobile Broadband subscribers	23
▷ Wireless broadband	38
Internet users	15
Internet bandwidth speed	31
High-tech exports (%)	11

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	5	4	6	4	10
Business agility	22	25	22	16	26
IT integration	16	13	6	2	14

**Adaptive attitudes** Rank

▶ E-Participation	5
▶ Internet retailing	3
Tablet possession	12
Smartphone possession	22
▷ Attitudes toward globalization	42

**Business agility** Rank

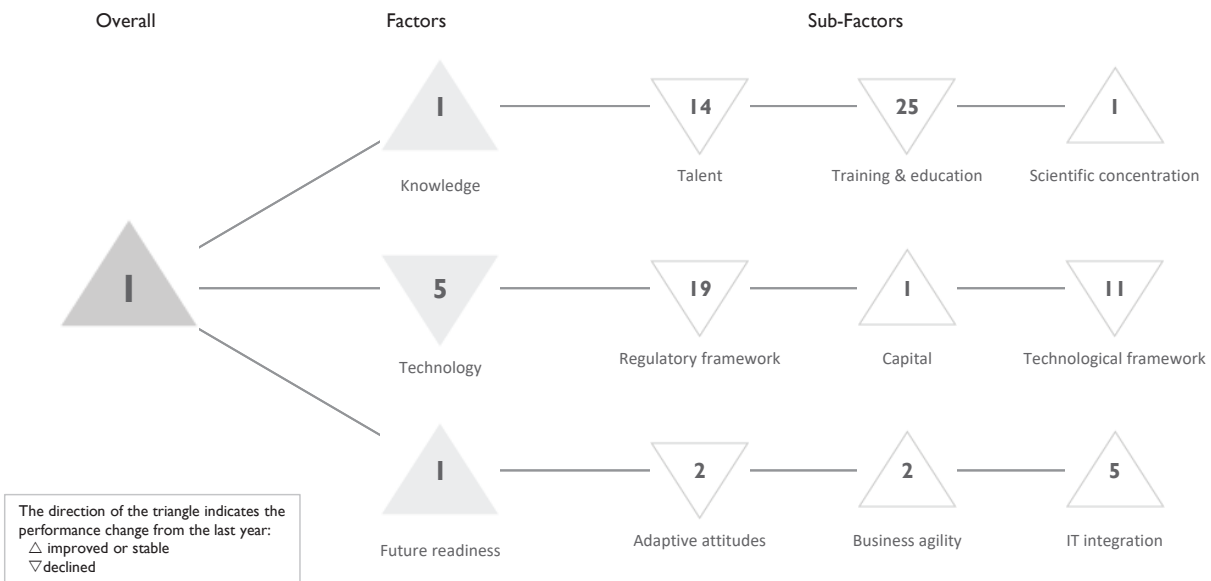
Opportunities and threats	36
World robots distribution	12
▷ Agility of companies	42
Use of big data and analytics	25
Knowledge transfer	17

**IT integration** Rank

▶ E-Government	4
Public-private partnerships	34
Cyber security	29
Software piracy	10

# USA

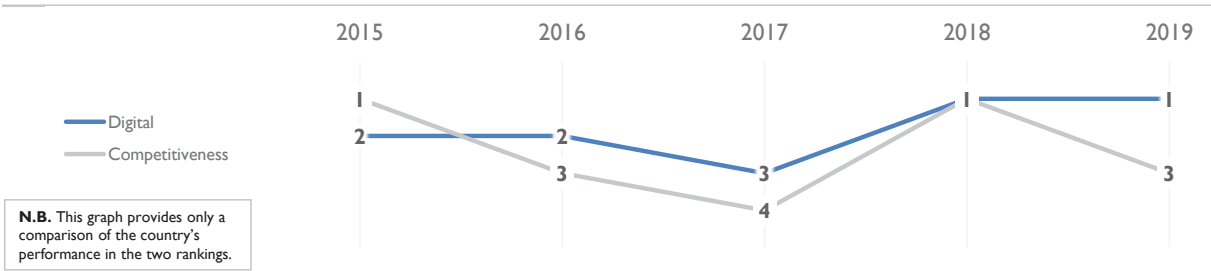
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

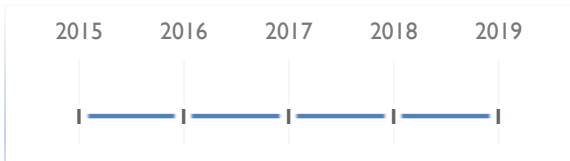
	2015	2016	2017	2018	2019
OVERALL	2	2	3	1	1
Knowledge	6	4	5	4	1
Technology	6	5	6	3	5
Future readiness	3	1	2	2	1

## COMPETITIVENESS & DIGITAL RANKINGS

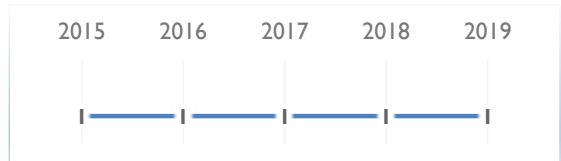


## PEER GROUPS RANKINGS

### THE AMERICAS (9 countries)



### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	14	11	13	11	14
Training & education	32	30	33	21	25
Scientific concentration	1	1	1	1	1

**Talent** Rank

▷ Educational assessment PISA - Math	37
International experience	29
Foreign highly-skilled personnel	7
Management of cities	18
Digital/Technological skills	9
Net flow of international students	13

**Training & education** Rank

▷ Employee training	38
Total public expenditure on education	9
Higher education achievement	19
Pupil-teacher ratio (tertiary education)	19
▷ Graduates in Sciences	54
Women with degrees	11

**Scientific concentration** Rank

Total expenditure on R&D (%)	10
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	3
Scientific and technical employment	7
High-tech patent grants	5
Robots in Education and R&D	3

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	16	12	17	16	19
Capital	2	1	2	1	1
Technological framework	11	12	12	9	11

**Regulatory framework** Rank

Starting a business	29
Enforcing contracts	15
▷ Immigration laws	60
Development and application of technc	8
Scientific research legislation	5
Intellectual property rights	13

**Capital** Rank

IT & media stock market capitalization	6
Funding for technological development	2
▶ Banking and financial services	1
Country credit rating	11
▶ Venture capital	1
Investment in Telecommunications	22

**Technological framework** Rank

Communications technology	17
Mobile Broadband subscribers	26
Wireless broadband	8
Internet users	3
Internet bandwidth speed	13
High-tech exports (%)	20

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	1	1	2	1	2
Business agility	9	4	3	9	2
IT integration	11	4	12	8	5

**Adaptive attitudes** Rank

E-Participation	5
▶ Internet retailing	2
▶ Tablet possession	2
Smartphone possession	12
▷ Attitudes toward globalization	46

**Business agility** Rank

Opportunities and threats	16
World robots distribution	4
Agility of companies	18
Use of big data and analytics	6
Knowledge transfer	4

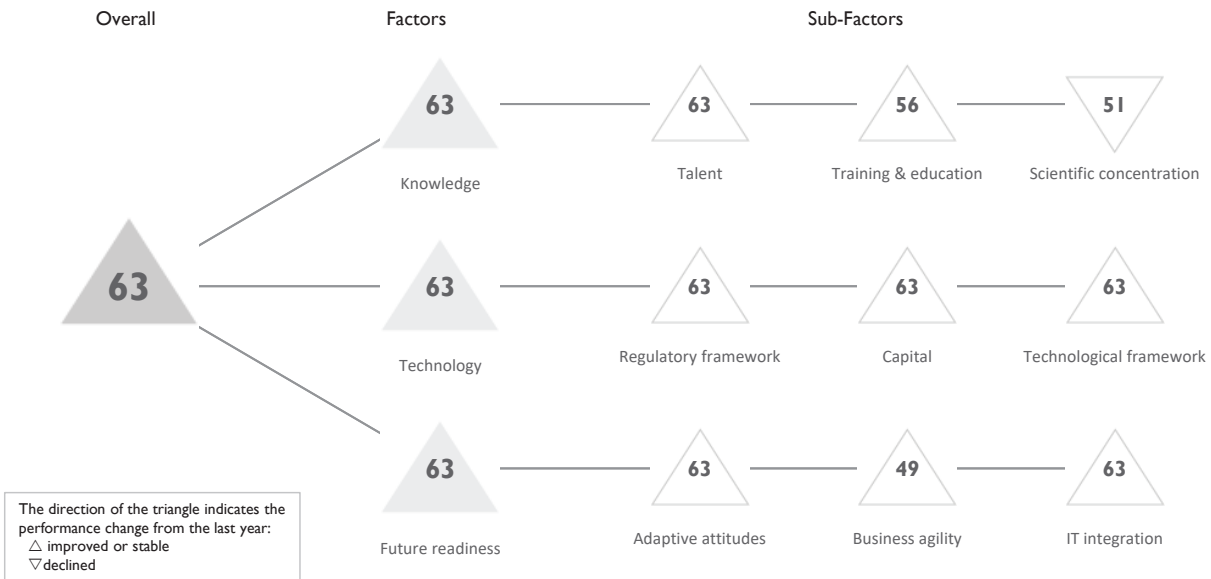
**IT integration** Rank

E-Government	11
Public-private partnerships	12
Cyber security	34
▶ Software piracy	1



# VENEZUELA

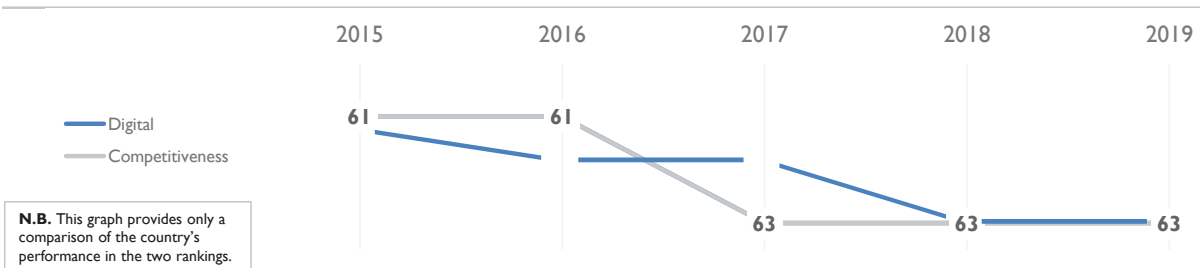
## OVERALL PERFORMANCE (63 countries)



### OVERALL & FACTORS - 5 years

	2015	2016	2017	2018	2019
OVERALL	61	61	63	63	63
Knowledge	54	57	63	63	63
Technology	61	61	63	63	63
Future readiness	60	59	63	63	63

### COMPETITIVENESS & DIGITAL RANKINGS



### PEER GROUPS RANKINGS

#### THE AMERICAS (9 countries)



#### POPULATIONS > 20 MILLION (29 countries)



## ► Overall top strengths

## ▷ Overall top weaknesses

## KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	61	61	63	63	63
Training & education	44	39	62	60	56
Scientific concentration	33	47	50	22	51

Talent	Rank
Educational assessment PISA - Math	-
International experience	60
Foreign highly-skilled personnel	63
Management of cities	63
▷ Digital/Technological skills	63
Net flow of international students	-

Training & education	Rank
Employee training	52
Total public expenditure on education	-
Higher education achievement	-
Pupil-teacher ratio (tertiary education)	-
Graduates in Sciences	-
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	63
Total R&D personnel per capita	-
► Female researchers	1
R&D productivity by publication	37
Scientific and technical employment	-
High-tech patent grants	56
Robots in Education and R&D	54

## TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	61	61	63	63	63
Capital	61	61	63	63	63
Technological framework	57	59	62	63	63

Regulatory framework	Rank
▷ Starting a business	63
Enforcing contracts	60
Immigration laws	52
Development and application of techn	63
Scientific research legislation	63
Intellectual property rights	63

Capital	Rank
IT & media stock market capitalization	50
Funding for technological development	63
Banking and financial services	63
▷ Country credit rating	63
Venture capital	63
Investment in Telecommunications	63

Technological framework	Rank
▷ Communications technology	63
Mobile Broadband subscribers	63
Wireless broadband	61
Internet users	48
Internet bandwidth speed	63
▷ High-tech exports (%)	63

## FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	57	56	62	63	63
Business agility	52	52	49	51	49
IT integration	60	61	63	63	63

Adaptive attitudes	Rank
E-Participation	61
Internet retailing	52
Tablet possession	52
Smartphone possession	61
Attitudes toward globalization	53

Business agility	Rank
► Opportunities and threats	15
World robots distribution	57
► Agility of companies	23
Use of big data and analytics	44
Knowledge transfer	62

IT integration	Rank
E-Government	60
Public-private partnerships	63
Cyber security	62
Software piracy	62

# Appendices and Sources

The statistical tables are available for subscribers of the IMD World Competitiveness Online.  
**Visit our eShop**

## Background Statistics

0.0.1 [B]	Population - market size	Estimates in millions
0.0.2 [B]	GDP per capita	US\$ per capita

## Factor I: Knowledge

### 1.1 Talent

1.1.1	Educational assessment PISA - Math	PISA survey of 15-year olds
1.1.2 [S]	International experience	International experience of senior managers is generally significant
1.1.3 [S]	Foreign highly-skilled personnel	Foreign highly-skilled personnel are attracted to your country's business environment
1.1.4 [S]	Management of cities	Management of cities supports business development
1.1.5 [S]	Digital/Technological skills	Digital/Technological skills are readily available
1.1.6	Net flow of international students	Tertiary-level international students inbound minus students outbound (per 1000 people)

### 1.2 Training & education

1.2.1 [S]	Employee training	Employee training is a high priority in companies
1.2.2	Total public expenditure on education	Percentage of GDP
1.2.3	Higher education achievement	Percentage of population that has attained at least tertiary education for persons 25-34
1.2.4	Pupil-teacher ratio (tertiary education)	Number of pupils per teacher
1.2.5	Graduates in Sciences	% of graduates in ICT, Engineering, Math & Natural Sciences
1.2.6	Women with degrees	Share of women who have a degree in the population 25-65

### 1.3 Scientific concentration

1.3.1	Total expenditure on R&D (%)	Percentage of GDP
1.3.2	Total R&D personnel per capita	Full-time work equivalent (FTE) per 1000 people
1.3.3	Female researchers	% of total (headcount FT&PT)
1.3.4	R&D productivity by publication	No. of scientific articles over R&D expenditure (as % GDP)
1.3.5	Scientific and technical employment	% of total employment
1.3.6	High-tech patent grants	% of all patents granted by applicant's origin (average 2015-2017)
1.3.7	Robots in Education and R&D	number of robots

## Factor II: Technology

### 2.1 Regulatory framework

2.1.1	Starting a business	Distance to Frontier
2.1.2	Enforcing contracts	Distance to Frontier
2.1.3 [S]	Immigration laws	Immigration laws do not prevent your company from employing foreign labor
2.1.4 [S]	Development & application of technology	Development and application of technology are supported by the legal environment
2.1.5 [S]	Scientific research legislation	Laws relating to scientific research do encourage innovation
2.1.6 [S]	Intellectual property rights	Intellectual property rights are adequately enforced

### 2.2 Capital

2.2.1	IT & media stock market capitalization	% of total stock market capitalization
2.2.2 [S]	Funding for technological development	Funding for technological development is readily available
2.2.3 [S]	Banking and financial services	Banking and financial services do support business activities efficiently
2.2.4	Country credit rating	Index (0-60) of three country credit ratings: Fitch, Moody's and S&P
2.2.5 [S]	Venture capital	Venture capital is easily available for business
2.2.6	Investment in Telecommunications	Percentage of GDP

## 2.3 Technological framework

2.3.1 [S]	Communications technology	Communications technology (voice and data) meets business requirements
2.3.2	Mobile Broadband subscribers	3G & 4G market, % of mobile market
2.3.3	Wireless broadband	Penetration rate (per 100 people)
2.3.4	Internet users	Number of internet users per 1000 people/ Source: Computer Industry Almanac
2.3.5	Internet bandwidth speed	Average speed
2.3.6	High-tech exports (%)	Percentage of manufactured exports

## Factor III: Future Readiness

### 3.1 Adaptive attitudes

3.1.1	E-Participation	Use of online services that facilitate public's interaction with government
3.1.2	Internet retailing	US\$ Per '000 People
3.1.3	Tablet possession	% households
3.1.4	Smartphone possession	% households
3.1.5 [S]	Attitudes toward globalization	Attitudes toward globalization are generally positive in your society

### 3.2 Business agility

3.2.1 [S]	Opportunities and threats	Companies are very good at responding quickly to opportunities and threats
3.2.2	World robots distribution	Percentage share of world robots
3.2.3 [S]	Agility of companies	Companies are agile
3.2.4 [S]	Use of big data and analytics	Companies are very good at using big data and analytics to support decision-making
3.2.5 [S]	Knowledge transfer	Knowledge transfer is highly developed between companies and universities

### 3.3 IT integration

3.3.1	E-Government	Provision of online government services to promote access and inclusion of citizens
3.3.2 [S]	Public-private partnerships	Public and private sector ventures are supporting technological development
3.3.3 [S]	Cyber security	Cyber security is being adequately addressed by corporations
3.3.4	Software piracy	% of unlicensed software installation

# Notes and Sources by Criteria

Standard notes used in the data tables

When statistical data is not available or is too out-dated to be relevant for a particular economy, the name appears at the bottom of the statistical table and a dash is shown. When the data is older than the reference year, the year of the data is shown next to the criterion value.

Exchange Rate	As most data are expressed in U.S. dollars, you will find the exchange rates used at the beginning of the Statistical Tables. The sources for the Exchange Rates are International Financial Statistics Online March 2019 (IMF) and national sources.
Per capita	For all information presented “per capita” the sources for the population are Passport GMID (Euromonitor) and national sources.
% of GDP	For all information presented as a “percentage of GDP” the sources for GDP are the OECD Main Economic Indicators April 2019 and national sources.

## **[B] GDP per capita (US\$ per capita)**

### **OECD (2019), Main Economic Indicators - complete database**

National sources

Provisional data or estimates for most recent year.

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## **[B] Population - market size (Estimates in millions)**

### **UNDP Human Development Report 2018**

Mid-year estimates. Croatia: new census in 2011 with a new methodology. India: break in series in 2011. Jordan: series have been revised according to the the new Population and Housing Census published in 2016. Portugal: methodological change in 2011. Russia: including Crimea as of 2015. UAE: re-estimation of the national population was made by the National Bureau of Statistics in 2010 (consequent increase as of 2008). Lithuania: break in series 2011 - census revised population figure downwards by 10% (emigration to EU over past decade). Philippines: Latest available census data is for 2010. 2011-2015 figures are projections based on PSA's annual Philippines in Figures publication.

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## **Factor 1: Knowledge**

### **1.1 Talent**

#### **1.1.1 Educational assessment PISA - Math (PISA survey of 15-year olds)**

PISA 2015 (OECD)

<http://www.oecd.org/pisa/>

The OECD's Programme for International Student Assessment (PISA) is a regular survey of 15-year olds which assesses aspects of their preparedness for adult life. Mathematical literacy: an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen. Scientific literacy: an individual's scientific knowledge and use of that knowledge to identify questions, to acquire new knowledge, to explain scientific phenomena, and to draw evidence based conclusions about science-related issues, understanding of the characteristic features of science as a form of human knowledge and enquiry, awareness of how science and technology shape our material, intellectual, and cultural environments, and willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.

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### 1.1.6 Net flow of international students (Tertiary-level international students inbound minus students outbound (per 1000 people))

UNESCO <http://stats.uis.unesco.org>

Net flow of internationally mobile students (inbound from abroad studying in a given country minus outbound from a given country), both sexes, in tertiary education. Data can refer to the school or financial year prior or after the reference year.

---

## 1.2 Training & education

### 1.2.2 Total public expenditure on education (Percentage of GDP)

UNESCO <http://stats.uis.unesco.org>

Eurostat April 2019

National sources

Chile and Jordan: Budgetary central government. Philippines: Includes expenditure for items other than basic and higher education such as vocational education, culture and sports.

---

### 1.2.3 Higher education achievement (Percentage of population that has attained at least tertiary education for persons 25-34)

OECD Education at a Glance 2018

National sources

Percentage of the population aged 25-34 that has attained tertiary-type B and tertiary-type A and advance research programs. Tertiary-type A education covers more theoretical programs that give access to advanced research programs and to professions with high general skills requirements. Tertiary-type B education covers more practical or occupationally specific programs that provide participants with a qualification of immediate relevance to the labor market. Hong Kong: Figures starting from 2012 exclude post-secondary diploma or certificate and exclude foreign domestic helpers. New-Zealand and Slovenia: break in series. Peru: Tertiary education type A refers to University tertiary level and tertiary education type B refers to Non-university tertiary level; for 25 years and more. Singapore: proportion of resident non-students aged 25-34 years with polytechnic, professional qualification or other diploma, or university qualification. Japan: Data for tertiary education include upper secondary or post-secondary non-tertiary programmes (less than 5% of adults are in this group).

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### 1.2.4 Pupil-teacher ratio (tertiary education) (Number of pupils per teacher)

UNESCO <http://stats.uis.unesco.org>

OECD Education at a Glance 2018

National sources

Average number of pupils per teacher at a given level of education, based on headcounts of both pupils and teachers. Tertiary education (ISCED levels 5 to 8). Tertiary education builds on secondary education, providing learning activities in specialised fields of education. It aims at learning at a high level of complexity and specialisation. Tertiary education includes what is commonly understood as academic education but also includes advanced vocational or professional education. Australia, Czech Republic, Estonia, Greece and Ireland: based on full-time equivalents. Philippines: Academic Year 2016-2017 data. Data includes students and faculty from both public and private tertiary educational institutions.

---

### 1.2.5 Graduates in Sciences (% of graduates in ICT, Engineering, Math & Natural Sciences)

OECD Education at a Glance 2018

UNESCO

National sources

Share of graduates in Natural Sciences; Mathematics and Statistics; Computing, Information and Communication technologies. In tertiary education (ISCED2011 levels 5 to 8), both sexes (%). Philippines: Academic Year 2016-2017 data. Does not include engineering.

---

### 1.2.6 Women with degrees (Share of women who have a degree in the population 25-65)

OECD Education at a Glance

Educational attainment in tertiary education of 25-64 year-old females expressed as a percentage of the female population 25-64. Note: In most countries data refer to ISCED 2011 (codes 5/6/7/8). For Indonesia and Saudi Arabia data refer to ISCED-97 (codes 5A/5B/6)

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## Scientific concentration

### 1.3.1 Total expenditure on R&D (%) (Percentage of GDP)

OECD Main Science and Technology Indicators 2/2018

UNESCO <http://stats.uis.unesco.org>

National sources

National estimates, projections or provisional data for the most recent year. Chile, Denmark, France, Japan, Korea, Netherlands, Portugal, Slovenia, Spain and Sweden: break in series. Hungary (up to 2003), Israel: defense excluded(all or mostly). Indonesia: Estimate based on target GERD by the Ministry of Science and Technology. Sweden: underestimated or based on underestimated data. USA: excludes most or all capital expenditure.

---

### 1.3.2 Total R&D personnel per capita (Full-time work equivalent (FTE) per 1000 people)

OECD Main Science and Technology Indicators 2/2018

UNESCO <http://stats.uis.unesco.org>

National sources

National estimates, projections or provisional data for most recent year. Czech Republic, Colombia, Denmark, Finland, Korea, Mexico, Netherlands, Hungary, Japan, Portugal, Slovenia, Sweden and Taiwan: break in series. United Kingdom: underestimated or based on underestimated data. Jordan, Philippines: based on headcount, not FTE.

---

### 1.3.3 Female researchers (% of total (headcount FT&PT))

UNESCO

Female researchers (headcount) who are mainly or partially employed in R&D. This includes staff employed both full-time and part-time. Expressed as a percentage of the total workforce (male + female)

---

### 1.3.4 R&D productivity by publication (No. of scientific articles over R&D expenditure (as % GDP))

NSF Science & Engineering Indicators 2018

Courtesy: National Science Foundation

National sources

The indicator is calculated as a ratio between the number of scientific articles by author's origin and the total expenditure in R&D as % GDP, which clearly include the input costs to produce research (e.g. researchers' salaries, equipment etc.). The result gives therefore the number of scientific articles published every year for a one percent (of GDP) expenditure in R&D activities. This measure can be considered as a proxy to assess the efficiency (or productivity) in producing high-level scientific research at country level.

---

### 1.3.5 Scientific and technical employment (% of total employment)

Business Monitor International

Eurostat

Scientific and technical employment as a % of total employment. Defined as formal employment within the 'scientific and technical' sector. For more information, refer to NACE2 category M (or equivalent).

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### 1.3.6 High-tech patent grants (% of all patents granted by applicant's origin (average 2014-2016))

WIPO Statistics Database

<http://www.wipo.int/ipstats/en/statistics/patents/>

TIPO for Taiwan

High-Tech patent grants as a percentage of total patent grants (Direct and PCT national phase entries) by applicant's origin. Three year average to reduce volatility. Counts are based on the grant date. Country of origin refers to the country of residency of the first-named applicant in the application. Taiwan: data compiled by TIPO using data supplied by international patent offices (USPTO, JPO, EPO, KIPO, SIPO).

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### 1.3.7 Robots in Education and R&D (number of robots)

World Robotics 2018

International Federation of Robotics (IFR)

Industrial robot as defined by ISO 8373:2012: an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications.

The primary source is data on robot installations by country, industry and application that nearly all industrial robot suppliers worldwide report to the IFR Statistical Department directly. Several national robot associations collect data on their national robot markets and provide their results as secondary data to the IFR. This data is used to validate and complete the IFR primary data.

IFR Statistical Departments estimates the operational stock assuming an average service life of 12 years with an immediate withdrawal from service afterwards.

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## Factor 2: Technology

### 2.1 Regulatory framework

#### 2.1.1 Starting a business (Distance to Frontier)

Doing Business 2019 - World Bank

The distance to frontier score aids in assessing the absolute level of regulatory performance and how it improves over time. This measure shows the distance of each economy to the "frontier," which represents the best performance observed on each of the indicators across all economies in the Doing Business sample since 2005. This allows users both to see the gap between a particular economy's performance and the best performance at any point in time and to assess the absolute change in the economy's regulatory environment over time as measured by Doing Business. An economy's distance to frontier is reflected on a scale from 0 to 100, where 0 represents the lowest performance and 100 represents the frontier. For example, a score of 75 in DB 2016 means an economy was 25 percentage points away from the frontier constructed from the best performances across all economies and across time. A score of 80 in DB 2017 would indicate the economy is improving. In this way the distance to frontier measure complements the annual ease of doing business ranking, which compares economies with one another at a point in time.

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### 2.1.2 Enforcing contracts (Distance to Frontier)

Doing Business 2019 - World Bank

The distance to frontier score aids in assessing the absolute level of regulatory performance and how it improves over time. This measure shows the distance of each economy to the “frontier,” which represents the best performance observed on each of the indicators across all economies in the Doing Business sample since 2005. This allows users both to see the gap between a particular economy’s performance and the best performance at any point in time and to assess the absolute change in the economy’s regulatory environment over time as measured by Doing Business. An economy’s distance to frontier is reflected on a scale from 0 to 100, where 0 represents the lowest performance and 100 represents the frontier. For example, a score of 75 in DB 2016 means an economy was 25 percentage points away from the frontier constructed from the best performances across all economies and across time. A score of 80 in DB 2017 would indicate the economy is improving. In this way the distance to frontier measure complements the annual ease of doing business ranking, which compares economies with one another at a point in time.

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## 2.2 Capital

### 2.2.1 IT & media stock market capitalization (% of total stock market capitalization)

Thomson One Banker  
Thomson Data Stream

Datastream Telecom, Media and IT (TMT) Market Value in national currency. Calculated as a percentage of Datastream Total Market Value in national currency. Figures for close-of-business on the 29th March each year.

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### 2.2.4 Country credit rating (Index (0-60) of three country credit ratings: Fitch, Moody's and S&P)

Fitch, Moody's and S&P

IMD WCC created index of the three country credit ratings Fitch, Moody's and S&P. Each rating, including the outlook, is converted to a numerical score from 20-0 and totalled for each country.

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### 2.2.6 Investment in Telecommunications (Percentage of GDP)

Passport GMID  
Source: © Euromonitor International 2019  
National sources

Investment refers to as the annual capital expenditure; this is the gross annual investment in telecom (including fixed, mobile and other services) for acquiring property and network. The term investment means the expenditure associated with acquiring the ownership of property (including intellectual and non-tangible property such as computer software) and plant. This includes expenditure on initial installations and on additions to existing installations where the usage is expected to be over an extended period of time. Note that this applies to telecom services that are available to the public, and exclude investment in telecom software or equipment for private use.

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## 2.3 Technological framework

### 2.3.2 Mobile Broadband subscribers (3G & 4G market, % of mobile market)

Business Monitor International

Total active mobile 3G and 4G subscriptions, excluding broadband connections on dedicated data SIM cards or USB dongles. Data given as a percentage of the total mobile market.

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### 2.3.3 Wireless broadband (Penetration rate (per 100 people))

Passport GMID  
Source: © Euromonitor International 2019

The penetration rates of wireless broadband is calculated by dividing the number of Wireless Broadband subscribers by the total population and multiplying by 100. Wireless-broadband subscriptions refer to the sum of satellite broadband, terrestrial fixed wireless broadband and active mobile-broadband subscriptions to the public Internet. The indicator refers to total active wireless-broadband Internet subscriptions using satellite, terrestrial fixed wireless or terrestrial mobile connections. Broadband subscriptions are those with an advertised download speed of at least 256 kbit/s. In the case of mobile-broadband, only active subscriptions are included (those with at least one access to the Internet in the last three months or with a dedicated data plan). The service can be standalone with a data card, or an add-on service to a voice plan. The indicator does not cover fixed (wired)-broadband or Wi-Fi subscriptions. Both residential and business subscriptions should be included.

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### 2.3.4 Internet users (Number of internet users per 1000 people/ Source: Computer Industry Almanac )

Computer Industry Almanac Inc. April 2018  
National sources

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### 2.3.5 Internet bandwidth speed (Average speed)

M-Labs / cable.co.uk  
Ookla  
Akamai  
OpenSignal

Average connection speed in Mbps: data transfer rates for Internet access by end-users.

Values presented are an average compiled from four different sources: M-Labs / cable.co.uk; Ookla; Akamai; and OpenSignal.

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### 2.3.6 High-tech exports (%) (Percentage of manufactured exports)

The World Bank (Development Data Group)  
<http://databank.worldbank.org>  
National sources

High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.

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## Factor 3: Future readiness

### Adaptive attitudes

#### 3.1.1 E-Participation (Use of online services that facilitate public's interaction with government)

UN E-Government Knowledge Database

The e-participation index (EPI) measures the use of online services to facilitate provision of information by governments to citizens ("e-information sharing"), interaction with stakeholders ("e-consultation"), and engagement in decision-making processes ("e-decision making").

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#### 3.1.2 Internet retailing (US\$ Per '000 People)

Passport GMID  
Source: © Euromonitor International 2019

Retail Value excluding sales tax

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#### 3.1.3 Tablet possession (% households)

Passport GMID  
Source: © Euromonitor International 2019

Percentage of households having at least one item. Portable, usually battery-powered, and very thin personal computer contained with a touchscreen panel.

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#### 3.1.4 Smartphone possession (% households)

Passport GMID  
Source: © Euromonitor International 2019

Percentage of households having at least one item. A smartphone is a cellular telephone with an integrated computer and other features not originally associated with telephones, such as an operating system, Web browsing, music and movie player, camera and camcorder, GPS navigation, voice dictation for messaging, the ability to run software applications, etc.

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### Business agility

#### 3.2.2 World robots distribution (Percentage share of world robots)

World Robotics 2018  
International Federation of Robotics (IFR)

Industrial robot as defined by ISO 8373:2012: an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications.

The primary source is data on robot installations by country, industry and application that nearly all industrial robot suppliers worldwide report to the IFR Statistical Department directly. Several national robot associations collect data on their national robot markets and provide their results as secondary data to the IFR. This data is used to validate and complete the IFR primary data.

IFR Statistical Departments estimates the operational stock assuming an average service life of 12 years with an immediate withdrawal from service afterwards.

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## IT integration

### 3.3.1 E-Government (Provision of online government services to promote access and inclusion of citizens)

UN E-Government Knowledge Database

The E-Government Development Index presents the state of E-Government Development of the United Nations Member States. Along with an assessment of the website development patterns in a country, the E-Government Development index incorporates the access characteristics, such as the infrastructure and educational levels, to reflect how a country is using information technologies to promote access and inclusion of its people. The EGDI is a composite measure of three important dimensions of e-government, namely: provision of online services, telecommunication connectivity and human capacity.

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### 3.3.4 Software piracy (% of unlicensed software installation)

BSA Global Software Survey

The BSA Global Software Survey calculates unlicensed installations of software that runs on PCs — including desktops, laptops, and ultra-portables, such as netbooks. A key component of the BSA Global Software Survey is a global survey of more than 20,000 home and enterprise PC users, conducted by IDC. In addition, a parallel survey was carried out among 2,200 IT managers in 22 countries. Please consult the original report for a more detailed explanation of the methodology.

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