



IMD WORLD

DIGITAL COMPETITIVENESS

RANKING 2021



Preface

The year 2020 started with news of a pandemic out of Wuhan, China. After a slow response by the rest of the world, the aftermath of the pandemic was clear and powerful. The presence of COVID-19 throughout 2020 introduced two great challenges to governments around the world: a health crisis and a consequent economic turmoil.

The common domain for successfully addressing the twin challenges of the health and economic crises was the technological infrastructure of countries. People, firms, and countries had to rapidly adapt in the new environment of learning and working online, order their necessities online and enjoy family and friends virtually. In fact, it is the capacity of economies to use digital technologies to transform themselves that the IMD World Digital Competitiveness Ranking measures.

We are delighted to present the fifth edition of the *IMD World Digital Competitiveness Ranking (WDCR)* for 2021. This year we have the pleasure of welcoming a new economy in the group of countries we study, Botswana, increasing the total number to 64.

The three important results we identified examining this year's rankings follow the suggestions that the Center has echoed in the last few years. The countries who seem to have performed better are those that have managed to have a strong presence in future readiness, that is, with flexible and agile individuals as well as firms, and to integrate the IT technologies in their daily practice. In addition, leading economies are characterized by strong performance in training and education. Finally, leading economies have the ability to allocate capital towards learning and developing new technologies.

Once again, we were reminded how fortunate we are to enjoy the support of a large group of stakeholders. Our *Partner Institutes*, the *IMD Alumni* community and our *Panel of Experts* from all the countries generously offer data and insights that are crucial for the completion of this and the other rankings of the Center. This year again, they miraculously managed to make us feel that it was business as usual and not a uniquely complicated and difficult environment. The reason you have this publication in your hands now is, for a great part, because of our stakeholders. We are immensely thankful!



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The IMD World Competitiveness Center

For more than 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 58 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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User's Guide to the IMD World Digital Competitiveness Ranking

Overall and Breakdown Digital Rankings

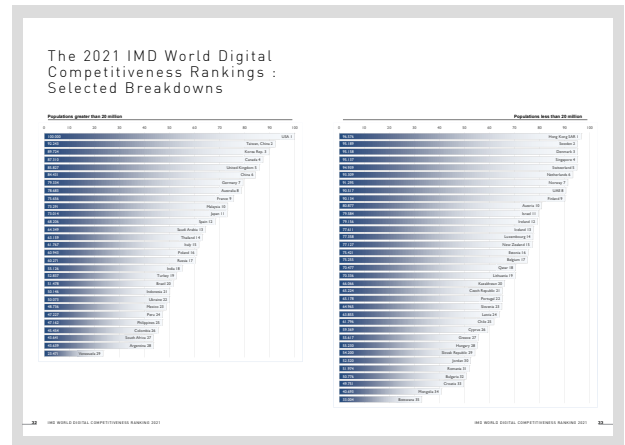
The IMD World Digital Competitiveness Ranking

The IMD World Digital Competitiveness Ranking presents the 2021 overall rankings for the 64 economies covered by the WCY. The rankings are calculated on the basis of the 52 ranked criteria: 32 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 (2020) are shown in brackets. The index value or "score" is also indicated for each country.



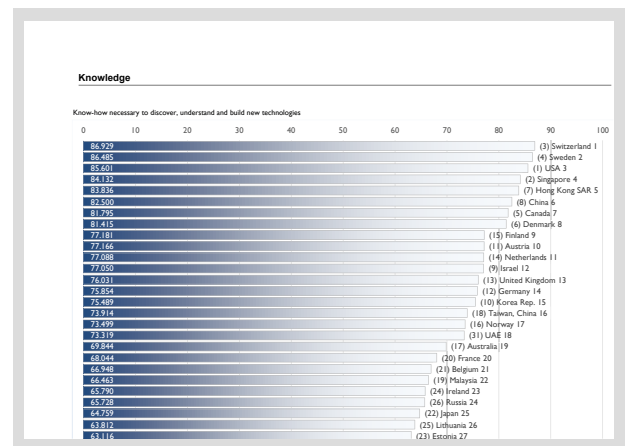
Selected breakdowns of the IMD World Digital Competitiveness Ranking

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 (2020) 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.

The table displays overall rankings and 5-year trends for three digital competitiveness factors: Knowledge, Technology, and Future Readiness. It lists 64 economies and their respective scores and trends for each factor.

Digital Sub-factor Rankings

A summary of the rankings for all nine sub-factors is presented for the 64 economies for 2021. 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.

The table shows sub-factor rankings for 64 economies across three main categories: Knowledge, Technology, and Future Readiness. Each category is further divided into specific sub-factors.

Country	Knowledge			Technology			Future Readiness		
	Index	Training & Education	Scientific Concentration	Regulatory Framework	Capital	Technological Framework	Infrastructure	Business Maturity	Migration
Argentina	62	65	54	37	43	56	30	45	37
Australia	8	37	18	17	17	27	14	55	21
Austria	15	5	15	26	32	38	21	18	11
Belgium	20	31	20	18	20	37	22	38	26
Botswana	53	48	63	63	56	64	63	46	63
Brazil	63	58	21	51	59	51	40	42	49
Bulgaria	54	53	46	55	53	42	45	61	53
Canada	9	16	5	13	9	29	17	20	14
Chile	36	51	57	33	38	36	24	54	39
China	12	35	1	15	27	28	19	3	32
Colombia	37	50	58	61	49	59	58	47	46
Croatia	61	42	34	56	50	41	39	64	58
Cyprus	56	28	29	47	54	52	37	50	33
Czech Republic	28	45	30	44	29	32	35	32	36
Denmark	5	4	17	4	13	6	4	7	1
Estonia	29	8	45	28	33	20	20	25	25
Finland	10	19	10	11	10	14	7	21	2
France	23	27	12	10	21	17	46	23	22
Germany	21	17	6	25	23	43	23	15	20
Greece	42	55	35	43	52	50	43	51	41
Hong Kong SAR	4	1	14	4	7	1	3	9	17
Hungary	43	47	42	36	45	21	62	62	42
Iceland	35	22	29	14	26	3	31	16	27
India	38	43	47	52	4	62	55	36	51
Indonesia	48	64	44	50	25	55	57	26	60
Ireland	18	32	24	19	35	34	12	14	19
Israel	27	3	9	31	28	26	25	31	13
Italy	40	60	25	42	48	44	36	19	38

Digital Competitiveness Country Profiles

Each two page profile analyses the performance of one of the 64 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.

Page 1: Digital Competitiveness – Overall and factors trends

This page shows the overall, factors and sub-factors ranking performances of the country in 2021, their 5-years trends and a comparison of between competitiveness and digital competitiveness rankings. The following indicators are presented:

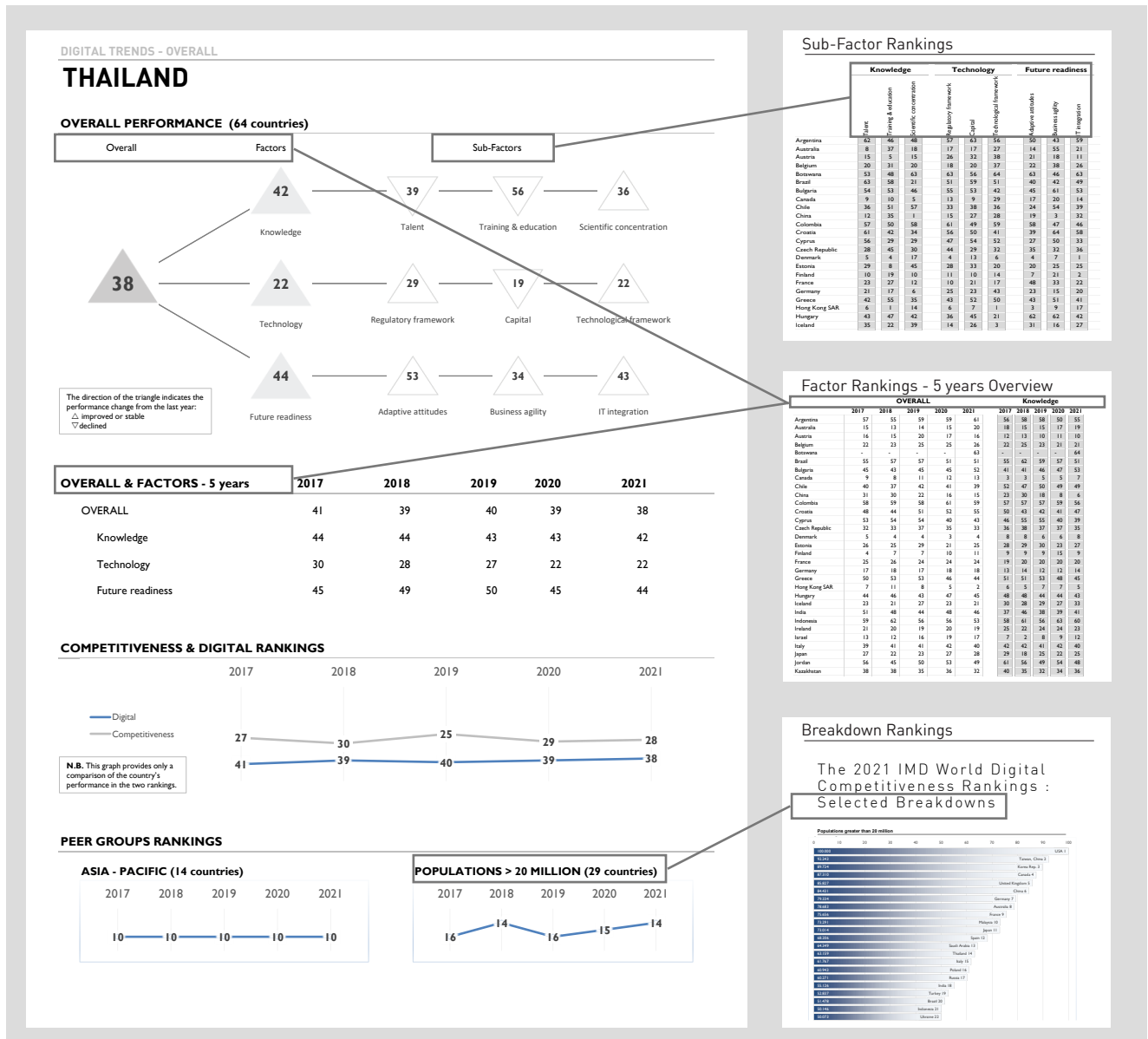
Overall Performance: Overall, factors and sub-factors digital ranking performances of the country in 2021. The direction of the triangles indicates whether there has been an improvement or a decline with respect to the previous year.

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.



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 52 criteria rankings for 2021.

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 52 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

THAILAND

▶ Overall top strengths
▶ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	42	42	40	36	39
Training & education	47	44	50	55	56
Scientific concentration	43	45	35	37	36

Subfactors	2017	2018	2019	2020	2021
Talent	42	42	40	36	39
Training & education	47	44	50	55	56
Scientific concentration	43	45	35	37	36

Subfactors	Rank	Training & education	Rank
Educational assessment PISA - Math	48	Employee training	20
International experience	25	▶ Total public expenditure on education	59
Foreign highly-skilled personnel	22	▶ Higher education achievement	49
Management of cities	28	▶ Pupil-teacher ratio (tertiary education)	56
Digital/Technological skills	42	▶ Graduates in Sciences	17
Net flow of international students	37	▶ Women with degrees	47

Subfactors	Rank	Scientific concentration	Rank
Total expenditure on R&D (%)	40	▶ Female researchers	6
Total R&D personnel per capita	40	▶ R&D productivity by publication	31
Female researchers	6	▶ Scientific and technical employment	58
R&D productivity by publication	31	▶ High-tech patent grants	42
Scientific and technical employment	58	▶ Robots in Education and R&D	17
High-tech patent grants	42		
Robots in Education and R&D	17		

Factor Rankings - 5 years Overview

Country	OVERALL					Knowledge				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Argentina	27	35	59	59	41	56	58	58	50	55
Australia	15	13	14	15	20	18	15	15	17	19
Austria	16	15	20	17	14	12	13	20	11	10
Belgium	22	23	25	25	26	22	25	23	21	21
Botswana	-	-	-	-	-	-	-	-	-	-
Brazil	45	37	37	51	51	55	62	59	57	51
Bulgaria	45	43	45	45	52	41	41	46	47	53
Canada	9	8	11	12	13	3	3	5	5	7
Chile	40	37	42	41	39	52	47	50	49	49
China	31	26	22	16	15	23	28	18	8	5
Colombia	58	59	58	61	59	57	57	57	59	56
Croatia	48	44	51	52	55	50	43	42	41	47
Cyprus	53	54	54	40	43	46	55	40	39	39
Czech Republic	32	33	37	35	33	36	38	37	37	35
Denmark	5	4	4	3	4	6	8	16	6	9
Estonia	36	35	29	21	25	28	29	28	23	27
Finland	4	7	7	10	11	9	9	9	15	9
France	25	26	34	34	34	19	20	20	20	20
Germany	17	18	17	18	18	13	14	13	12	14
Greece	50	53	53	46	44	51	51	53	48	45
Hong Kong SAR	7	11	8	5	2	6	5	7	7	5
Hungary	44	46	43	47	45	48	48	44	44	43
Iceland	23	21	27	23	21	20	28	29	27	23
India	51	48	44	48	46	37	46	38	39	41
Indonesia	59	62	56	56	53	58	61	56	63	60
Israel	21	20	19	20	19	21	22	19	24	23
Italy	39	41	41	42	40	42	42	41	42	40
Japan	27	22	23	27	28	29	18	25	22	25
Jordan	56	45	50	53	49	61	56	49	54	48
Kazakhstan	38	38	35	34	32	40	35	34	36	34
Korea Rep.	19	14	10	8	12	14	11	11	10	15
Kuwait	35	35	36	38	37	34	34	36	35	34
Lithuania	29	29	30	29	30	21	23	26	25	26
Luxembourg	20	24	21	28	22	27	32	34	35	29
Malaysia	34	27	36	34	27	17	17	16	19	19
Mexico	51	49	54	56	54	54	54	52	54	54
Mongolia	61	61	62	62	62	59	53	62	58	60
Netherlands	4	9	6	7	7	11	12	13	14	11
New Zealand	14	19	18	22	23	20	21	21	28	28
Norway	15	16	16	9	9	15	16	16	14	17
Paraguay	62	60	61	55	57	62	60	61	55	59
Philippines	46	56	58	51	58	51	58	54	52	58
Poland	37	36	33	32	41	32	33	33	30	38
Portugal	33	32	34	37	34	31	27	31	33	32
Qatar	38	38	31	30	29	35	37	45	44	44
Romania	54	47	46	49	50	47	45	47	53	52
Russia	42	40	28	43	42	24	24	23	26	24
Saudi Arabia	36	42	39	34	36	39	40	39	40	50
Singapore	1	2	1	2	1	1	1	1	2	4

Sub-factor Rankings

Country	Knowledge		Technology		Future readiness	
	Rank	Score	Rank	Score	Rank	Score
Argentina	62	60	48	57	63	56
Australia	8	32	18	17	27	14
Austria	15	5	15	26	32	38
Belgium	20	31	20	18	20	37
Botswana	53	48	63	63	56	64
Brazil	63	58	21	51	59	51
Bulgaria	54	53	46	55	53	42
Canada	9	10	5	13	9	29
Chile	36	51	57	33	38	36
China	12	35	1	15	27	28
Colombia	57	50	58	61	49	59
Croatia	61	62	34	56	50	41
Cyprus	56	29	29	47	54	52
Czech Republic	38	45	30	44	29	32
Denmark	5	4	17	4	13	4
Estonia	39	8	45	28	33	20
Finland	23	27	12	10	21	17
France	21	17	6	25	23	43
Germany	17	18	10	11	10	14
Greece	42	55	35	43	52	50
Hong Kong SAR	6	1	14	6	7	1
Hungary	43	47	42	36	45	21
Iceland	35	22	39	14	26	3
India	48	44	47	52	4	55
Indonesia	59	64	64	50	55	57
Israel	18	32	26	19	35	34
Italy	37	3	9	31	28	36
Japan	40	60	25	42	48	44
Jordan	47	21	13	48	37	8
Kazakhstan	34	31	62	38	43	53
Korea Rep.	45	14	54	22	51	47
Kuwait	36	16	3	33	16	7
Lithuania	24	30	51	34	46	18
Luxembourg	25	15	37	32	30	47
Malaysia	33	20	38	8	25	38
Malta	30	9	32	35	31	15
Mexico	51	57	50	54	54	52
Mongolia	60	39	61	58	62	60
Netherlands	4	28	16	7	3	10
New Zealand	14	36	33	24	23	21
Norway	16	11	22	1	6	12
Paraguay	59	41	60	49	58	54
Philippines	55	61	56	62	40	49
Poland	41	44	28	53	47	31

Digital competitiveness challenges in the midst of the pandemic

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1. Introduction

2020 started with news of a pandemic out of Wuhan, China. After a slow response by the rest of the world, the aftermath of the pandemic was clear and powerful. The presence of COVID-19 introduced two great challenges to governments around the world: a health crisis and subsequent economic turmoil.

To address the health crisis, countries had three areas to tackle. The first was to identify those people who were infected; a task that required frequent and accurate testing. The second was to control the spread of the virus; an undertaking that demanded new products and tools, from a large number of protective masks, gloves and bodywear, to digital applications that notified people if they had encountered an infected person. Finally, the existing health infrastructure system, used by countries to coordinate and

provide care to people with life-threatening symptoms, was an overpowering constraint too difficult to overcome during the pandemic for almost all countries.

The twin challenge of the pandemic – the economic crisis – spawned a similar response from every country, at least in principle. On the one hand, to introduce expansionary fiscal and monetary policies to stimulate the aggregate demand of economies. On the other, to extend liquidity provisions to people and firms in an unprecedented manner, to safeguard social wellbeing and the capacity of firms to operate under the difficult conditions of lockdown and broken international supply chains.

The common link for the success of the above measures was technological infrastructure. More specifically, the

Figure 1: Measures adopted under pandemic conditions

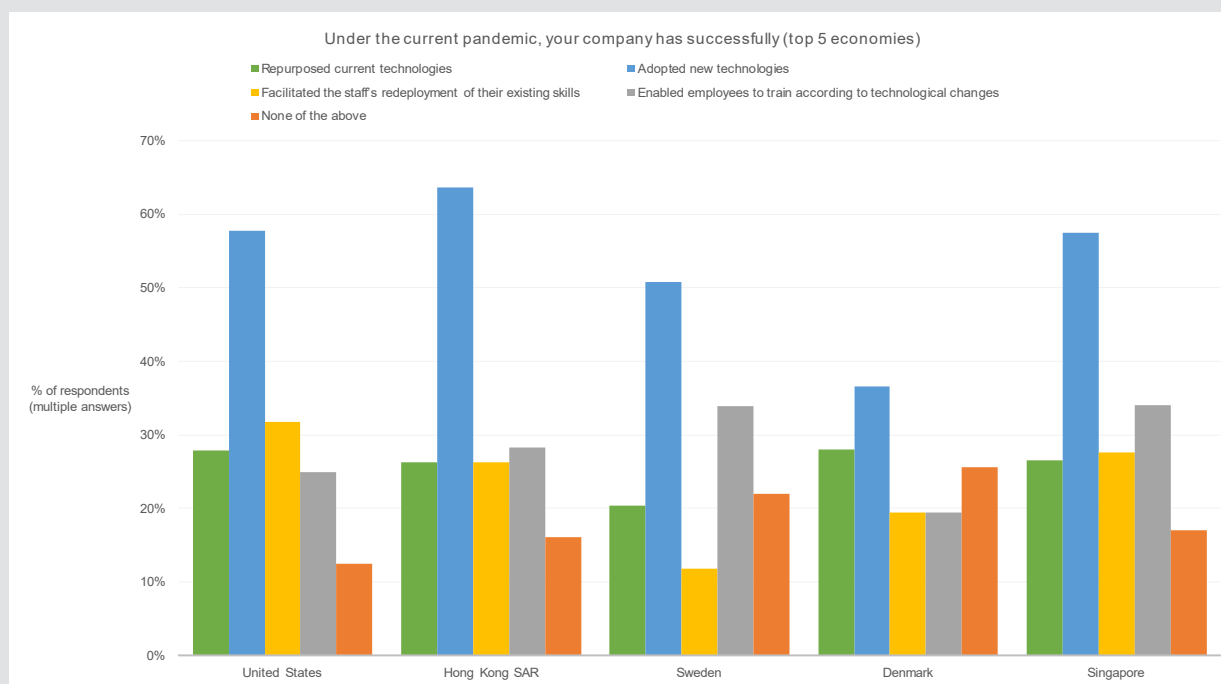
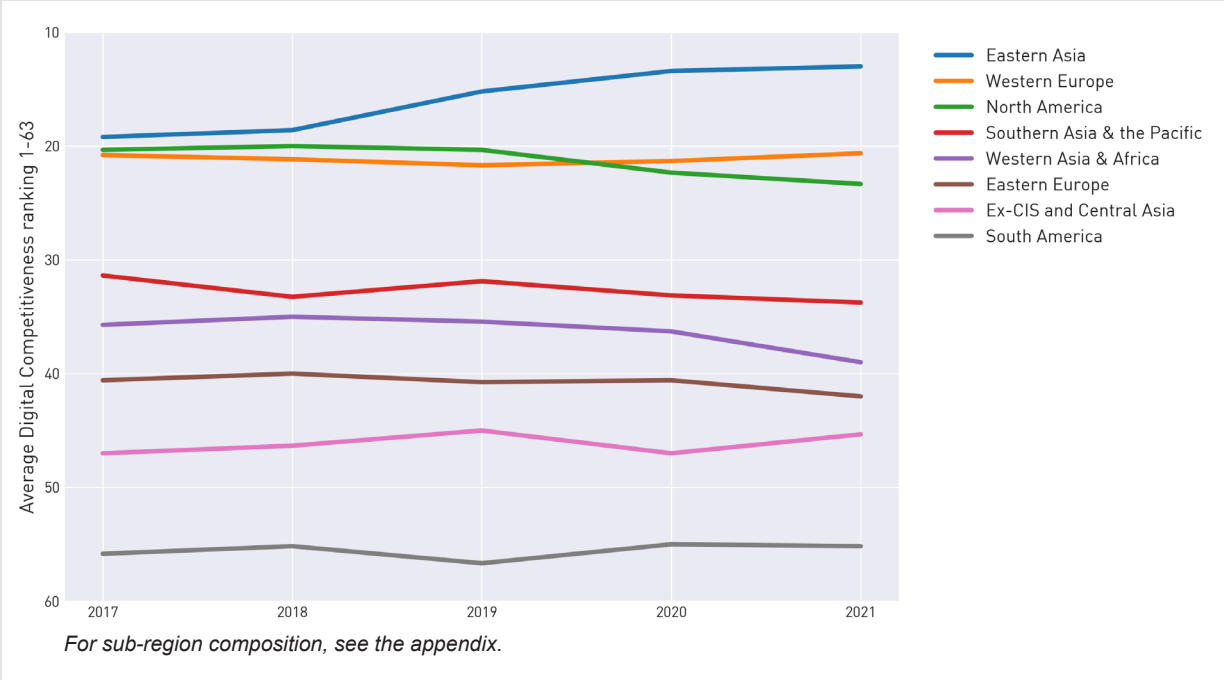


Figure 2: Average Digital Competitiveness Ranking (1-63) by sub-region.



pandemic challenged the capacity of a country to adopt a new, more secluded environment, which led to adjustments of both our social and professional lives. Academic institutions of any level were mostly closed. Therefore, both, students and participants on the one hand and instructors on the other had to fulfil their obligations from a distance. Similarly, many other professionals whose occupations allowed them to work from home, undertook this practice. People also became highly reliant on ordering their necessities online. This, in turn, implied that the selection of products and the payment processes took place digitally. In fact, families and friends began congregating in the digital space as well!

To succeed in such a rapidly shifting landscape, a country and its citizens had to be able to adopt and explore new digital technologies that transform government practices, business models, and society in general. This is indeed what the IMD World Digital Competitiveness Ranking quantifies. That is, the capacity of 64 economies to use digital technologies in order to transform themselves. We quantify this ability by employing three factors: Knowledge, Technology and Future Readiness.

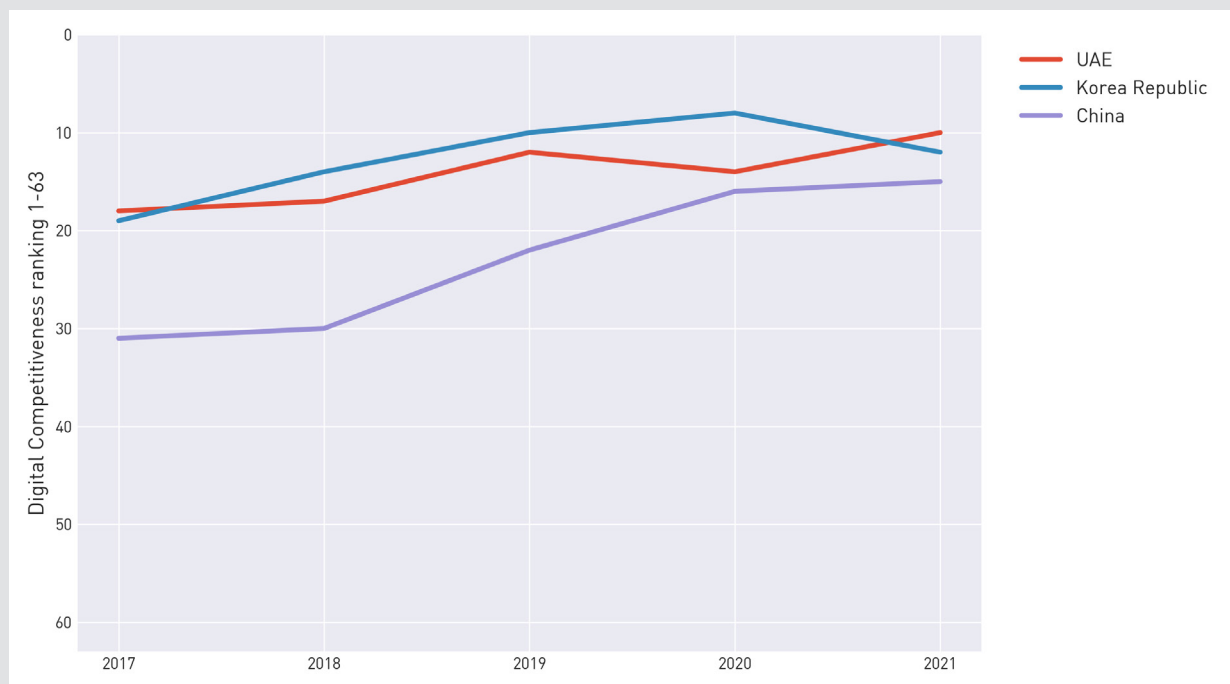
The Knowledge factor refers to the intangible infrastructure that underlines the process of digital transformation through the discovery, understanding and learning of new technologies. These aspects are captured by indicators that measure the quality of the human capital available in the country, the level of investments in education and research as well as the outcomes of these investments (e.g., registered patent grants in high-tech fields or scientific publications in academic journals).

The Technology factor assesses the overall context through which the development of digital technologies is enabled. This includes criteria that track how much friendly regulation is facilitating innovation in the private sector, the availability of capital for investments and the quality of the technological infrastructure in place. Finally, the Future Readiness factor examines the degree to which governments, business and society at large are adopting technology. Examples of indicators included in this factor are the diffusion of: internet retailing (e-commerce); of industrial robots and data analytics tools in the private sector; and of e-government services.

The ranking does not specifically measure issues related to the pandemic. Nevertheless, technology, as argued, has been one of the most important tools for addressing the crisis. Better access to advanced IT hardware (broadband, tablet possession) and services (e-government) are those that display higher IT usage (internet retailing). All these are indicators that help measure a country's transition to the new landscape adopted to accommodate the pandemic.

In what follows, we present an outline of the findings of the ranking. We identify the overall trends and dive into the specific characteristics of the five most digitally competitive economies. Among other issues, we recognise what mid- and upper-level executives in these five economies perceive to be their most successful transformations. The subsequent session identifies the bigger picture and places the results in a longer period perspective, examining the evolution of regions and countries over the last five years.

Figure 3: World Digital Competitiveness Ranking 2021 – Overall Ranking Top gainers 2017-2021



2. Overall Trends

Digital competitiveness implies the central role of new technologies in transforming governments' and businesses' process as well as how society interacts. Digital competitiveness thus reflects the adoption of new technologies in providing solutions that lead to long-term value creation. Such solutions may be, for example, the development of an innovative process that enables businesses to improve their services to customers. Value creation, in the latter example, may emerge from an organization's better understanding of its customers' needs and/or of its products' value in the eyes of customers. In any case, value creation brings long-term benefits to all stakeholders. The disruptive pandemic conditions of the last year and a half have forced many enterprises to undergo a shift in their business models. Such a pivot has required them to exhibit flexibility and speed in their responses to change and to new opportunities, and has led to a transformation of those organizations' relationships with their customers/clients.

In this context, readiness – particularly the level of societal adaptiveness and business agility – has been of paramount significance. Readiness, importantly, partly depends on the effectiveness of talent management and the production and acquisition of knowledge within an ecosystem that is conducive to innovation. The 2021 WDCR, indeed, highlights the prominence of readiness, talent and knowledge. In this year's results, we identify three overall trends:

- *Countries in the top positions of the ranking foster the continuous development of a knowledge-intensive economy that is able to explore, adopt, and produce digital technologies at scale, innovating the way in which businesses and government operate and their interactions with society*
- *More specifically, to different degrees, leading economies sustain their digital competitiveness through their performance in future readiness particularly by remaining adaptive and agile*
- *Their digital competitiveness also benefits from strong performances in talent and training and education*

As the next section highlights, these characteristics make leading economies resilient to short-term external shocks like the recent Covid-19 pandemic.

3. Top 5 economies: Highlights

The USA remains at the top of the 2021 IMD World Digital Competitiveness Ranking. It does so by performing strongly in the knowledge (3rd place) and Future Readiness (1st) factors. In the former, the USA excels in the scientific concentration sub-factor. In the latter, its performance is boosted by the adaptive attitudes and business agility sub-factors, ranking 1st in both.

Hong Kong SAR ranks 2nd, an increase from 5th place last year. The advancement results mainly from improvements in the technology factor in which it ranks 1st (up from 2nd) and to a lesser extent from increases in the knowledge factor, moving up to 5th from 7th. Under the technology factor, Hong Kong boosts its position by improving in all sub-factors, particularly in the technological framework sub-factor, in which it reaches the top position. In terms of the knowledge factor, it shows robust performances in training and education, moving from 5th to the 1st, and in talent within which it progresses to the 6th rank (from 7th). In addition, although in the future readiness factor it remains in 10th place, Hong Kong's performance in adaptive attitudes (up 3rd from 4th) and business agility (up 9th from 14th) is sharp.

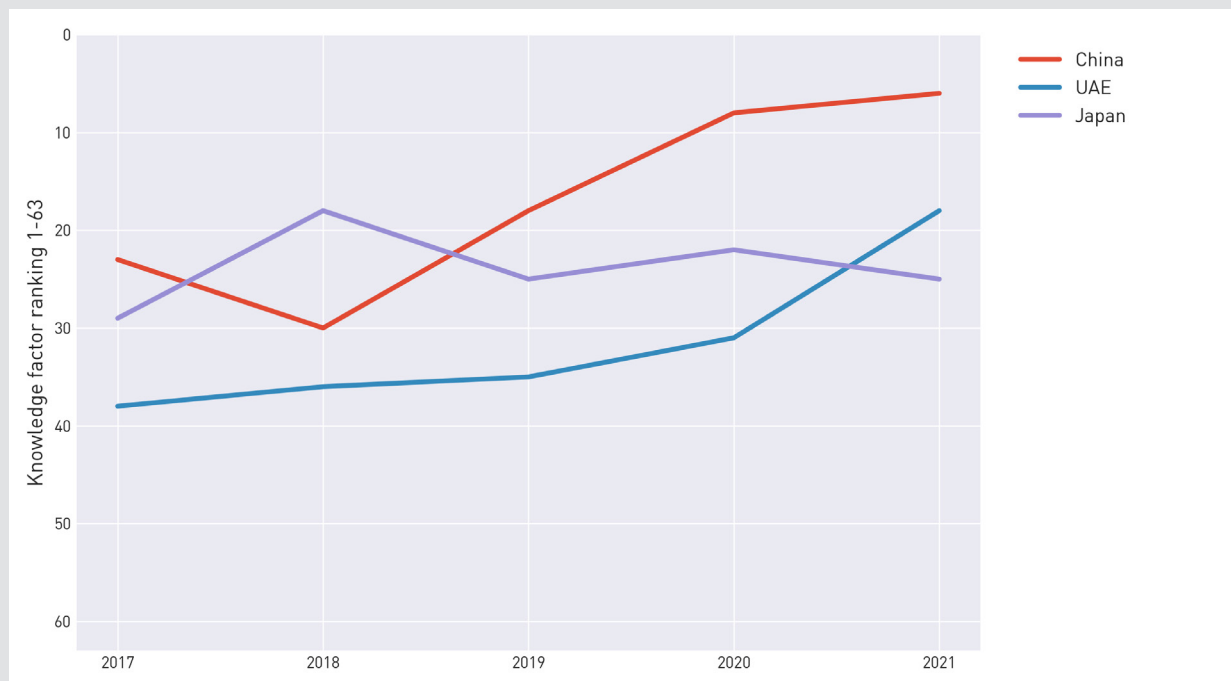
Sweden moves up to 3rd (from 4th), largely as a result of its performance in the knowledge (from 4th to 2nd) and future readiness (from 7th to 6th) factors. In knowledge, it advances in the talent (9th to 7th) and scientific concentration (6th to 4th) sub-factors, remaining in 2nd place in training and education. In future readiness, its achievements come in adaptive attitudes (5th from 8th) and despite a slight drop, in IT integration (from 4th to 5th). Sweden's performances in the regulatory framework and capital sub-factors (under technology), are also noteworthy, where it ranks 3rd and 5th, respectively.

Denmark ranks 4th, down from 3rd place. It undergoes drops in its positions in knowledge (6th to 8th) and future readiness (1st to 2nd), remaining in the same spot in technology (9th). Despite the drop under knowledge, Denmark remains among the leading economies in talent (5th) and training and education (4th). Similarly, in future readiness it remains in the top position in IT integration, and in the top 10 in adaptive attitudes (4th) and business agility (7th). Denmark also performs well in technology, remaining in 4th and 6th place in the regulatory and technological frameworks, respectively.

Singapore drops to 5th position (from 2nd), mainly as a result of declines in knowledge (from 2nd to 4th) and technology (from 1st to 3rd). Under knowledge, it experiences a deep drop in training and education (down to 13th from 7th) but remains in the top 10 in talent (2nd from 1st). In technology, Singapore shows its largest drop in the regulatory framework sub-factor (from 1st to 5th) followed by the decline in capital (from 11th to 14th). Within future readiness, however, its performances in IT integration (7th), and to a lesser extent in adaptive attitudes (11th) and business agility (12th), remain strong.

Additionally, and according to participants in our executive survey, in the aforementioned 5 most digitally competitive countries, most companies successfully adopted new technologies to address the implications of the pandemic. Furthermore, the majority of these countries enabled their staff to develop the skills needed to face the technological shifts that emerged during the pandemic, while others facilitated the redeployment of their employees' skills (see **Figure 1**).

Figure 4: Knowledge factor - Top gainers 2017-2021



4. Long-term regional trends

Regional trends also accentuate the fundamental role of knowledge acquisition, and of the readiness of an economy to adopt and integrate new technologies. The main trend highlighted by this year's edition of the WDCR is that Eastern Asian economies continue their (persistent) rise up the digital competitiveness ladder. This, despite the firm lead of the USA at the top of the ranking and the continuous domination of most of the top 10 positions by Western European countries. Regional averages of digital competitiveness (**Figure 2**) indicate that it is the rise of Eastern Asian countries (e.g., Hong Kong, China, South Korea and Japan) to the top of the ranking since 2017 that results in the advancement of the region. In general, countries in the Eastern Asian region experienced strong improvements both in knowledge generation (Knowledge Factor, **Figure 4**) and in technology adoption and diffusion (Future Readiness factor, **Figure 6**).

The trends presented in **Figure 2**, also show that North America registers a slightly declining tendency over the past 2 years, which is mainly driven by the sluggish performance of Mexico. Conversely, Western Europe experiences an improvement during the same period. Other world regions tend to be stable, with South American economies lagging behind in digital competitiveness when compared to the rest of the world.

China is the economy that achieved the biggest leap in the WDCR between 2017 and 2021, rising from 31st to the 15th place. During this period of time the country has become a leader in many sectors, from the development of artificial intelligence applications to large public and

private research investments in fields like robotics, batteries and electric vehicles. Furthermore, China was among the countries that swiftly reacted to problems brought about by the pandemic. Such a response has substantially reduced the negative effects of the COVID-19 crisis on its economy.

Similarly, South Korea experienced a 7-position improvement between 2017 and 2021. The Korean accomplishment was driven by strong R&D investments, increased levels of business agility, the adoption of robots in industrial companies and the diffusion of digital technology throughout society.

Other Asian and Middle Eastern economies such as the UAE (18th in 2017, 10th in 2021) and Kazakhstan (38th in 2017, 32nd in 2021) also show strong advancements. Their digital competitiveness has been boosted by increasing investments in digital technologies in the private sector as well as the development of e-government services.

Another important trend highlighted by this year's WDCR are the continuous consequences of the pandemic affecting the performance of several countries in the 2021 ranking. For example, over the past year or so, Singapore has experienced a decline in several indicators that capture its attractiveness to foreign talent and the effectiveness of its talent pool. This decline can be partly understood by the increase in remote working in foreign companies which in return has led to a progressive reduction of the flow of international talent towards the city-state.

Figure 5: Technology factor - Top gainers 2017-2021

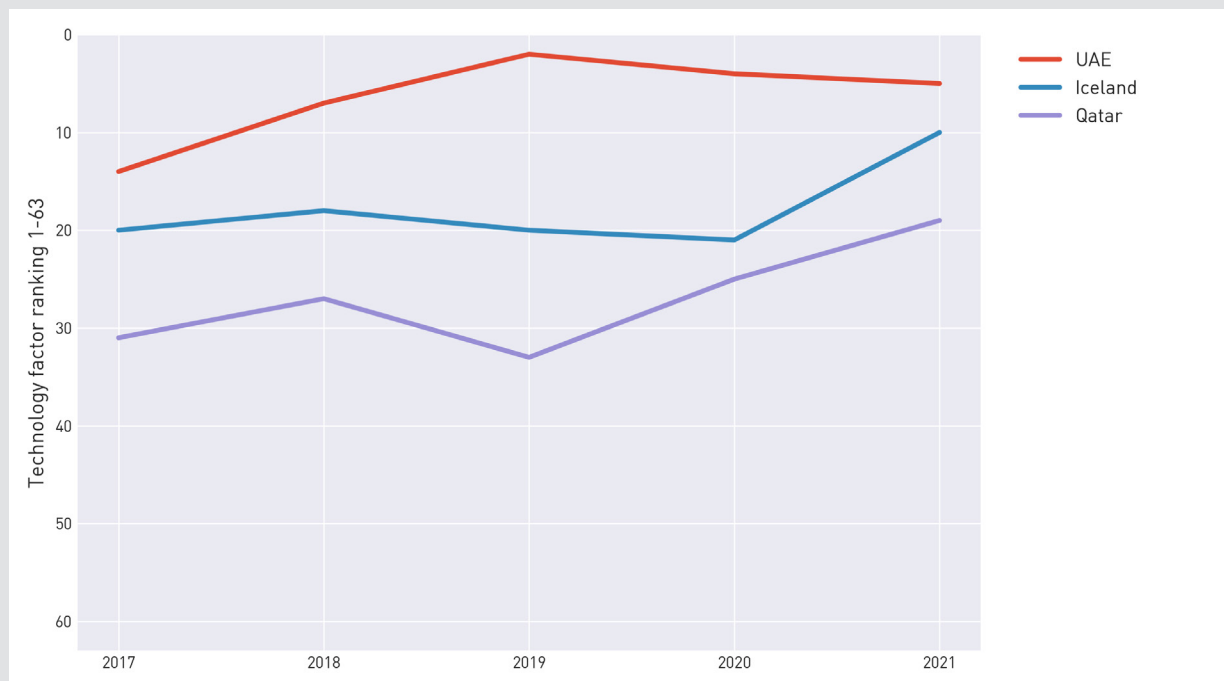
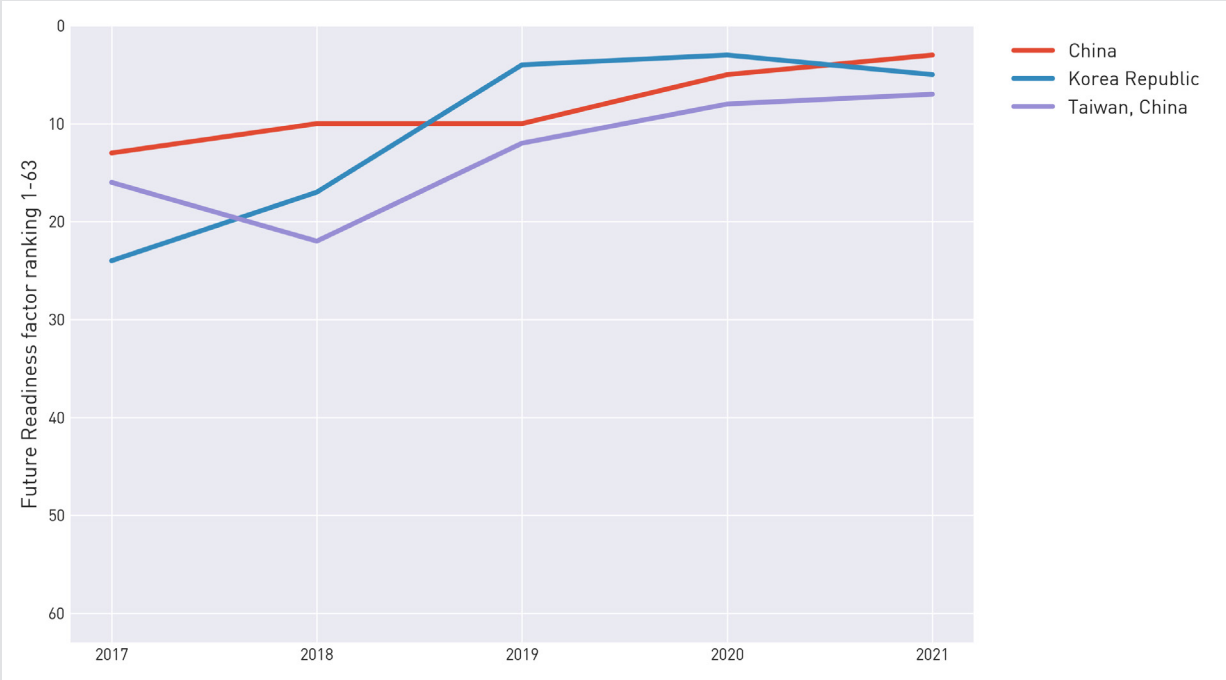


Figure 6: Future Readiness factor - Top gainers 2017-2021



5. Concluding remarks

2020 presented unparalleled challenges to all countries in two dimensions. On the one hand, their health infrastructure and ability to tackle a pandemic. On the other, their capacity to sustain their economies after they were affected by both demand and supply shocks. Given the existing level of international interdependence in the production of goods and services, the restricted mobility of people and goods only exacerbated the negative implications of the crisis. Technology proved to be the saving force in transforming government and business practices as well as social interconnection. The IMD World Digital Competitiveness Ranking provides a way to quantify the capacity of an economy to adopt and explore new digital technologies.

citizens around the world. Questions about the ownership of private versus public data, as well as the transparency of the use of the data, have been increasingly voiced. These topics need to be examined in a coordinated way, to enable us to enjoy the benefits of digital technology, while at the same time securing the liberties that societies have been built upon.

The three important results we identified when examining this year’s rankings follow the suggestions that the Center has echoed in the last few years. Countries with a strong presence in future readiness, that is, with individuals as well as firms that are flexible and agile, and who have managed to integrate IT technologies in their daily practices, seem to have performed better. In addition, leading economies are characterized by strong performances in training and education. Finally, those economies spearheading the way have the ability to allocate capital towards learning and developing new technologies.

The rapid expansion of the use of digital technologies has raised an additional issue that needs to be researched carefully. And this is related to the interactions of individuals with technology. The adoption of COVID-19 tracking applications was received with some scepticism from

Appendices

Figure 7: Digital competitiveness ranking 2020 and 2021

Rank 1-32	2020	2021	1 yr Change	Rank 33-64	2020	2021	1 yr Change
USA	1	1	-	Czech Republic	35	33	+ 2
Hong Kong SAR	5	2	+ 3	Portugal	37	34	+ 3
Sweden	4	3	+ 1	Slovenia	31	35	- 4
Denmark	3	4	- 1	Saudi Arabia	34	36	- 2
Singapore	2	5	- 3	Latvia	38	37	+ 1
Switzerland	6	6	-	Thailand	39	38	+ 1
Netherlands	7	7	-	Chile	41	39	+ 2
Taiwan, China	11	8	+ 3	Italy	42	40	+ 2
Norway	9	9	-	Poland	32	41	- 9
UAE	14	10	+ 4	Russia	43	42	+ 1
Finland	10	11	- 1	Cyprus	40	43	- 3
Korea Rep.	8	12	- 4	Greece	46	44	+ 2
Canada	12	13	- 1	Hungary	47	45	+ 2
United Kingdom	13	14	- 1	India	48	46	+ 2
China	16	15	+ 1	Slovak Republic	50	47	+ 3
Austria	17	16	+ 1	Turkey	44	48	- 4
Israel	19	17	+ 2	Jordan	53	49	+ 4
Germany	18	18	-	Romania	49	50	- 1
Ireland	20	19	+ 1	Brazil	51	51	-
Australia	15	20	- 5	Bulgaria	45	52	- 7
Iceland	23	21	+ 2	Indonesia	56	53	+ 3
Luxembourg	28	22	+ 6	Ukraine	58	54	+ 4
New Zealand	22	23	- 1	Croatia	52	55	- 3
France	24	24	-	Mexico	54	56	- 2
Estonia	21	25	- 4	Peru	55	57	- 2
Belgium	25	26	- 1	Philippines	57	58	- 1
Malaysia	26	27	- 1	Colombia	61	59	+ 2
Japan	27	28	- 1	South Africa	60	60	-
Qatar	30	29	+ 1	Argentina	59	61	- 2
Lithuania	29	30	- 1	Mongolia	62	62	-
Spain	33	31	+ 2	Botswana	-	63	New
Kazakhstan	36	32	+ 4	Venezuela	63	64	- 1

Figure 8: Digital competitiveness ranking 2019, 2020 and 2021

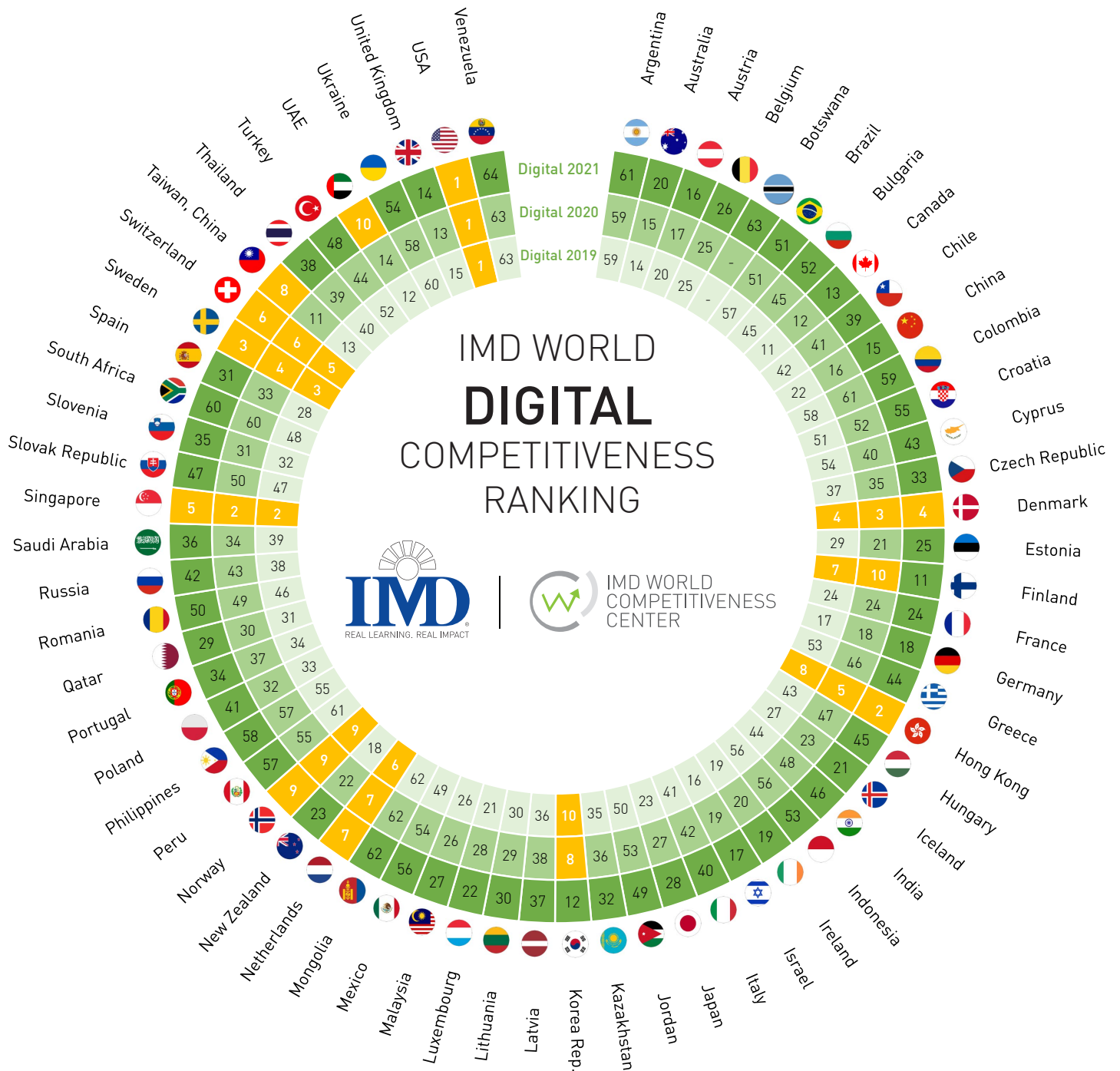


Figure 9: Composition of sub-regions and regions

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

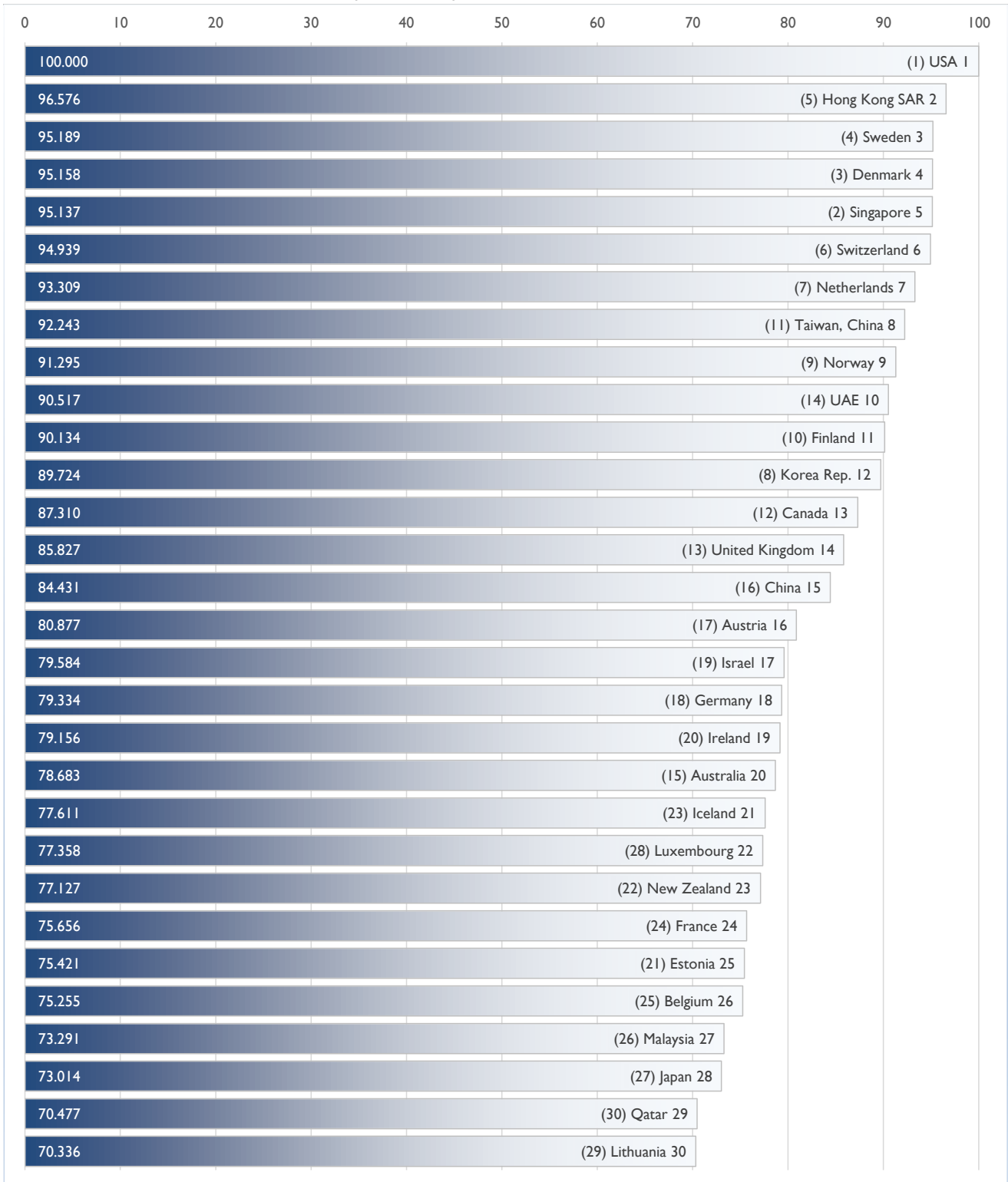
IMD WORLD DIGITAL COMPETITIVENESS RANKING 2021

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

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The 2021 IMD World Digital

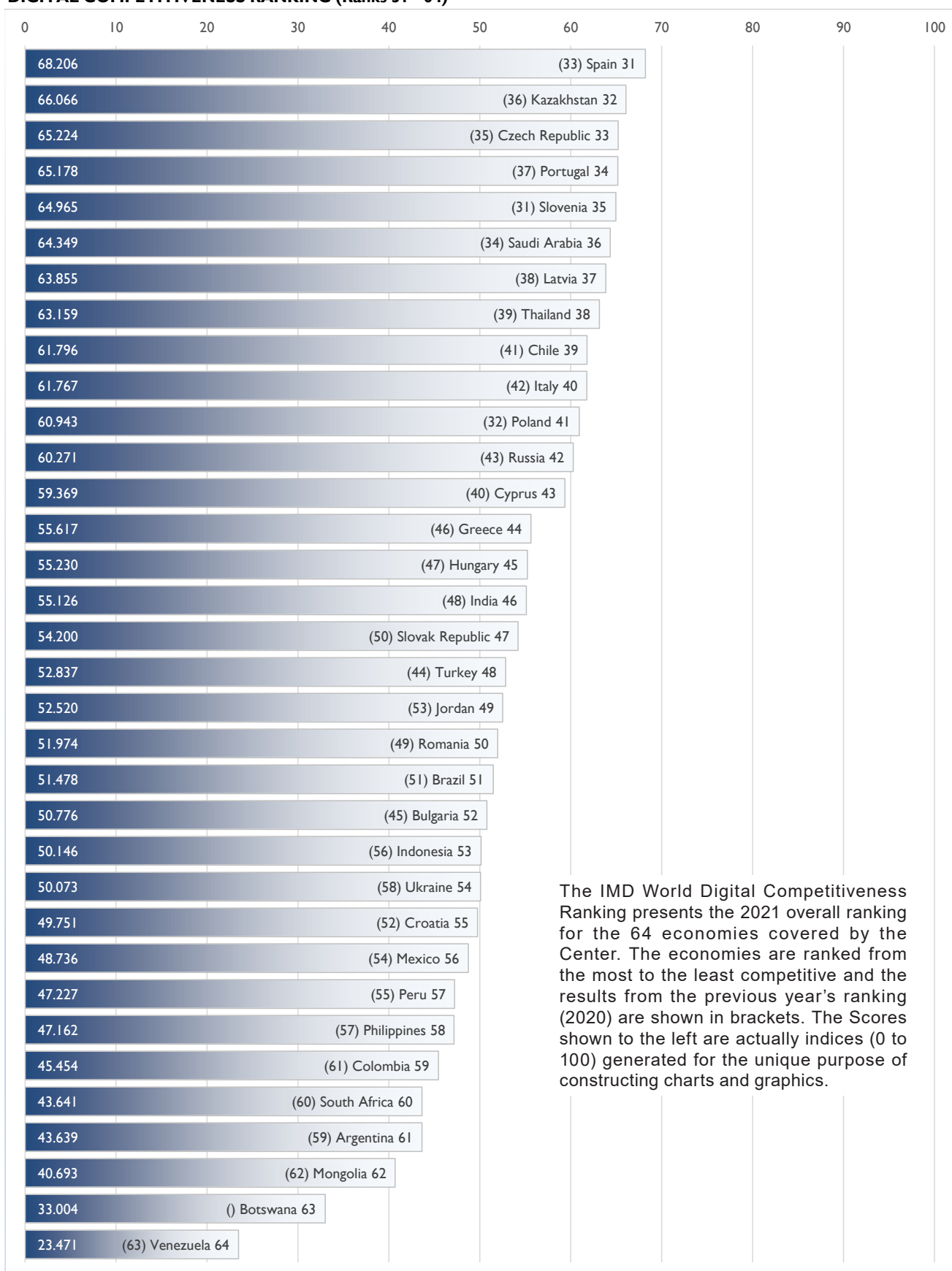
DIGITAL COMPETITIVENESS RANKING (Ranks 1 - 30)



(2020 rankings are in parentheses)

Competitiveness Ranking

DIGITAL COMPETITIVENESS RANKING (Ranks 31 - 64)



The IMD World Digital Competitiveness Ranking presents the 2021 overall ranking for the 64 economies covered by the Center. The economies are ranked from the most to the least competitive and the results from the previous year's ranking (2020) 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.

(2020 rankings are in parentheses)

The 2021 IMD World Digital Competitiveness



Overall and Factor Rankings



The IMD World Digital Competitiveness Ranking

Assesses the capacity of an economy to adopt and explore digital technologies leading to transformation in government practices, business models and society in general

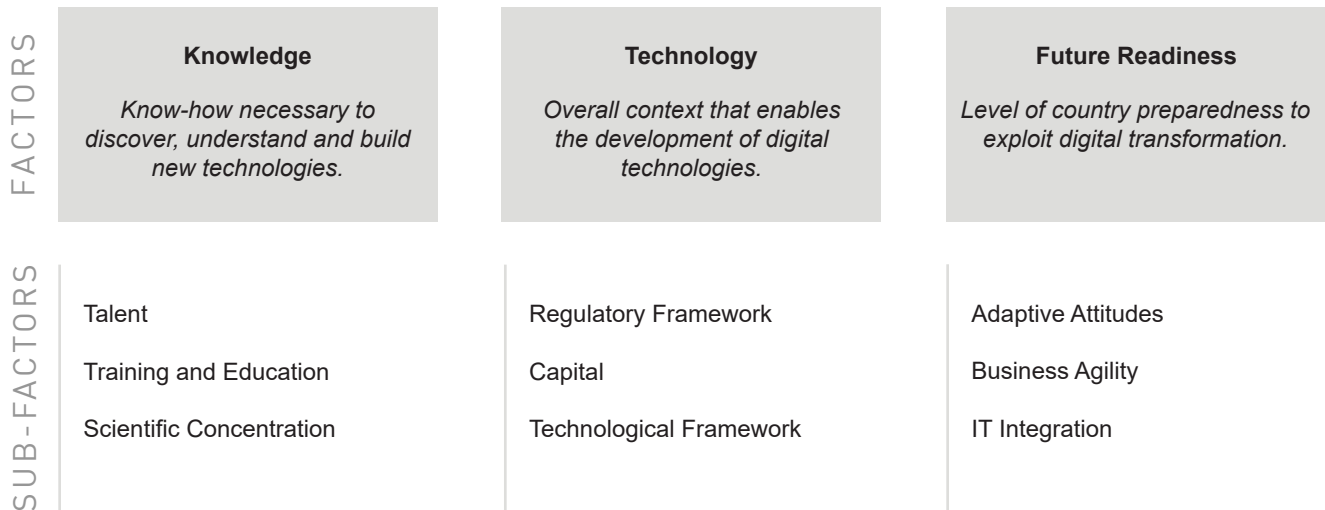
- Knowledge
- Technology
- Future Readiness

Methodology in a Nutshell

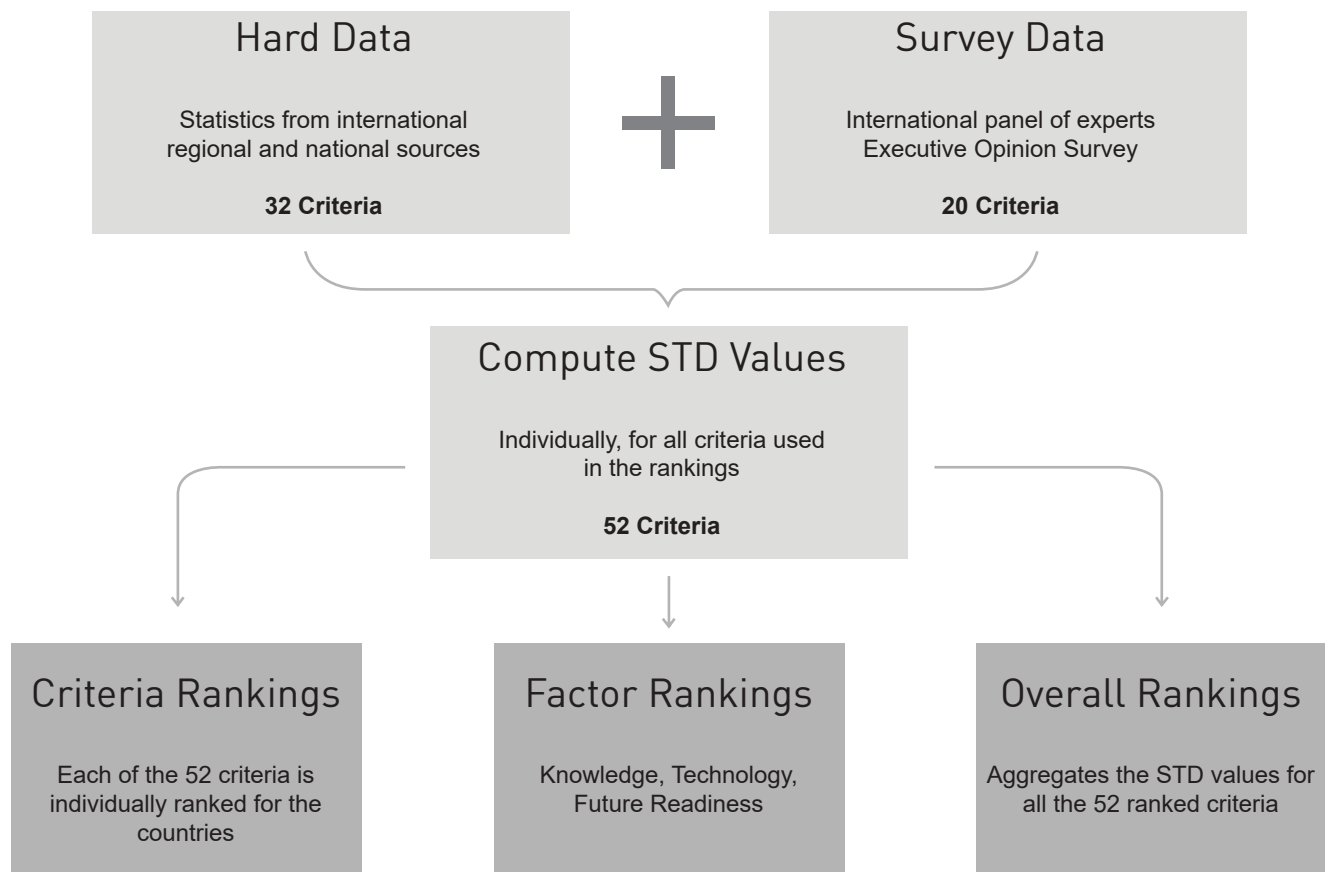
1. The IMD World Digital Competitiveness (WDC) ranking analyzes and ranks the extent to which countries adopt and explore digital technologies leading to transformation in government practices, business models and society in general.
2. As in the case of the IMD World Competitiveness ranking, we assume 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 52 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 52 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, two 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

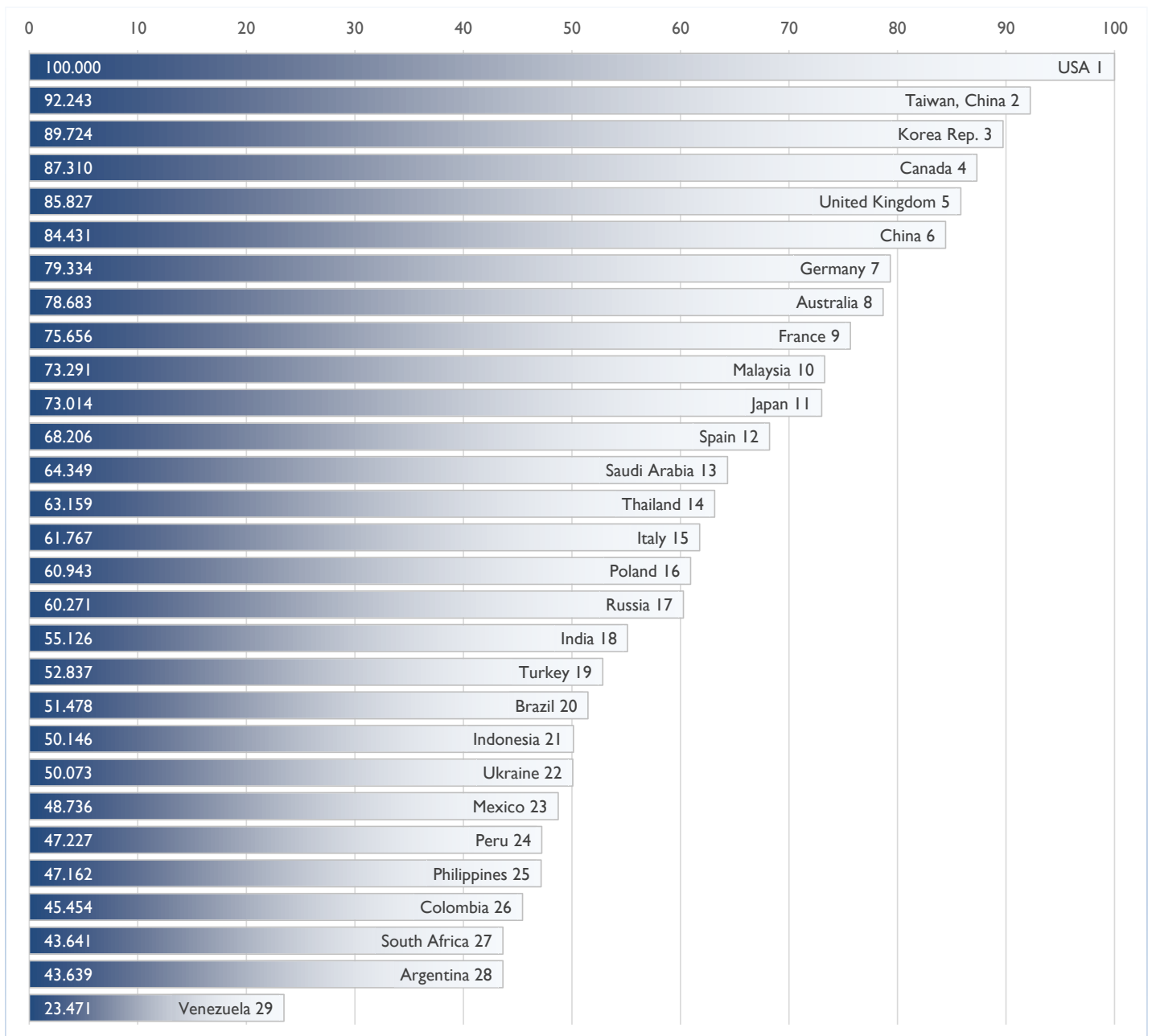


Computing the Rankings

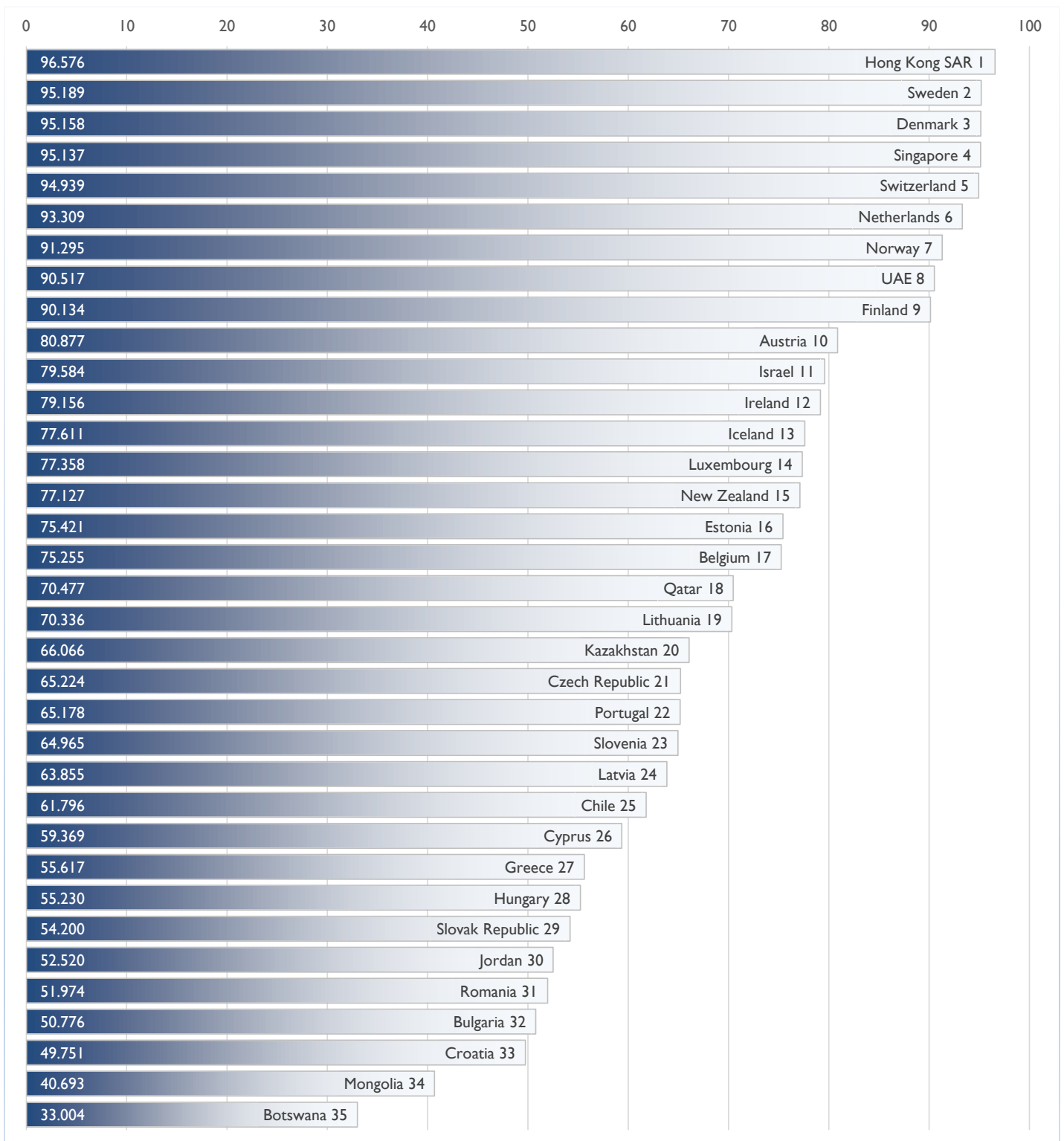


The 2021 IMD World Digital Competitiveness Rankings : Selected Breakdowns

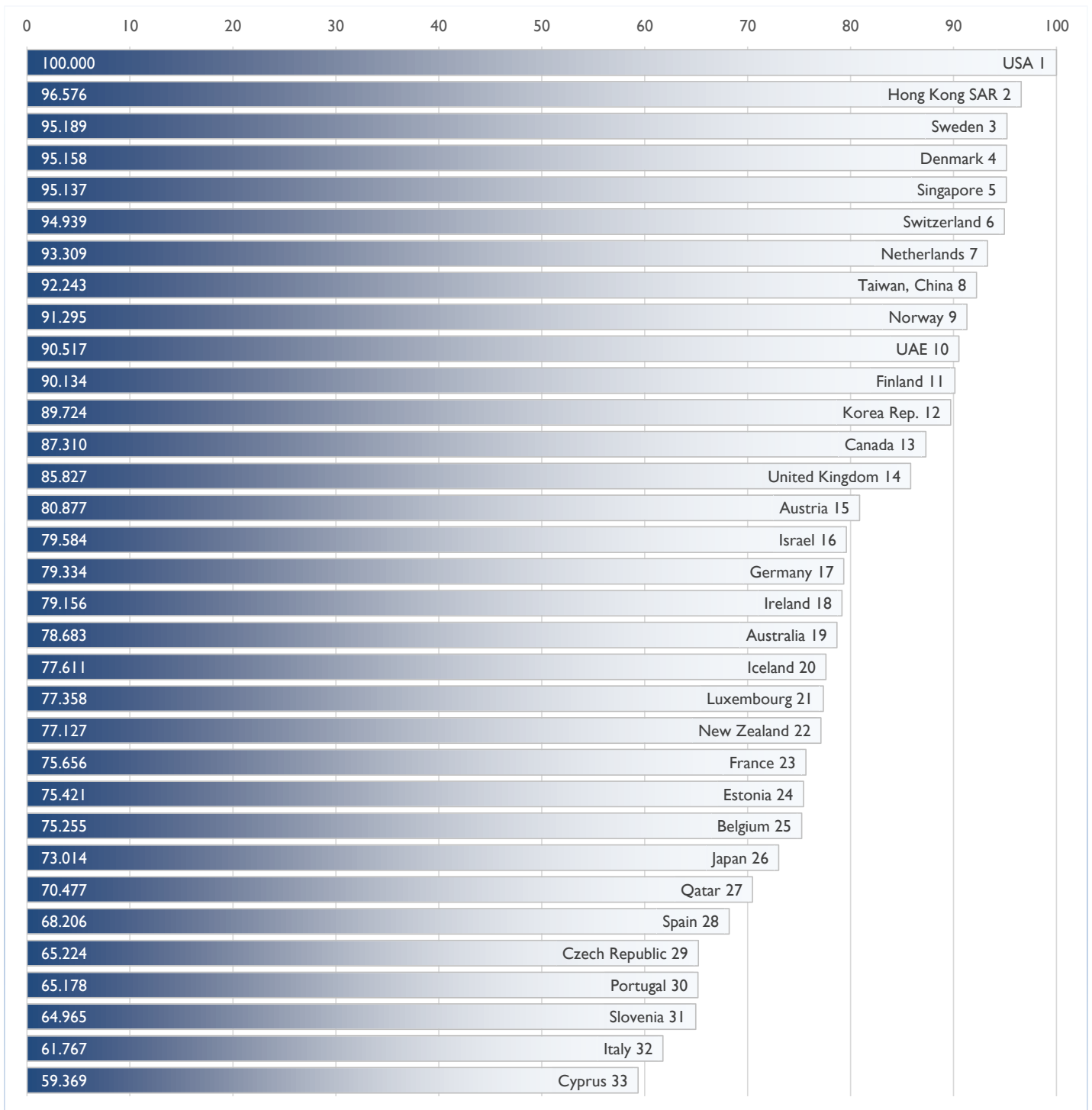
Populations greater than 20 million



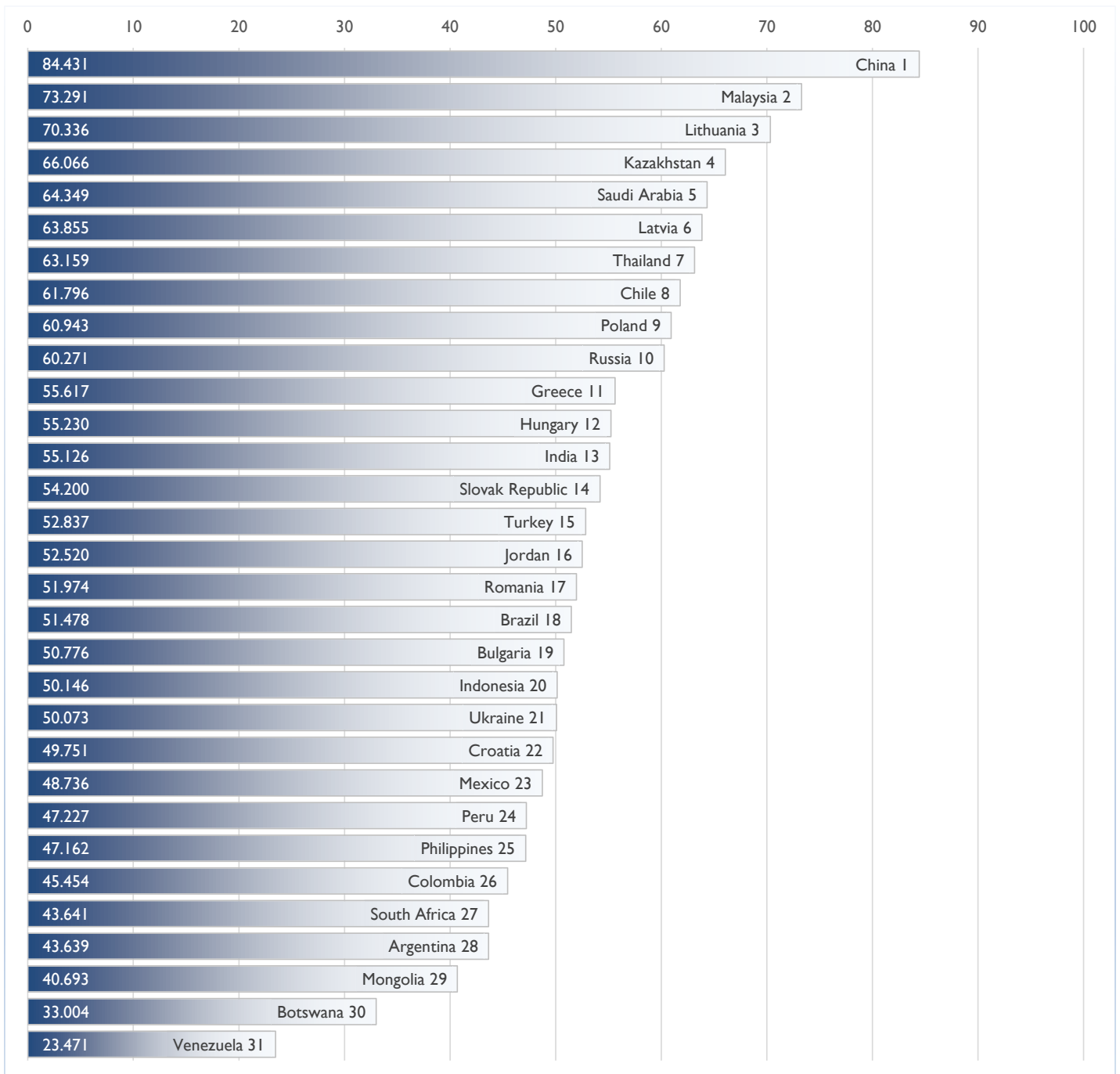
Populations less than 20 million



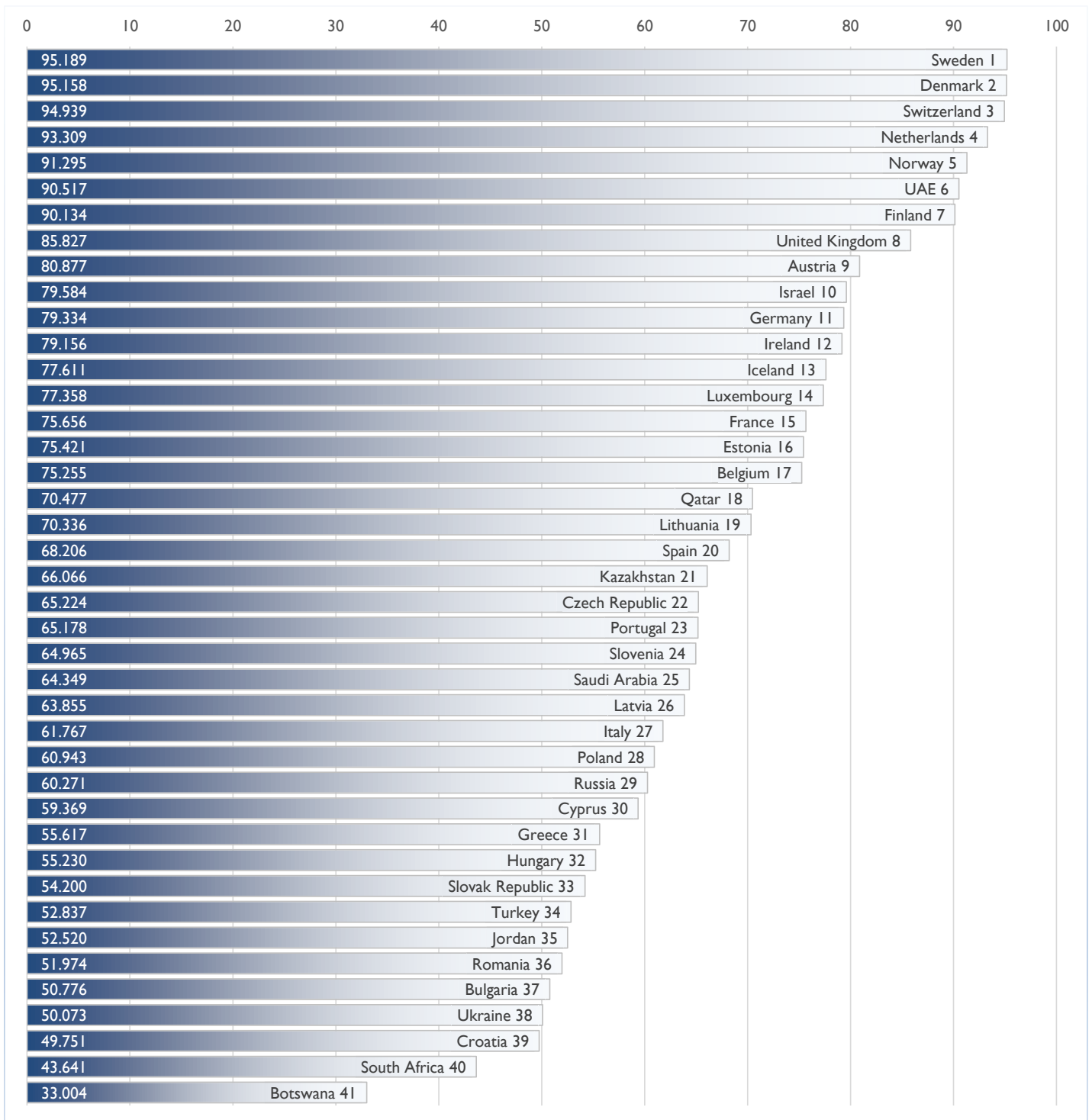
GDP per capita greater than \$20,000



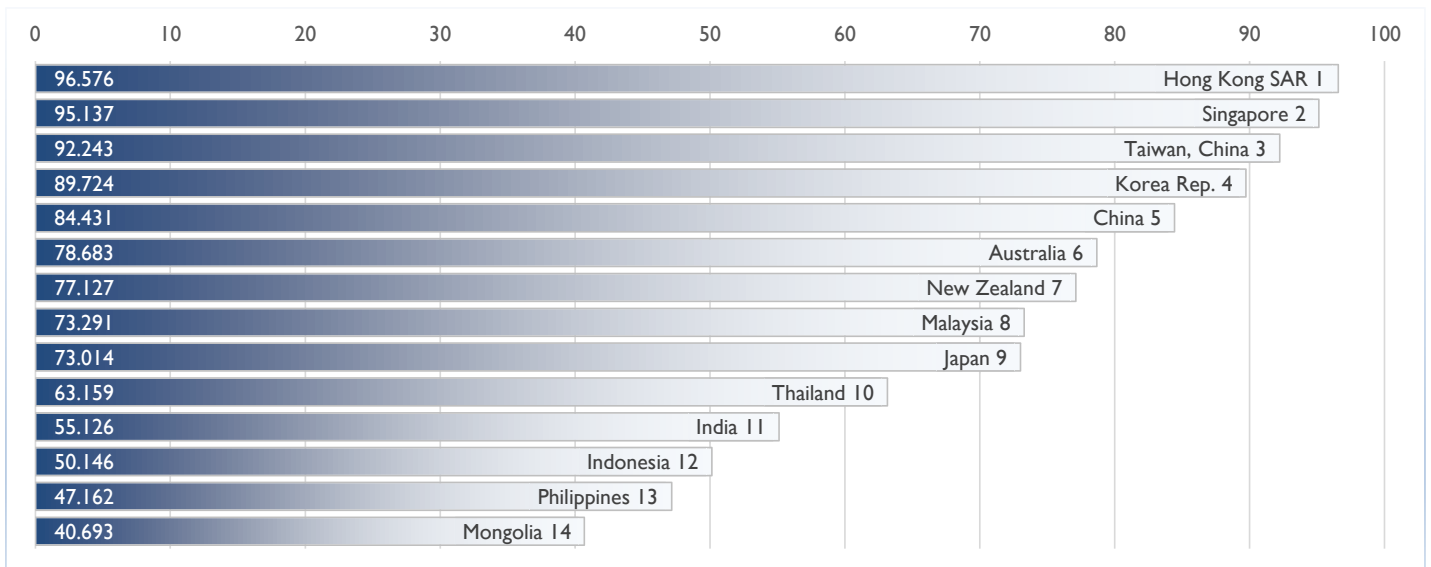
GDP per capita less than \$20,000



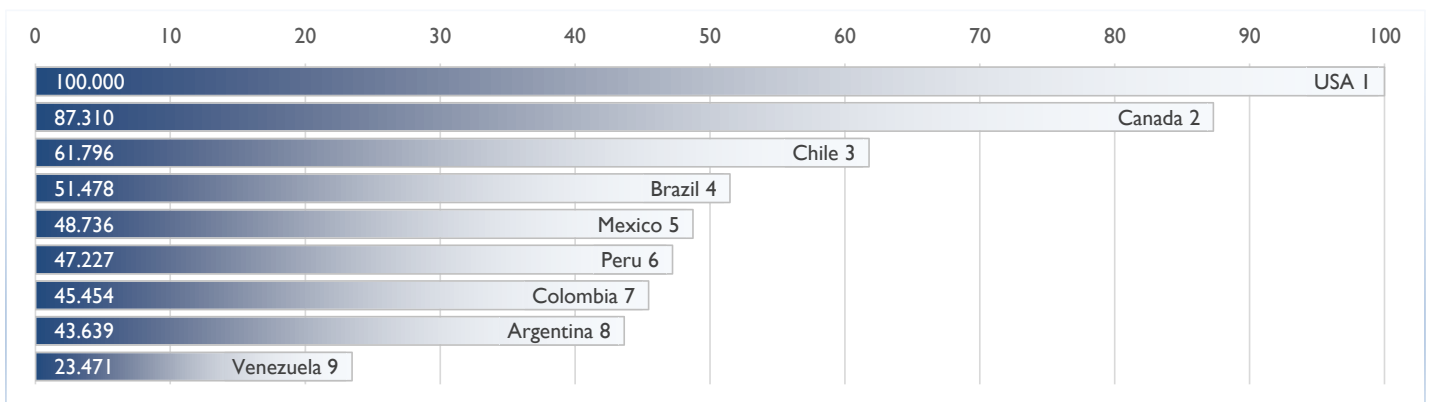
Europe - Middle East - Africa



Asia - Pacific

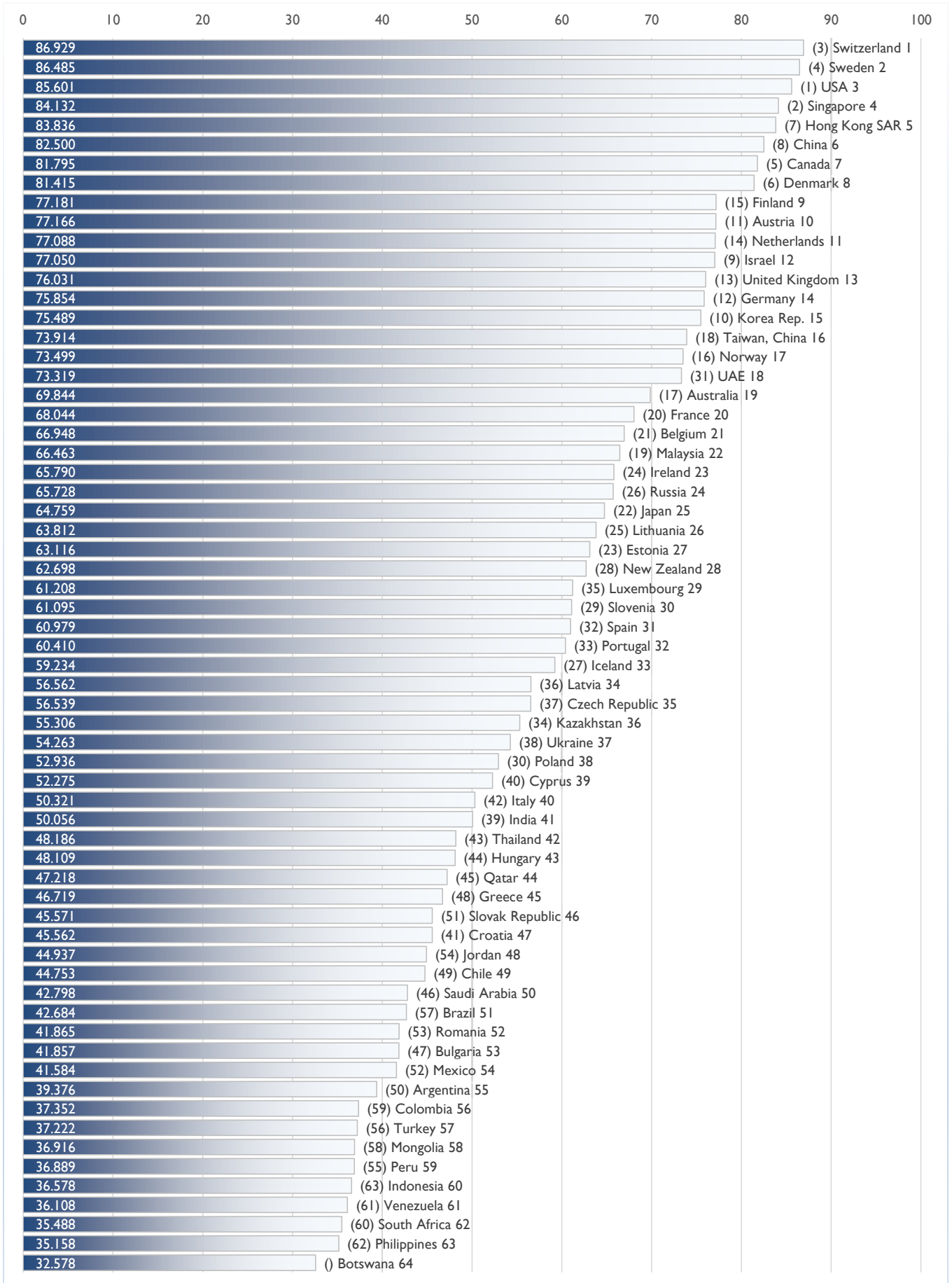


The Americas



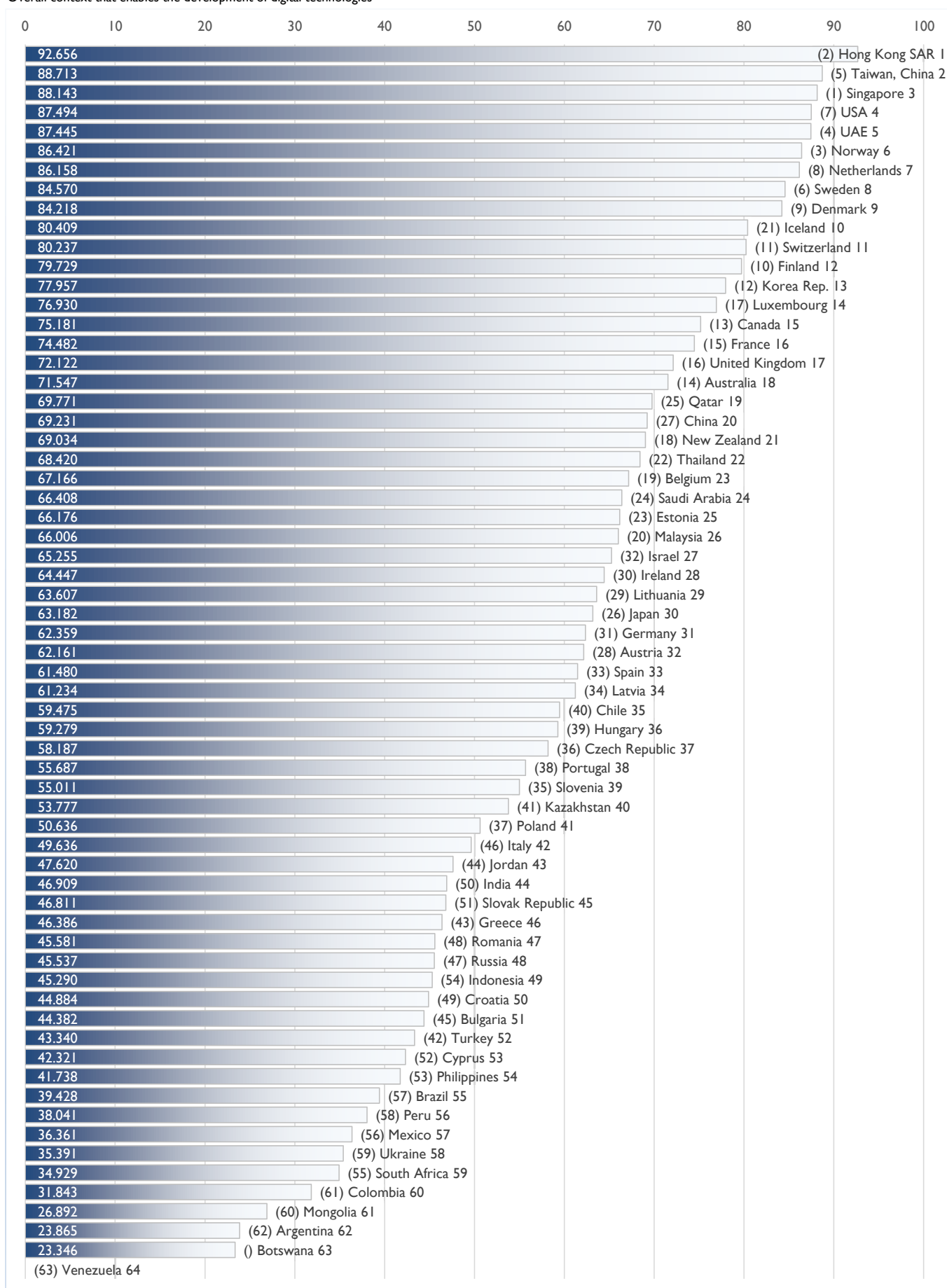
Knowledge

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



(2020 rankings are in parentheses)

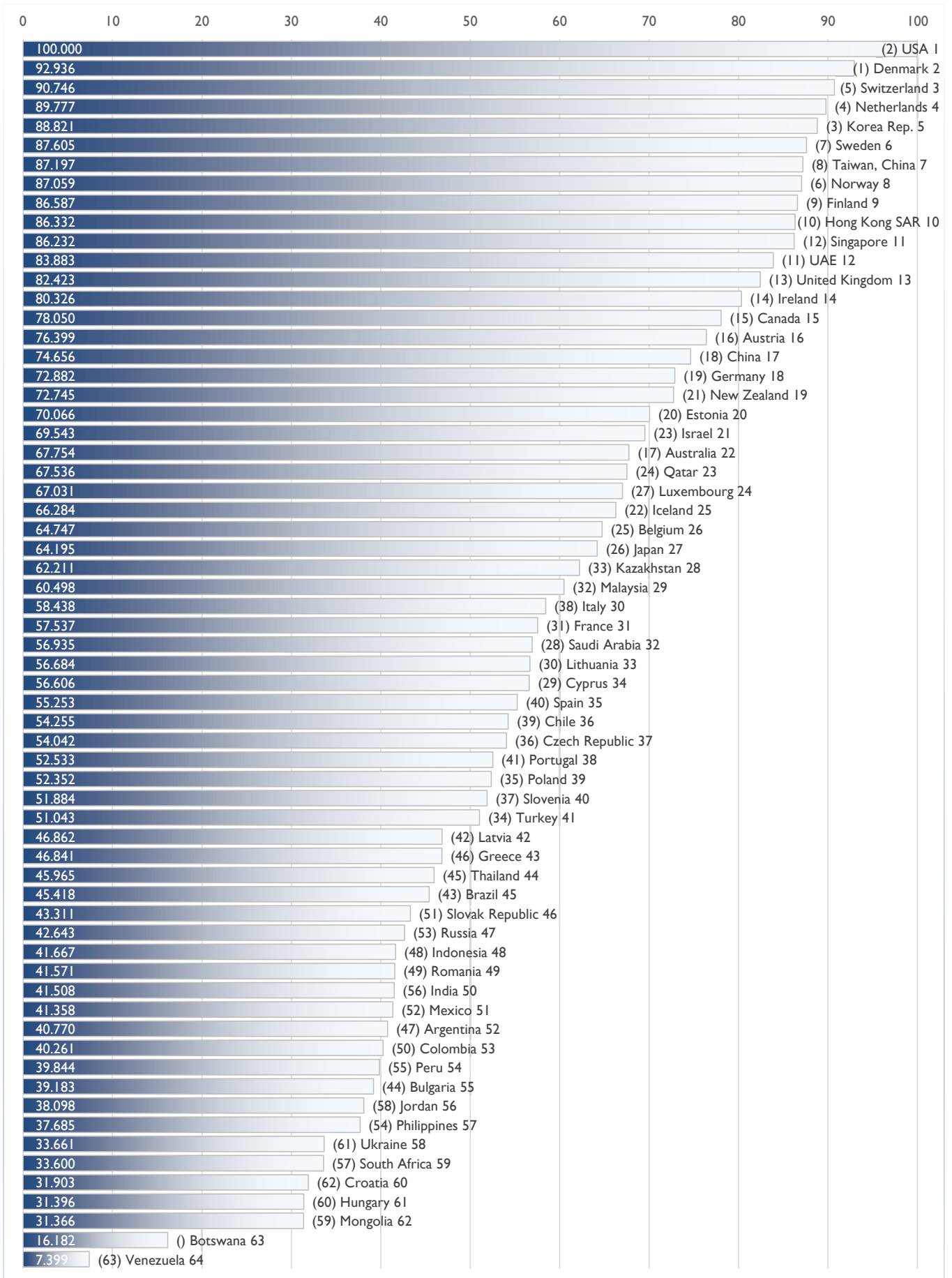
Overall context that enables the development of digital technologies



(2020 rankings are in parentheses)

Future Readiness

Level of country preparedness to exploit digital transformation



(2020 rankings are in parentheses)

Factor Rankings - 5 years overview

	OVERALL					Knowledge				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Argentina	57	55	59	59	61	56	58	58	50	55
Australia	15	13	14	15	20	18	15	15	17	19
Austria	16	15	20	17	16	12	13	10	11	10
Belgium	22	23	25	25	26	22	25	23	21	21
Botswana	-	-	-	-	63	-	-	-	-	64
Brazil	55	57	57	51	51	55	62	59	57	51
Bulgaria	45	43	45	45	52	41	41	46	47	53
Canada	9	8	11	12	13	3	3	5	5	7
Chile	40	37	42	41	39	52	47	50	49	49
China	31	30	22	16	15	23	30	18	8	6
Colombia	58	59	58	61	59	57	57	57	59	56
Croatia	48	44	51	52	55	50	43	42	41	47
Cyprus	53	54	54	40	43	46	55	55	40	39
Czech Republic	32	33	37	35	33	36	38	37	37	35
Denmark	5	4	4	3	4	8	8	6	6	8
Estonia	26	25	29	21	25	28	29	30	23	27
Finland	4	7	7	10	11	9	9	9	15	9
France	25	26	24	24	24	19	20	20	20	20
Germany	17	18	17	18	18	13	14	12	12	14
Greece	50	53	53	46	44	51	51	53	48	45
Hong Kong SAR	7	11	8	5	2	6	5	7	7	5
Hungary	44	46	43	47	45	48	48	44	44	43
Iceland	23	21	27	23	21	30	28	29	27	33
India	51	48	44	48	46	37	46	38	39	41
Indonesia	59	62	56	56	53	58	61	56	63	60
Ireland	21	20	19	20	19	25	22	24	24	23
Israel	13	12	16	19	17	7	2	8	9	12
Italy	39	41	41	42	40	42	42	41	42	40
Japan	27	22	23	27	28	29	18	25	22	25
Jordan	56	45	50	53	49	61	56	49	54	48
Kazakhstan	38	38	35	36	32	40	35	32	34	36
Korea Rep.	19	14	10	8	12	14	11	11	10	15
Latvia	35	35	36	38	37	34	34	36	36	34
Lithuania	29	29	30	29	30	21	23	26	25	26
Luxembourg	20	24	21	28	22	27	32	34	35	29
Malaysia	24	27	26	26	27	17	17	19	19	22
Mexico	49	51	49	54	56	54	54	52	52	54
Mongolia	61	61	62	62	62	59	53	62	58	58
Netherlands	6	9	6	7	7	11	12	13	14	11
New Zealand	14	19	18	22	23	20	21	21	28	28
Norway	10	6	9	9	9	15	16	16	16	17
Peru	62	60	61	55	57	62	60	61	55	59
Philippines	46	56	55	57	58	53	50	51	62	63
Poland	37	36	33	32	41	32	33	33	30	38
Portugal	33	32	34	37	34	31	27	31	33	32
Qatar	28	28	31	30	29	35	37	45	45	44
Romania	54	47	46	49	50	47	45	47	53	52
Russia	42	40	38	43	42	24	24	22	26	24
Saudi Arabia	36	42	39	34	36	39	40	39	46	50
Singapore	1	2	2	2	5	1	1	3	2	4
Slovak Republic	43	50	47	50	47	43	49	48	51	46
Slovenia	34	34	32	31	35	26	26	27	29	30
South Africa	47	49	48	60	60	49	52	54	60	62
Spain	30	31	28	33	31	33	31	28	32	31
Sweden	2	3	3	4	3	2	7	4	4	2
Switzerland	8	5	5	6	6	4	6	2	3	1
Taiwan, China	12	16	13	11	8	16	19	17	18	16
Thailand	41	39	40	39	38	44	44	43	43	42
Turkey	52	52	52	44	48	60	59	60	56	57
UAE	18	17	12	14	10	38	36	35	31	18
Ukraine	60	58	60	58	54	45	39	40	38	37
United Kingdom	11	10	15	13	14	10	10	14	13	13
USA	3	1	1	1	1	5	4	1	1	3
Venezuela	63	63	63	63	64	63	63	63	61	61

Technology					Future readiness					
2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	
58	54	56	62	62	49	45	56	47	52	Argentina
15	14	14	14	18	14	11	14	17	22	Australia
28	26	32	28	32	15	14	23	16	16	Austria
24	24	21	19	23	22	23	25	25	26	Belgium
-	-	-	-	63	-	-	-	-	63	Botswana
55	55	57	57	55	44	47	43	43	45	Brazil
42	42	42	45	51	57	55	48	44	55	Bulgaria
13	12	13	13	15	8	9	18	15	15	Canada
34	35	41	40	35	33	31	37	39	36	Chile
36	34	26	27	20	34	28	21	18	17	China
60	60	60	61	60	53	56	55	50	53	Colombia
47	49	50	49	50	56	54	60	62	60	Croatia
54	56	59	52	53	54	44	40	29	34	Cyprus
26	31	34	36	37	37	34	39	36	37	Czech Republic
10	10	11	9	9	1	1	2	1	2	Denmark
19	20	22	23	25	26	26	30	20	20	Estonia
4	4	8	10	12	4	8	7	9	9	Finland
22	19	16	15	16	28	27	29	31	31	France
21	21	31	31	31	18	20	16	19	18	Germany
52	51	54	43	46	47	46	53	46	43	Greece
3	6	4	2	1	17	24	15	10	10	Hong Kong SAR
38	40	36	39	36	55	58	57	60	61	Hungary
20	18	20	21	10	21	19	26	22	25	Iceland
59	53	49	50	44	51	48	46	56	50	India
56	59	47	54	49	62	62	58	48	48	Indonesia
25	29	28	30	28	10	13	5	14	14	Ireland
27	25	30	32	27	11	7	19	23	21	Israel
45	41	46	46	42	30	36	31	38	30	Italy
23	23	24	26	30	25	25	24	26	27	Japan
50	48	53	44	43	48	41	52	58	56	Jordan
35	39	39	41	40	38	40	35	33	28	Kazakhstan
17	17	17	12	13	24	17	4	3	5	Korea Rep.
32	32	23	34	34	41	39	45	42	42	Latvia
29	30	25	29	29	31	33	32	30	33	Lithuania
12	15	12	17	14	23	21	17	27	24	Luxembourg
18	22	19	20	26	27	29	28	32	29	Malaysia
48	46	52	56	57	50	50	49	52	51	Mexico
61	62	62	60	61	60	59	61	59	62	Mongolia
9	8	6	8	7	3	4	3	4	4	Netherlands
11	16	15	18	21	20	18	20	21	19	New Zealand
2	2	3	3	6	12	6	8	6	8	Norway
57	57	58	58	56	58	60	59	55	54	Peru
51	58	55	53	54	43	52	54	54	57	Philippines
39	37	37	37	41	39	37	33	35	39	Poland
37	36	38	38	38	35	32	34	41	38	Portugal
31	27	33	25	19	19	16	22	24	23	Qatar
46	44	45	48	47	59	57	51	49	49	Romania
44	43	43	47	48	52	51	42	53	47	Russia
41	50	40	24	24	32	38	38	28	32	Saudi Arabia
1	1	1	1	3	6	15	11	12	11	Singapore
43	47	44	51	45	46	53	47	51	46	Slovak Republic
40	38	35	35	39	36	35	36	37	40	Slovenia
53	52	51	55	59	42	43	44	57	59	South Africa
33	33	29	33	33	29	30	27	40	35	Spain
5	5	7	6	8	5	5	6	7	6	Sweden
8	9	10	11	11	13	10	10	5	3	Switzerland
7	11	9	5	2	16	22	12	8	7	Taiwan, China
30	28	27	22	22	45	49	50	45	44	Thailand
49	45	48	42	52	40	42	41	34	41	Turkey
14	7	2	4	5	7	12	9	11	12	UAE
62	61	61	59	58	61	61	62	61	58	Ukraine
16	13	18	16	17	9	3	13	13	13	United Kingdom
6	3	5	7	4	2	2	1	2	1	USA
63	63	63	63	64	63	63	63	63	64	Venezuela

	Knowledge			Technology			Future readiness			
	Talent	Training & education	Scientific concentration	Regulatory framework	Capital	Technological framework	Adaptive attitudes	Business agility	IT integration	
Argentina	62	46	48	57	63	56	50	43	59	Argentina
Australia	8	37	18	17	17	27	14	55	21	Australia
Austria	15	5	15	26	32	38	21	18	11	Austria
Belgium	20	31	20	18	20	37	22	38	26	Belgium
Botswana	53	48	63	63	56	64	63	46	63	Botswana
Brazil	63	58	21	51	59	51	40	42	49	Brazil
Bulgaria	54	53	46	55	53	42	45	61	53	Bulgaria
Canada	9	10	5	13	9	29	17	20	14	Canada
Chile	36	51	57	33	38	36	24	54	39	Chile
China	12	35	1	15	27	28	19	3	32	China
Colombia	57	50	58	61	49	59	58	47	46	Colombia
Croatia	61	42	34	56	50	41	39	64	58	Croatia
Cyprus	56	29	29	47	54	52	27	50	33	Cyprus
Czech Republic	28	45	30	44	29	32	35	32	36	Czech Republic
Denmark	5	4	17	4	13	6	4	7	1	Denmark
Estonia	29	8	45	28	33	20	20	25	25	Estonia
Finland	10	19	10	11	10	14	7	21	2	Finland
France	23	27	12	10	21	17	48	33	22	France
Germany	21	17	6	25	23	43	23	15	20	Germany
Greece	42	55	35	43	52	50	43	51	41	Greece
Hong Kong SAR	6	1	14	6	7	1	3	9	17	Hong Kong SAR
Hungary	43	47	42	36	45	21	62	62	42	Hungary
Iceland	35	22	39	14	26	3	31	16	27	Iceland
India	38	43	47	52	4	62	55	36	51	India
Indonesia	48	64	44	50	25	55	57	26	60	Indonesia
Ireland	18	32	26	19	35	34	12	14	19	Ireland
Israel	27	3	9	31	28	26	25	31	13	Israel
Italy	40	60	25	42	48	44	36	19	38	Italy
Japan	47	21	13	48	37	8	18	53	23	Japan
Jordan	34	33	62	38	41	53	61	28	54	Jordan
Kazakhstan	45	14	54	22	51	47	32	6	44	Kazakhstan
Korea Rep.	26	16	3	23	16	7	2	5	16	Korea Rep.
Latvia	24	30	51	34	46	18	51	48	37	Latvia
Lithuania	25	15	37	32	30	30	47	24	34	Lithuania
Luxembourg	33	20	38	8	8	25	38	22	12	Luxembourg
Malaysia	30	9	32	35	31	15	29	27	31	Malaysia
Mexico	51	57	50	54	57	54	52	41	52	Mexico
Mongolia	60	39	61	58	62	60	37	63	62	Mongolia
Netherlands	4	28	16	7	3	10	6	8	6	Netherlands
New Zealand	14	36	33	24	22	23	16	30	18	New Zealand
Norway	16	11	22	1	6	12	8	11	8	Norway
Peru	59	41	60	49	43	58	54	39	56	Peru
Philippines	55	61	56	62	40	49	60	37	57	Philippines
Poland	41	44	28	53	47	31	28	44	45	Poland
Portugal	22	38	27	21	44	46	30	58	30	Portugal
Qatar	19	54	59	27	24	16	26	17	28	Qatar
Romania	50	59	43	40	61	40	42	57	50	Romania
Russia	44	6	24	39	58	45	44	56	48	Russia
Saudi Arabia	32	34	64	30	15	35	46	35	24	Saudi Arabia
Singapore	2	13	11	5	14	2	11	12	7	Singapore
Slovak Republic	52	49	40	60	42	39	49	60	40	Slovak Republic
Slovenia	37	23	31	45	39	33	41	40	35	Slovenia
South Africa	58	62	53	59	36	61	59	59	55	South Africa
Spain	31	40	23	37	34	24	33	49	29	Spain
Sweden	7	2	4	3	5	13	5	13	5	Sweden
Switzerland	3	7	8	9	12	11	10	4	4	Switzerland
Taiwan, China	17	12	19	16	2	4	13	2	15	Taiwan, China
Thailand	39	56	36	29	19	22	53	34	43	Thailand
Turkey	49	63	41	41	60	48	34	29	47	Turkey
UAE	1	25	52	2	11	5	15	10	10	UAE
Ukraine	46	18	55	46	55	57	56	45	61	Ukraine
United Kingdom	11	26	7	20	18	19	9	23	9	United Kingdom
USA	13	24	2	12	1	9	1	1	3	USA
Venezuela	64	52	49	64	64	63	64	52	64	Venezuela

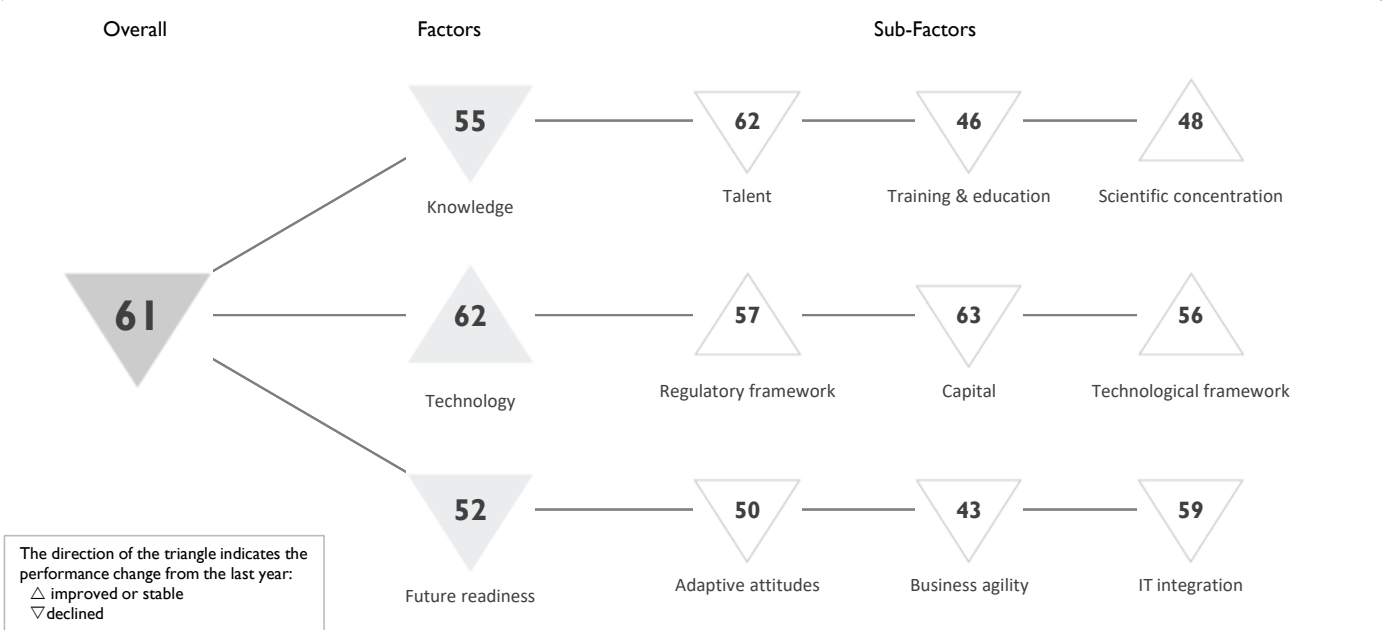
DIGITAL COMPETITIVENESS COUNTRY PROFILES

The statistical tables are available for subscribers of the
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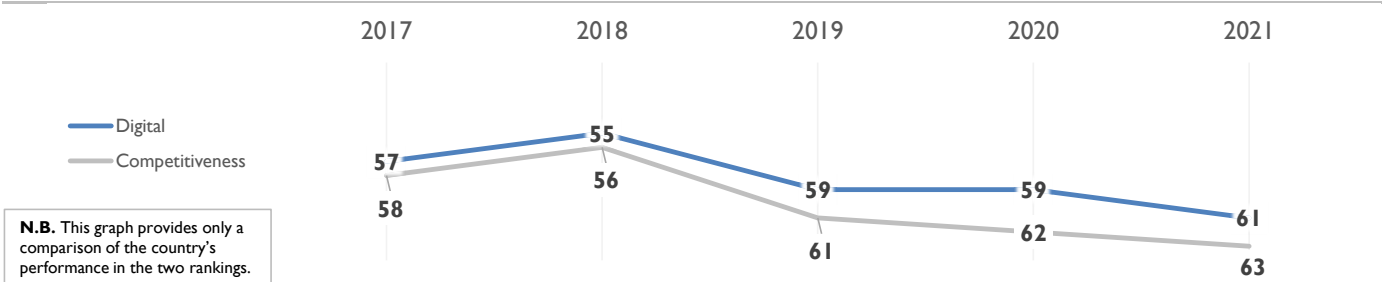
ARGENTINA

OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	57	55	59	59	61
Knowledge	56	58	58	50	55
Technology	58	54	56	62	62
Future readiness	49	45	56	47	52

COMPETITIVENESS & DIGITAL RANKINGS

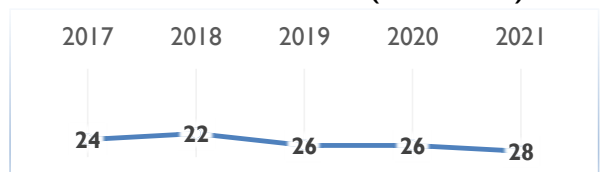


PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	54	47	51	56	62
Training & education	61	63	62	43	46
Scientific concentration	42	41	50	55	48

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	56	Employee training	61	Total expenditure on R&D (%)	49
International experience	53	▶ Total public expenditure on education	16	Total R&D personnel per capita	43
▷ Foreign highly-skilled personnel	63	Higher education achievement	38	▶ Female researchers	2
Management of cities	59	Pupil-teacher ratio (tertiary education)	24	R&D productivity by publication	25
Digital/Technological skills	59	Graduates in Sciences	60	Scientific and technical employment	52
▶ Net flow of international students	16	Women with degrees	32	High-tech patent grants	60
				Robots in Education and R&D	35

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	46	48	49	57	57
Capital	59	48	51	62	63
Technological framework	56	53	57	56	56

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	61	IT & media stock market capitalization	29	▷ Communications technology	62
Enforcing contracts	49	Funding for technological development	62	Mobile Broadband subscribers	57
▶ Immigration laws	16	▷ Banking and financial services	63	Wireless broadband	57
Development & application of tech.	61	▷ Country credit rating	63	Internet users	39
Scientific research legislation	60	▷ Venture capital	63	Internet bandwidth speed	55
Intellectual property rights	60	Investment in Telecommunications	25	High-tech exports (%)	56

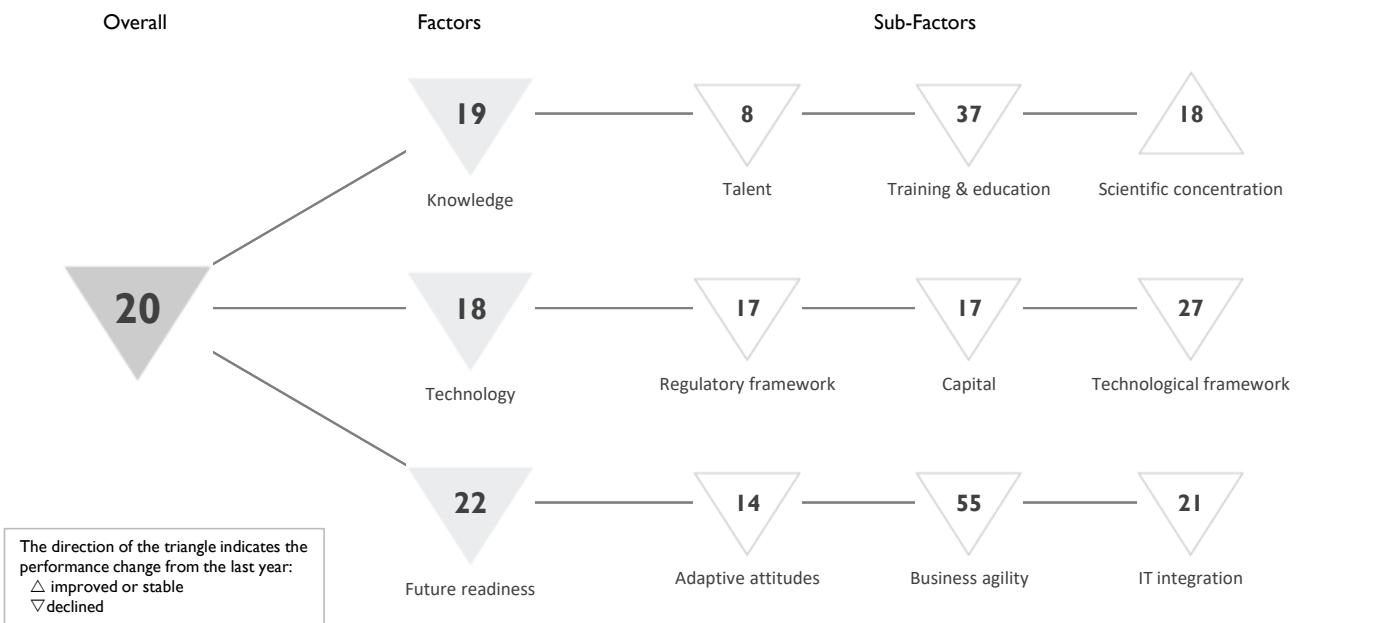
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	49	49	57	49	50
Business agility	36	37	48	39	43
IT integration	54	52	52	52	59

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	28	Opportunities and threats	37	E-Government	29
Internet retailing	43	World robots distribution	37	Public-private partnerships	54
Tablet possession	39	Agility of companies	60	Cyber security	62
Smartphone possession	41	Use of big data and analytics	46	Software piracy	58
Attitudes toward globalization	62	Knowledge transfer	47		
		▶ Entrepreneurial fear of failure	14		

AUSTRALIA

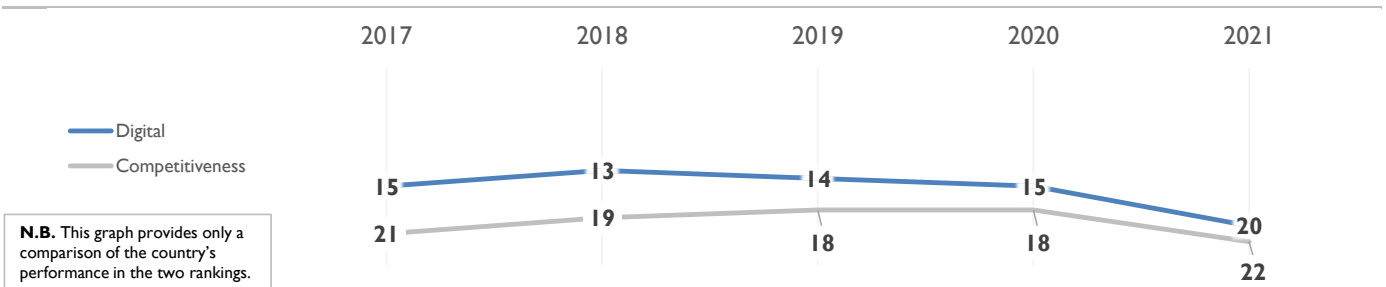
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

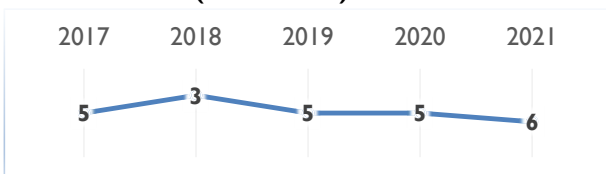
	2017	2018	2019	2020	2021
OVERALL	15	13	14	15	20
Knowledge	18	15	15	17	19
Technology	15	14	14	14	18
Future readiness	14	11	14	17	22

COMPETITIVENESS & DIGITAL RANKINGS

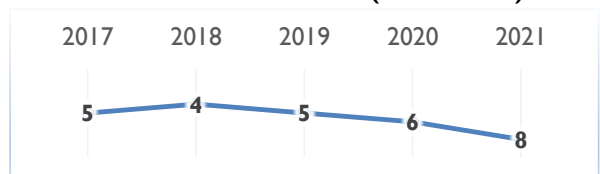


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	8	8	7	6	8
Training & education	51	32	29	28	37
Scientific concentration	14	11	13	19	18

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▶ Educational assessment PISA - Math	28	▶ Employee training	58	Total expenditure on R&D (%)	21	Total R&D personnel per capita	-	Female researchers	-	R&D productivity by publication	17
International experience	45	Total public expenditure on education	22	Total R&D personnel per capita	-	Female researchers	-	R&D productivity by publication	17	Scientific and technical employment	13
Foreign highly-skilled personnel	11	Higher education achievement	15	Female researchers	-	R&D productivity by publication	17	Scientific and technical employment	13	High-tech patent grants	41
Management of cities	24	Pupil-teacher ratio (tertiary education)	-	R&D productivity by publication	17	Scientific and technical employment	13	High-tech patent grants	41	Robots in Education and R&D	22
Digital/Technological skills	44	▶ Graduates in Sciences	58	Scientific and technical employment	13	High-tech patent grants	41	Robots in Education and R&D	22		
▶ Net flow of international students	2	Women with degrees	12	High-tech patent grants	41						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	11	6	7	6	17
Capital	16	18	19	13	17
Technological framework	21	19	17	20	27

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
▶ Starting a business	5	IT & media stock market capitalization	38	▶ Communications technology	57	Mobile Broadband subscribers	8	Wireless broadband	12	Internet users	31
Enforcing contracts	6	Funding for technological development	37	Mobile Broadband subscribers	8	Wireless broadband	12	Internet users	31	Internet bandwidth speed	42
Immigration laws	33	Banking and financial services	29	Wireless broadband	12	Internet users	31	Internet bandwidth speed	42	High-tech exports (%)	17
Development & application of tech.	28	Country credit rating	11	Internet users	31	Internet bandwidth speed	42	High-tech exports (%)	17		
Scientific research legislation	29	Venture capital	31	Internet bandwidth speed	42	High-tech exports (%)	17				
Intellectual property rights	20	Investment in Telecommunications	8	High-tech exports (%)	17						

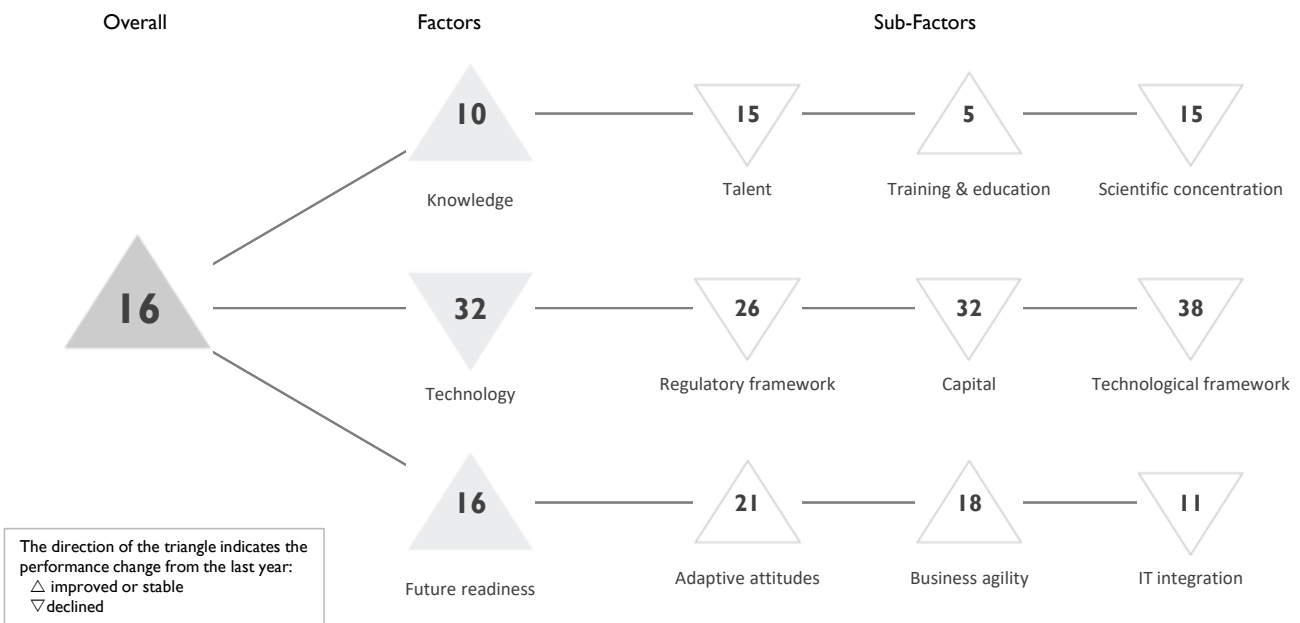
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	4	2	7	5	14
Business agility	42	28	35	43	55
IT integration	10	6	11	12	21

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	9	▶ Opportunities and threats	56	▶ E-Government	5	Public-private partnerships	34	Cyber security	54	Software piracy	5
Internet retailing	12	World robots distribution	30	Public-private partnerships	34	Cyber security	54	Software piracy	5		
▶ Tablet possession	4	▶ Agility of companies	56	Cyber security	54	Software piracy	5				
Smartphone possession	8	Use of big data and analytics	35	Software piracy	5						
Attitudes toward globalization	50	Knowledge transfer	31								
		Entrepreneurial fear of failure	44								

AUSTRIA

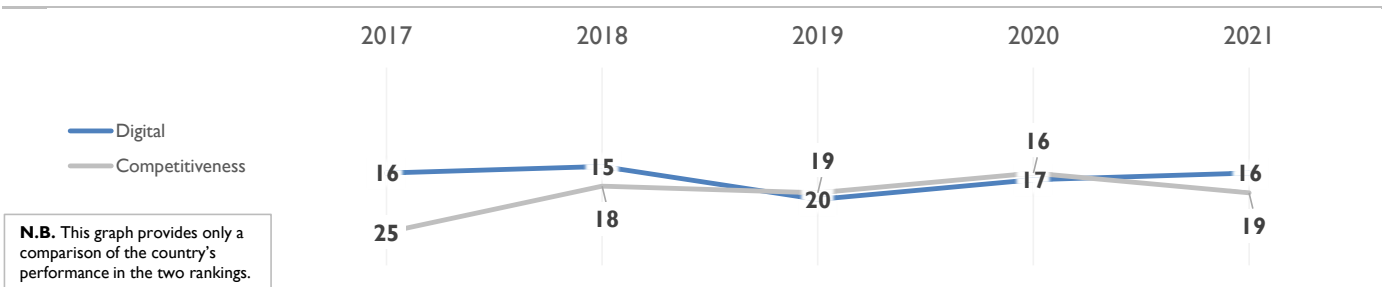
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

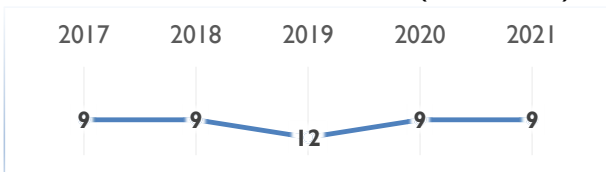
	2017	2018	2019	2020	2021
OVERALL	16	15	20	17	16
Knowledge	12	13	10	11	10
Technology	28	26	32	28	32
Future readiness	15	14	23	16	16

COMPETITIVENESS & DIGITAL RANKINGS

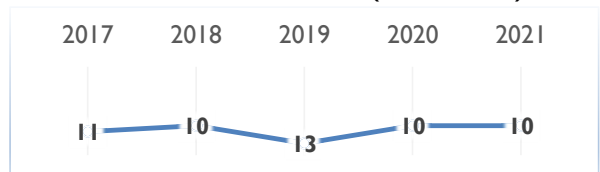


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	12	12	12	12	15
Training & education	4	7	8	12	5
Scientific concentration	21	18	14	14	15

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▶ Educational assessment PISA - Math	22	▶ Employee training	1	▶ Total expenditure on R&D (%)	6						
International experience	21	Total public expenditure on education	30	▶ Total R&D personnel per capita	6						
Foreign highly-skilled personnel	18	Higher education achievement	36	Female researchers	44						
Management of cities	14	▶ Pupil-teacher ratio (tertiary education)	2	▷ R&D productivity by publication	49						
Digital/Technological skills	45	Graduates in Sciences	8	Scientific and technical employment	15						
▶ Net flow of international students	5	Women with degrees	36	High-tech patent grants	22						
				Robots in Education and R&D	10						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	25	24	25	24	26
Capital	38	38	34	30	32
Technological framework	22	21	31	33	38

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
▷ Starting a business	53	IT & media stock market capitalization	42	Communications technology	39						
Enforcing contracts	10	Funding for technological development	19	Mobile Broadband subscribers	33						
▷ Immigration laws	47	Banking and financial services	21	Wireless broadband	30						
Development & application of tech.	24	Country credit rating	12	Internet users	27						
Scientific research legislation	17	Venture capital	38	Internet bandwidth speed	41						
Intellectual property rights	11	▷ Investment in Telecommunications	60	High-tech exports (%)	36						

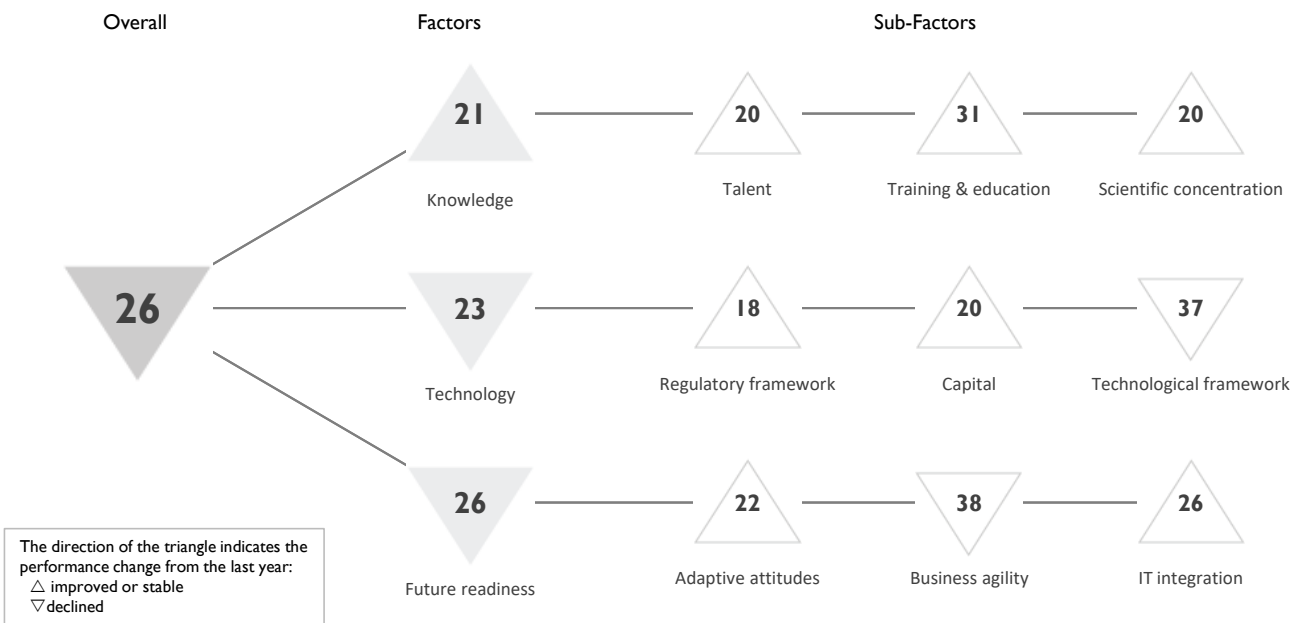
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	25	25	29	21	21
Business agility	8	5	25	21	18
IT integration	9	10	15	9	11

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	6	Opportunities and threats	19	E-Government	15						
Internet retailing	16	World robots distribution	23	Public-private partnerships	35						
Tablet possession	17	Agility of companies	17	Cyber security	6						
Smartphone possession	33	Use of big data and analytics	27	Software piracy	6						
▷ Attitudes toward globalization	51	Knowledge transfer	17								
		Entrepreneurial fear of failure	22								

BELGIUM

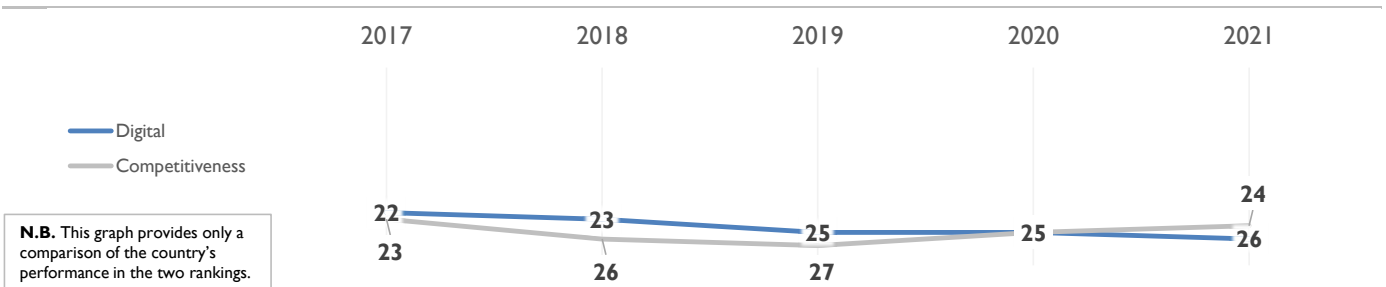
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

	2017	2018	2019	2020	2021
OVERALL	22	23	25	25	26
Knowledge	22	25	23	21	21
Technology	24	24	21	19	23
Future readiness	22	23	25	25	26

COMPETITIVENESS & DIGITAL RANKINGS

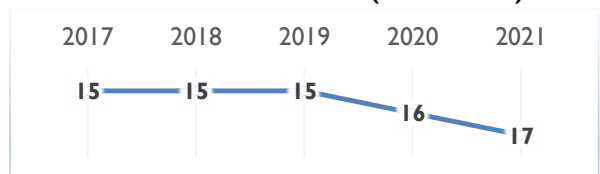


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	17	17	18	20	20
Training & education	29	30	26	31	31
Scientific concentration	27	29	24	21	20

Talent	Rank
Educational assessment PISA - Math	14
International experience	11
Foreign highly-skilled personnel	29
Management of cities	30
Digital/Technological skills	31
Net flow of international students	12

Training & education	Rank
Employee training	24
▶ Total public expenditure on education	8
Higher education achievement	24
Pupil-teacher ratio (tertiary education)	42
▷ Graduates in Sciences	59
Women with degrees	24

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	11
Total R&D personnel per capita	13
Female researchers	34
R&D productivity by publication	43
Scientific and technical employment	23
High-tech patent grants	39
Robots in Education and R&D	19

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	16	17	22	19	18
Capital	23	23	25	21	20
Technological framework	31	33	26	29	37

Regulatory framework	Rank
Starting a business	28
Enforcing contracts	40
▶ Immigration laws	8
Development & application of tech.	31
Scientific research legislation	18
▶ Intellectual property rights	10

Capital	Rank
IT & media stock market capitalization	35
Funding for technological development	20
Banking and financial services	19
Country credit rating	19
Venture capital	13
Investment in Telecommunications	30

Technological framework	Rank
Communications technology	33
Mobile Broadband subscribers	39
▷ Wireless broadband	59
Internet users	17
Internet bandwidth speed	22
High-tech exports (%)	35

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	21	19	23	24	22
Business agility	21	21	33	35	38
IT integration	19	21	23	26	26

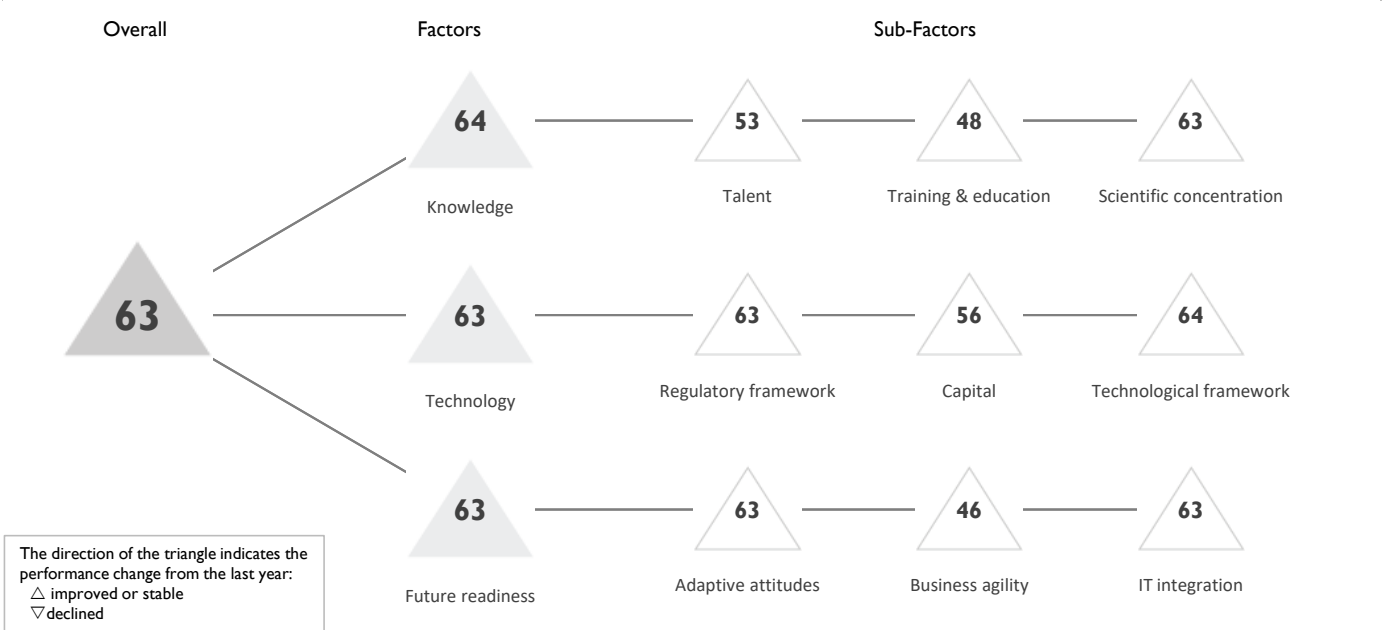
Adaptive attitudes	Rank
▷ E-Participation	56
▶ Internet retailing	10
Tablet possession	11
Smartphone possession	20
Attitudes toward globalization	23

Business agility	Rank
▷ Opportunities and threats	44
World robots distribution	24
Agility of companies	42
Use of big data and analytics	36
Knowledge transfer	21
▷ Entrepreneurial fear of failure	47

IT integration	Rank
E-Government	36
Public-private partnerships	31
Cyber security	30
Software piracy	13

BOTSWANA

OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

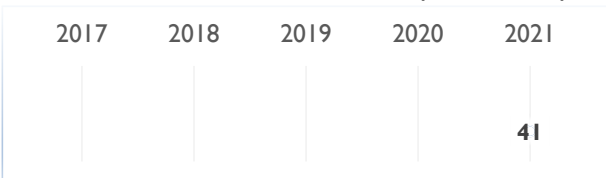
	2017	2018	2019	2020	2021
OVERALL					63
Knowledge					64
Technology					63
Future readiness					63

COMPETITIVENESS & DIGITAL RANKINGS

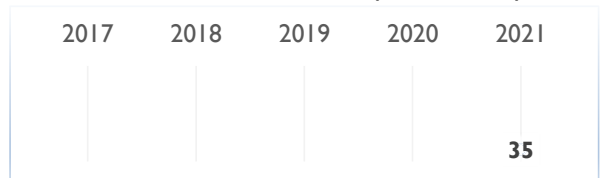


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent					53
Training & education					48
Scientific concentration					63

Talent	Rank
Educational assessment PISA - Math	-
International experience	61
Foreign highly-skilled personnel	36
Management of cities	58
Digital/Technological skills	63
Net flow of international students	50

Training & education	Rank
Employee training	63
▶ Total public expenditure on education	1
Higher education achievement	61
Pupil-teacher ratio (tertiary education)	43
Graduates in Sciences	36
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	-
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	-
Scientific and technical employment	51
▷ High-tech patent grants	64
Robots in Education and R&D	-

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework					63
Capital					56
Technological framework					64

Regulatory framework	Rank
Starting a business	62
Enforcing contracts	57
Immigration laws	58
▷ Development & application of tech.	64
Scientific research legislation	49
Intellectual property rights	62

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	63
Banking and financial services	60
Country credit rating	39
Venture capital	58
Investment in Telecommunications	41

Technological framework	Rank
Communications technology	63
Mobile Broadband subscribers	62
Wireless broadband	50
Internet users	59
▷ Internet bandwidth speed	63
High-tech exports (%)	63

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes					63
Business agility					46
IT integration					63

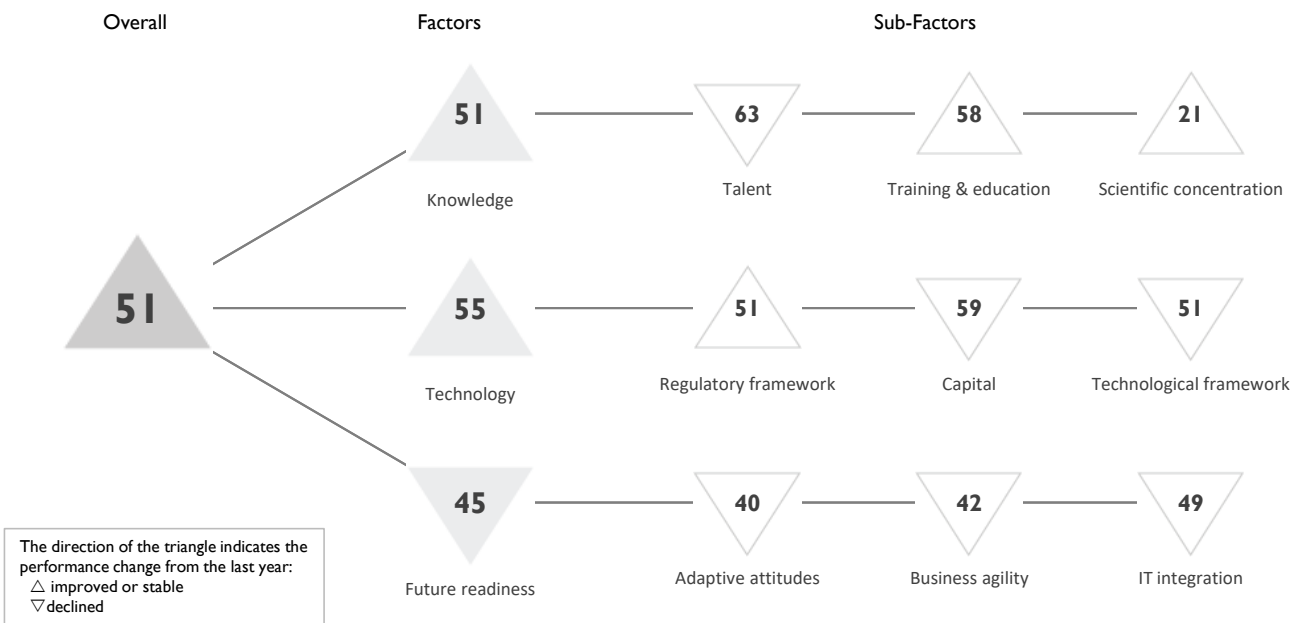
Adaptive attitudes	Rank
E-Participation	60
Internet retailing	-
Tablet possession	-
Smartphone possession	-
Attitudes toward globalization	57

Business agility	Rank
▷ Opportunities and threats	64
World robots distribution	-
Agility of companies	62
▷ Use of big data and analytics	64
Knowledge transfer	60
▶ Entrepreneurial fear of failure	2

IT integration	Rank
E-Government	60
Public-private partnerships	62
Cyber security	59
Software piracy	60

BRAZIL

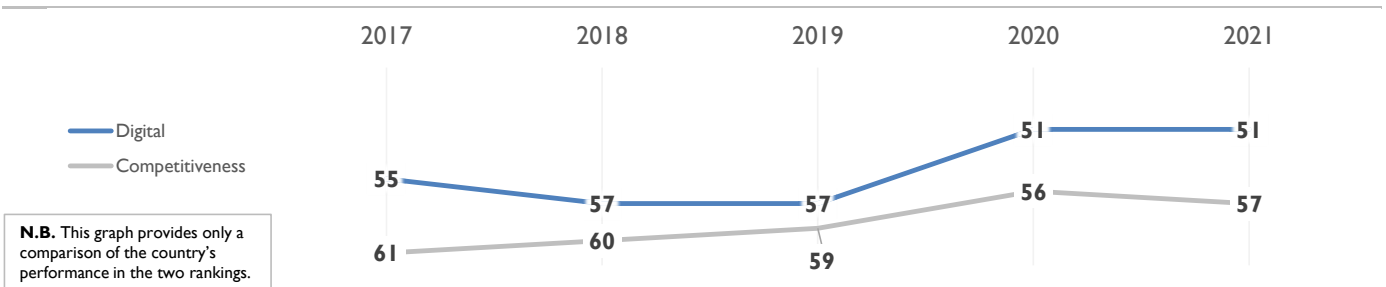
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

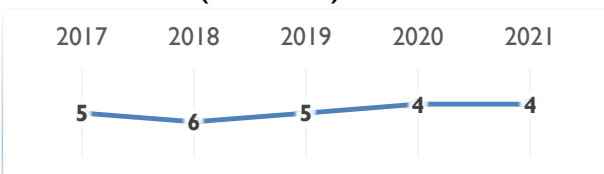
	2017	2018	2019	2020	2021
OVERALL	55	57	57	51	51
Knowledge	55	62	59	57	51
Technology	55	55	57	57	55
Future readiness	44	47	43	43	45

COMPETITIVENESS & DIGITAL RANKINGS

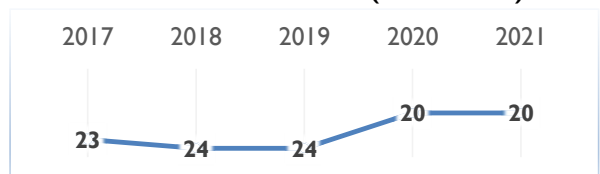


PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	60	61	61	62	63
Training & education	48	57	59	61	58
Scientific concentration	44	54	44	27	21

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	55	Employee training	43	Total expenditure on R&D (%)	35	International experience	58	Total R&D personnel per capita	-	Foreign highly-skilled personnel	59
Management of cities	57	▶ Total public expenditure on education	12	▶ Female researchers	8	▶ Digital/Technological skills	60	▶ R&D productivity by publication	8	Net flow of international students	42
		Higher education achievement	56	Scientific and technical employment	39			High-tech patent grants	46		
		Pupil-teacher ratio (tertiary education)	47	▶ Robots in Education and R&D	15						
		Graduates in Sciences	54								
		Women with degrees	49								

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	60	59	57	52	51
Capital	56	56	61	58	59
Technological framework	48	47	47	50	51

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	58	IT & media stock market capitalization	49	▶ Communications technology	58	Enforcing contracts	42	▷ Funding for technological development	59	Mobile Broadband subscribers	30
Immigration laws	36	Banking and financial services	51	Wireless broadband	48	Development & application of tech.	54	▶ Country credit rating	58	Internet users	53
Scientific research legislation	57	Venture capital	45	Internet bandwidth speed	45	Intellectual property rights	51	Investment in Telecommunications	21	High-tech exports (%)	29

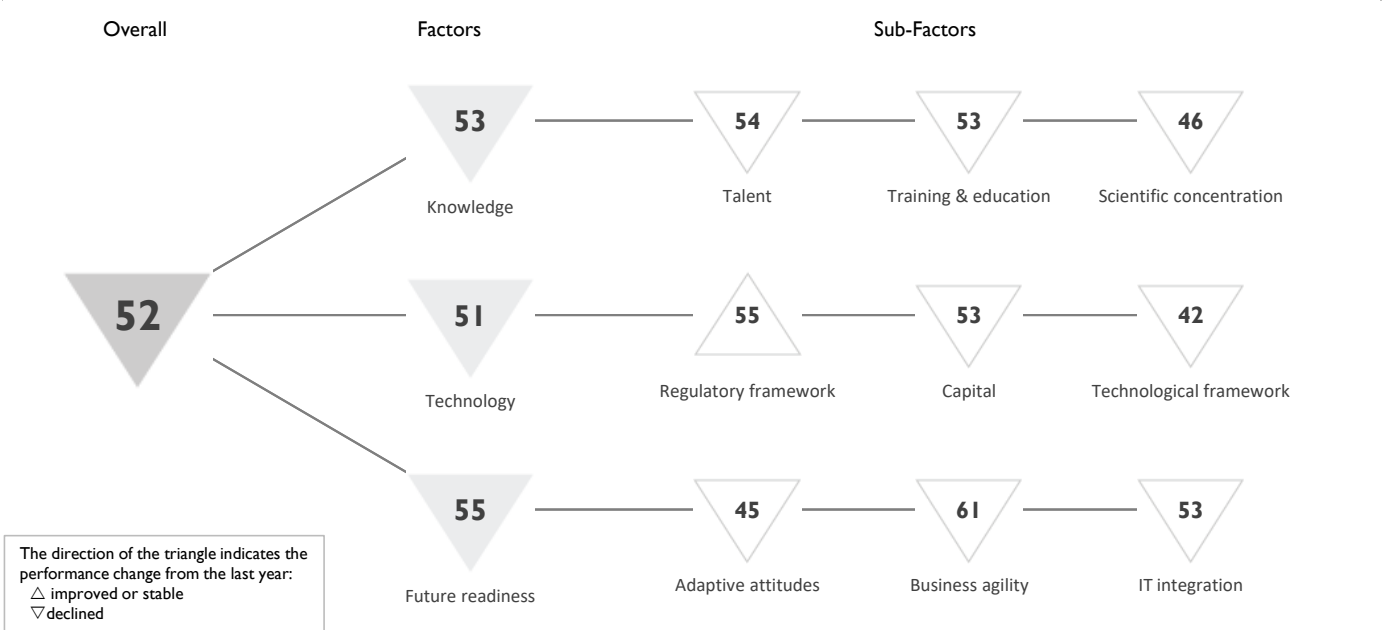
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	45	38	33	39	40
Business agility	46	52	58	41	42
IT integration	49	51	49	48	49

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
▶ E-Participation	18	Opportunities and threats	41	E-Government	47	Internet retailing	45	World robots distribution	18	Public-private partnerships	56
Tablet possession	47	Agility of companies	44	Cyber security	58	Smartphone possession	35	Use of big data and analytics	56	Software piracy	36
Attitudes toward globalization	42	Knowledge transfer	58					Entrepreneurial fear of failure	19		

BULGARIA

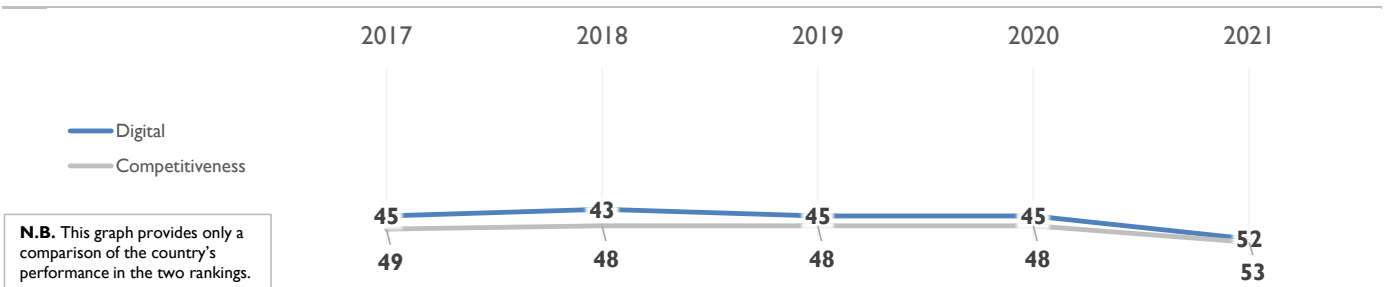
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

	2017	2018	2019	2020	2021
OVERALL	45	43	45	45	52
Knowledge	41	41	46	47	53
Technology	42	42	42	45	51
Future readiness	57	55	48	44	55

COMPETITIVENESS & DIGITAL RANKINGS

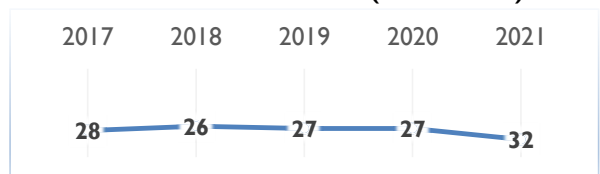


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	51	53	50	48	54
Training & education	39	42	46	50	53
Scientific concentration	30	33	37	42	46

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	44	Employee training	57	Total expenditure on R&D (%)	43	International experience	55	Total R&D personnel per capita	35	Female researchers	12
▷ Foreign highly-skilled personnel	62	Total public expenditure on education	47	R&D productivity by publication	47	Management of cities	55	Scientific and technical employment	38	High-tech patent grants	25
Digital/Technological skills	40	Higher education achievement	47	Robots in Education and R&D	50	▷ Net flow of international students	55	Pupil-teacher ratio (tertiary education)	14		
		Graduates in Sciences	51					Women with degrees	34		

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	50	52	46	55	55
Capital	46	50	42	48	53
Technological framework	34	36	44	39	42

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	47	IT & media stock market capitalization	36	Communications technology	32	Enforcing contracts	32	Funding for technological development	50	Mobile Broadband subscribers	33
▷ Immigration laws	60	Banking and financial services	49	Wireless broadband	21	Development & application of tech.	56	Country credit rating	43	Internet users	56
Scientific research legislation	57	Venture capital	48	Internet bandwidth speed	38	Intellectual property rights	55	Investment in Telecommunications	33	High-tech exports (%)	38

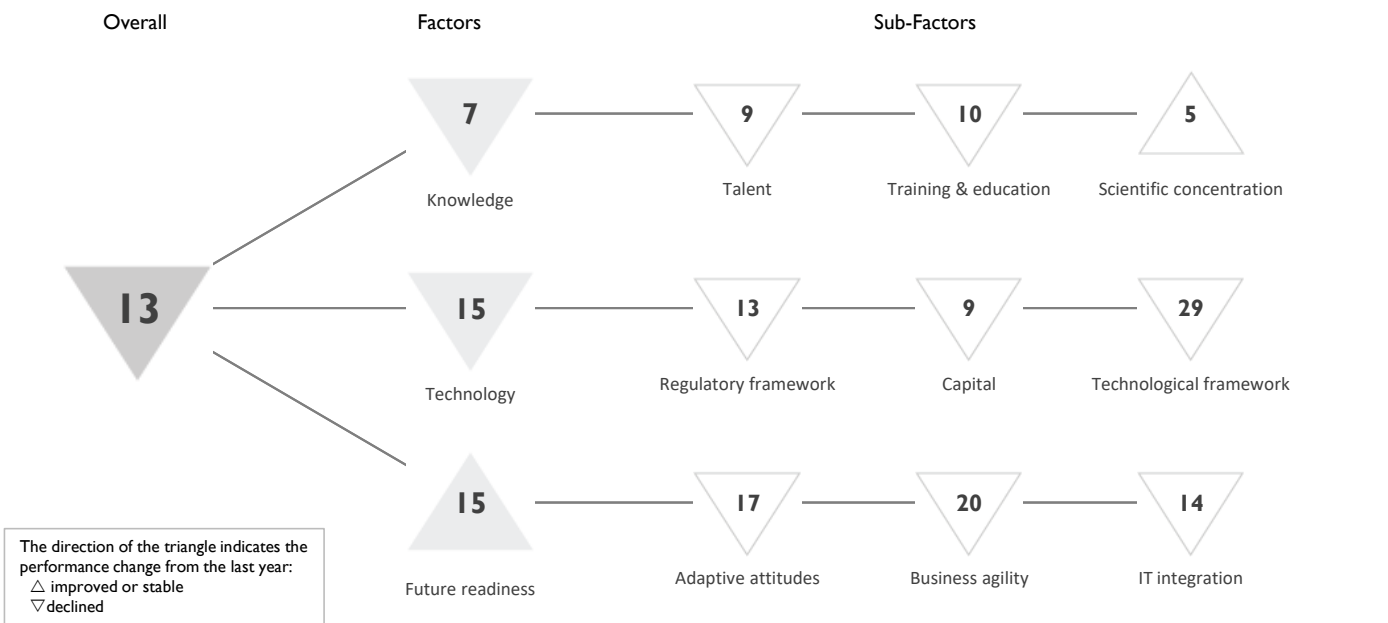
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	47	48	43	41	45
Business agility	61	59	56	40	61
IT integration	55	54	47	47	53

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
▶ E-Participation	22	Opportunities and threats	61	E-Government	39	Internet retailing	51	World robots distribution	45	Public-private partnerships	55
Tablet possession	46	Agility of companies	61	▷ Cyber security	60	Smartphone possession	41	Use of big data and analytics	59	Software piracy	50
Attitudes toward globalization	54	Knowledge transfer	52					Entrepreneurial fear of failure	10		

CANADA

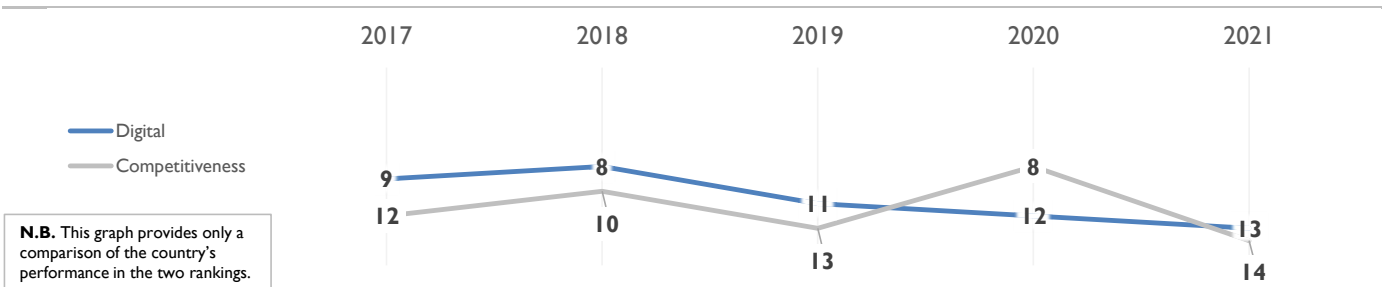
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

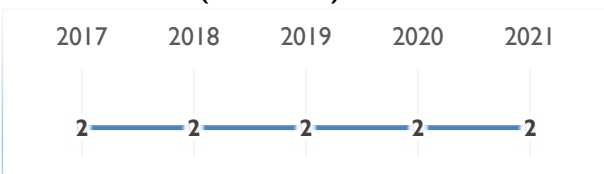
	2017	2018	2019	2020	2021
OVERALL	9	8	11	12	13
Knowledge	3	3	5	5	7
Technology	13	12	13	13	15
Future readiness	8	9	18	15	15

COMPETITIVENESS & DIGITAL RANKINGS

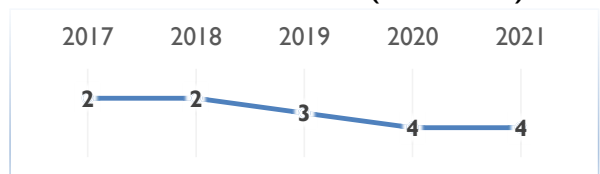


PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	9	7	13	8	9
Training & education	10	4	7	6	10
Scientific concentration	4	4	2	7	5

Talent	Rank
Educational assessment PISA - Math	11
International experience	24
Foreign highly-skilled personnel	13
Management of cities	20
Digital/Technological skills	12
Net flow of international students	8

Training & education	Rank
Employee training	28
▷ Total public expenditure on education	42
▶ Higher education achievement	6
Pupil-teacher ratio (tertiary education)	7
▷ Graduates in Sciences	38
▶ Women with degrees	1

Scientific concentration	Rank
Total expenditure on R&D (%)	24
Total R&D personnel per capita	22
Female researchers	20
R&D productivity by publication	11
▶ Scientific and technical employment	5
High-tech patent grants	13
Robots in Education and R&D	8

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	21	11	17	12	13
Capital	1	5	10	3	9
Technological framework	27	24	27	26	29

Regulatory framework	Rank
▶ Starting a business	2
▷ Enforcing contracts	50
Immigration laws	7
Development & application of tech.	10
Scientific research legislation	14
Intellectual property rights	23

Capital	Rank
IT & media stock market capitalization	15
Funding for technological development	15
Banking and financial services	15
Country credit rating	9
Venture capital	15
Investment in Telecommunications	17

Technological framework	Rank
Communications technology	29
Mobile Broadband subscribers	36
▷ Wireless broadband	51
Internet users	12
Internet bandwidth speed	15
High-tech exports (%)	26

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	13	15	17	16	17
Business agility	5	4	16	16	20
IT integration	15	12	13	13	14

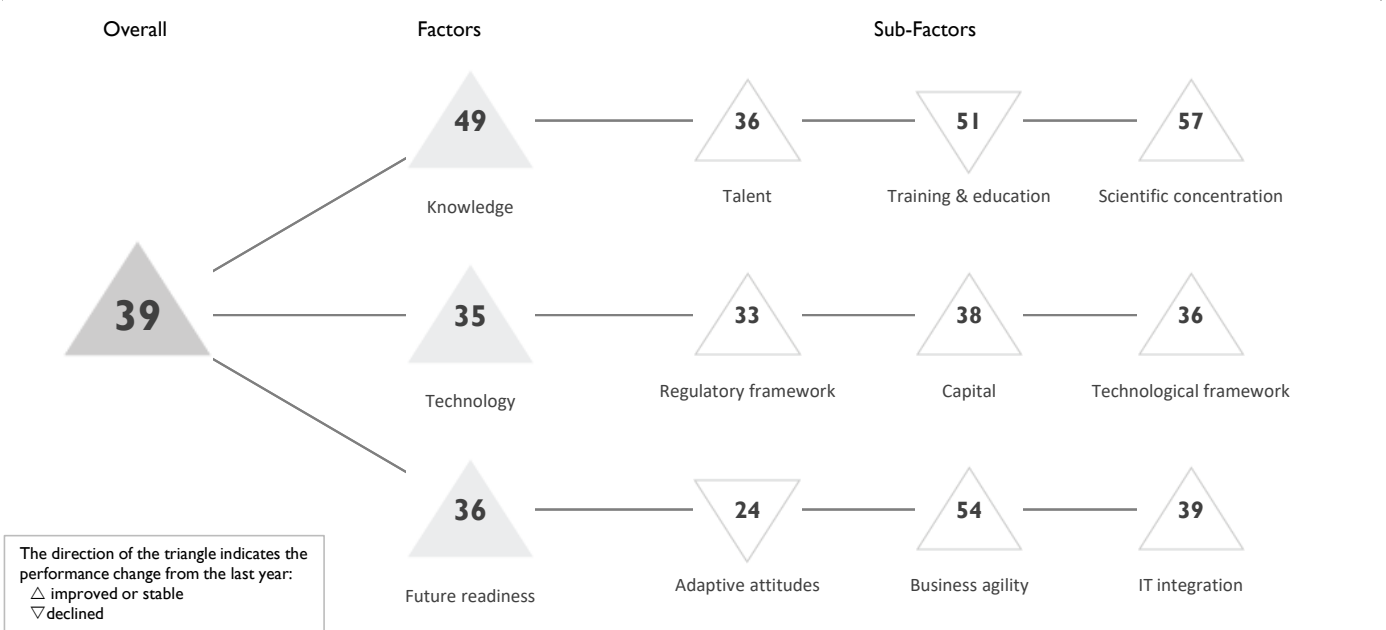
Adaptive attitudes	Rank
E-Participation	16
▶ Internet retailing	4
Tablet possession	21
Smartphone possession	34
Attitudes toward globalization	29

Business agility	Rank
Opportunities and threats	15
World robots distribution	13
Agility of companies	21
Use of big data and analytics	8
Knowledge transfer	19
▷ Entrepreneurial fear of failure	43

IT integration	Rank
E-Government	26
Public-private partnerships	12
Cyber security	15
Software piracy	13

CHILE

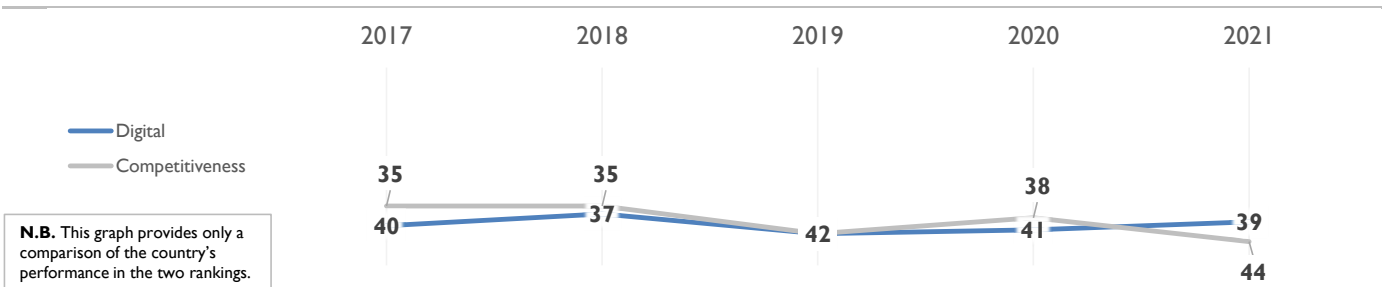
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

	2017	2018	2019	2020	2021
OVERALL	40	37	42	41	39
Knowledge	52	47	50	49	49
Technology	34	35	41	40	35
Future readiness	33	31	37	39	36

COMPETITIVENESS & DIGITAL RANKINGS

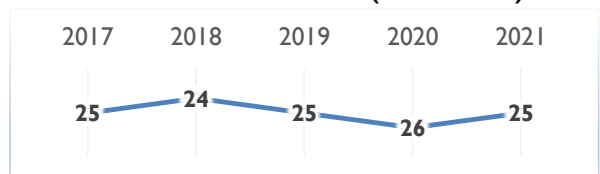


PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	34	31	36	37	36
Training & education	50	49	55	49	51
Scientific concentration	59	61	57	58	57

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	49	Employee training	46	▷ Total expenditure on R&D (%)	54
International experience	20	Total public expenditure on education	18	▷ Total R&D personnel per capita	50
▶ Foreign highly-skilled personnel	7	Higher education achievement	45	Female researchers	35
Management of cities	43	Pupil-teacher ratio (tertiary education)	-	R&D productivity by publication	23
Digital/Technological skills	32	Graduates in Sciences	47	Scientific and technical employment	41
Net flow of international students	49	Women with degrees	46	▷ High-tech patent grants	61
				Robots in Education and R&D	45

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	33	33	36	33	33
Capital	20	26	44	40	38
Technological framework	46	41	42	44	36

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	31	▷ IT & media stock market capitalization	51	Communications technology	30
Enforcing contracts	38	Funding for technological development	46	Mobile Broadband subscribers	32
▶ Immigration laws	5	Banking and financial services	23	Wireless broadband	41
Development & application of tech.	40	Country credit rating	30	Internet users	29
Scientific research legislation	50	Venture capital	40	Internet bandwidth speed	26
Intellectual property rights	32	▶ Investment in Telecommunications	16	High-tech exports (%)	49

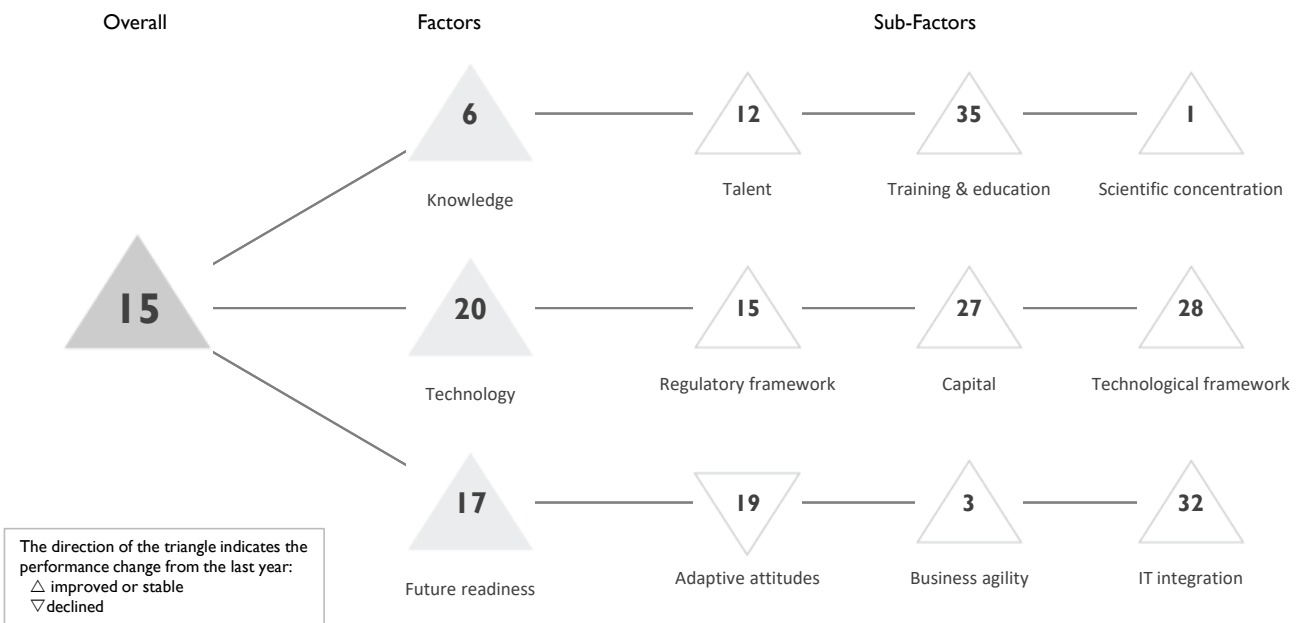
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	30	27	27	22	24
Business agility	31	39	50	54	54
IT integration	40	38	39	40	39

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	28	Opportunities and threats	30	E-Government	31
Internet retailing	36	World robots distribution	48	Public-private partnerships	24
Tablet possession	30	Agility of companies	26	Cyber security	48
▶ Smartphone possession	9	Use of big data and analytics	41	Software piracy	46
▶ Attitudes toward globalization	15	Knowledge transfer	38		
		▷ Entrepreneurial fear of failure	53		

CHINA

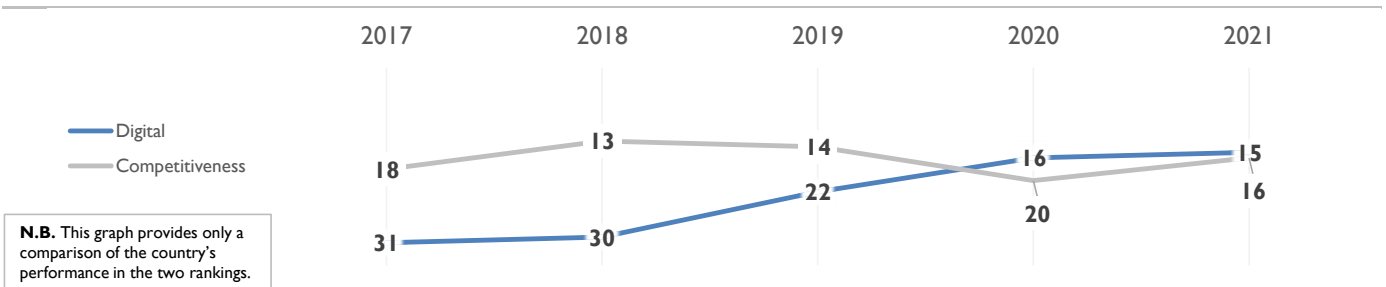
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

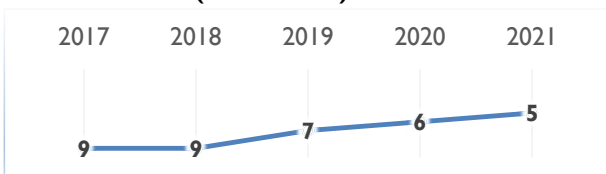
	2017	2018	2019	2020	2021
OVERALL	31	30	22	16	15
Knowledge	23	30	18	8	6
Technology	36	34	26	27	20
Future readiness	34	28	21	18	17

COMPETITIVENESS & DIGITAL RANKINGS

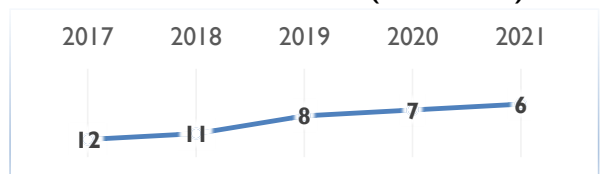


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	23	18	19	13	12
Training & education	53	46	37	40	35
Scientific concentration	3	21	9	2	1

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▶ Educational assessment PISA - Math		1		Employee training		13		Total expenditure on R&D (%)		14	
▷ International experience		44		▶ Total public expenditure on education		52		Total R&D personnel per capita		36	
Foreign highly-skilled personnel		31		Higher education achievement		16		Female researchers		-	
Management of cities		11		Pupil-teacher ratio (tertiary education)		41		▶ R&D productivity by publication		1	
Digital/Technological skills		16		Graduates in Sciences		-		▶ Scientific and technical employment		1	
▷ Net flow of international students		48		Women with degrees		-		High-tech patent grants		8	
								▶ Robots in Education and R&D		1	

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	32	26	20	18	15
Capital	22	30	32	31	27
Technological framework	47	40	32	32	28

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business		16		IT & media stock market capitalization		24		Communications technology		13	
Enforcing contracts		5		Funding for technological development		16		Mobile Broadband subscribers		24	
Immigration laws		31		Banking and financial services		33		Wireless broadband		23	
Development & application of tech.		16		Country credit rating		26		▷ Internet users		57	
Scientific research legislation		22		Venture capital		25		Internet bandwidth speed		25	
Intellectual property rights		35		Investment in Telecommunications		37		High-tech exports (%)		8	

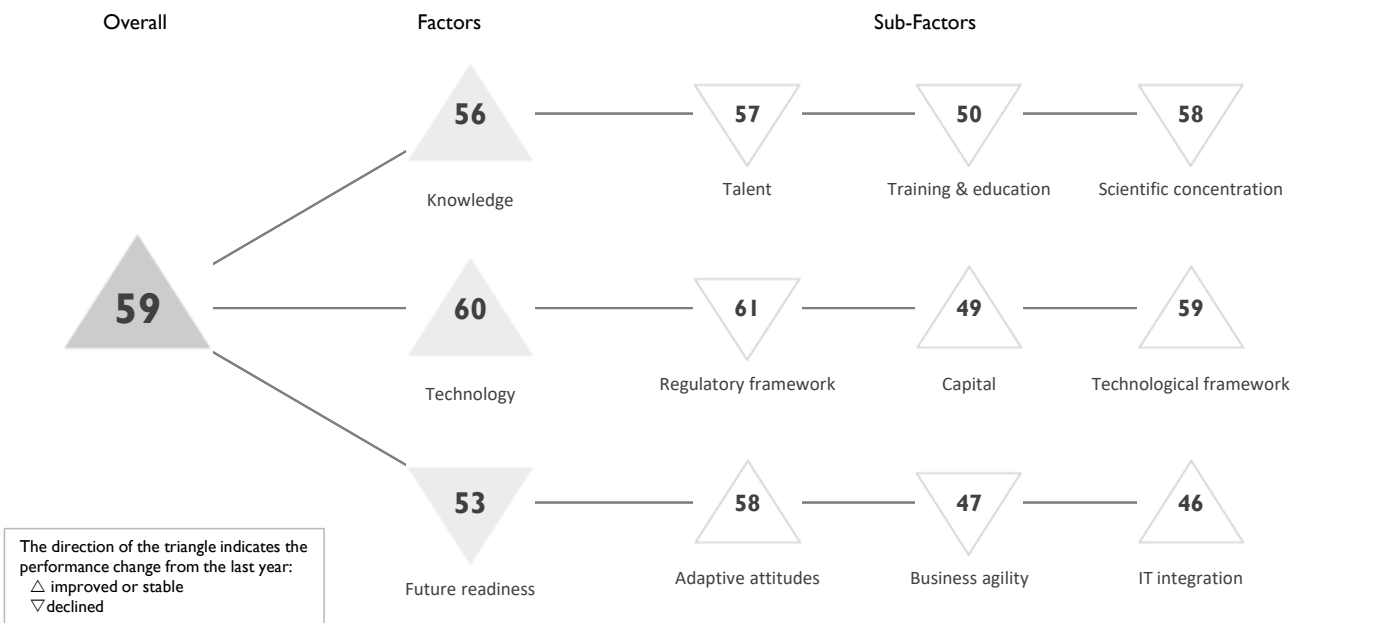
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	32	23	24	17	19
Business agility	24	19	1	4	3
IT integration	44	41	41	35	32

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation		9		Opportunities and threats		31		E-Government		40	
Internet retailing		22		▶ World robots distribution		1		Public-private partnerships		4	
Tablet possession		36		Agility of companies		19		Cyber security		12	
Smartphone possession		17		Use of big data and analytics		11		▷ Software piracy		56	
Attitudes toward globalization		11		Knowledge transfer		23					
				Entrepreneurial fear of failure		36					

COLOMBIA

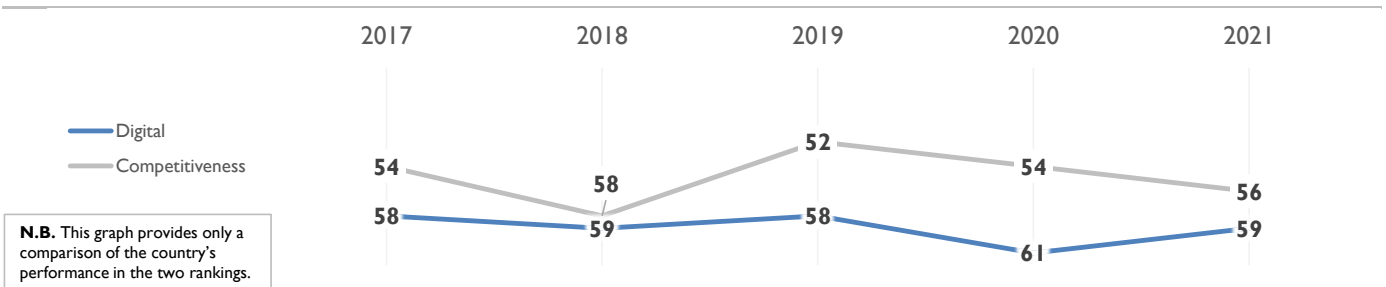
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

	2017	2018	2019	2020	2021
OVERALL	58	59	58	61	59
Knowledge	57	57	57	59	56
Technology	60	60	60	61	60
Future readiness	53	56	55	50	53

COMPETITIVENESS & DIGITAL RANKINGS

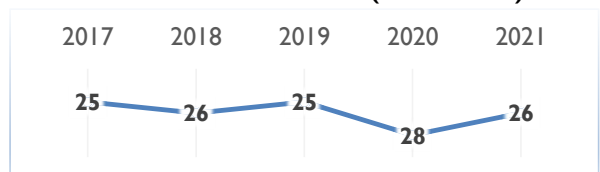


PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	58	57	56	54	57
Training & education	45	45	49	48	50
Scientific concentration	58	57	58	57	58

Talent	Rank
Educational assessment PISA - Math	54
International experience	48
Foreign highly-skilled personnel	44
Management of cities	52
Digital/Technological skills	52
Net flow of international students	51

Training & education	Rank
Employee training	33
Total public expenditure on education	46
Higher education achievement	51
Pupil-teacher ratio (tertiary education)	34
Graduates in Sciences	32
Women with degrees	45

Scientific concentration	Rank
Total expenditure on R&D (%)	56
Total R&D personnel per capita	48
Female researchers	29
▶ R&D productivity by publication	18
Scientific and technical employment	50
▷ High-tech patent grants	62
Robots in Education and R&D	50

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	58	62	61	60	61
Capital	55	57	55	56	49
Technological framework	55	55	52	61	59

Regulatory framework	Rank
Starting a business	40
▷ Enforcing contracts	64
Immigration laws	40
Development & application of tech.	38
Scientific research legislation	56
Intellectual property rights	46

Capital	Rank
IT & media stock market capitalization	56
Funding for technological development	53
Banking and financial services	55
Country credit rating	51
Venture capital	52
▶ Investment in Telecommunications	3

Technological framework	Rank
Communications technology	54
▷ Mobile Broadband subscribers	58
▷ Wireless broadband	62
Internet users	55
Internet bandwidth speed	58
High-tech exports (%)	45

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	53	57	56	60	58
Business agility	54	54	55	38	47
IT integration	45	48	45	49	46

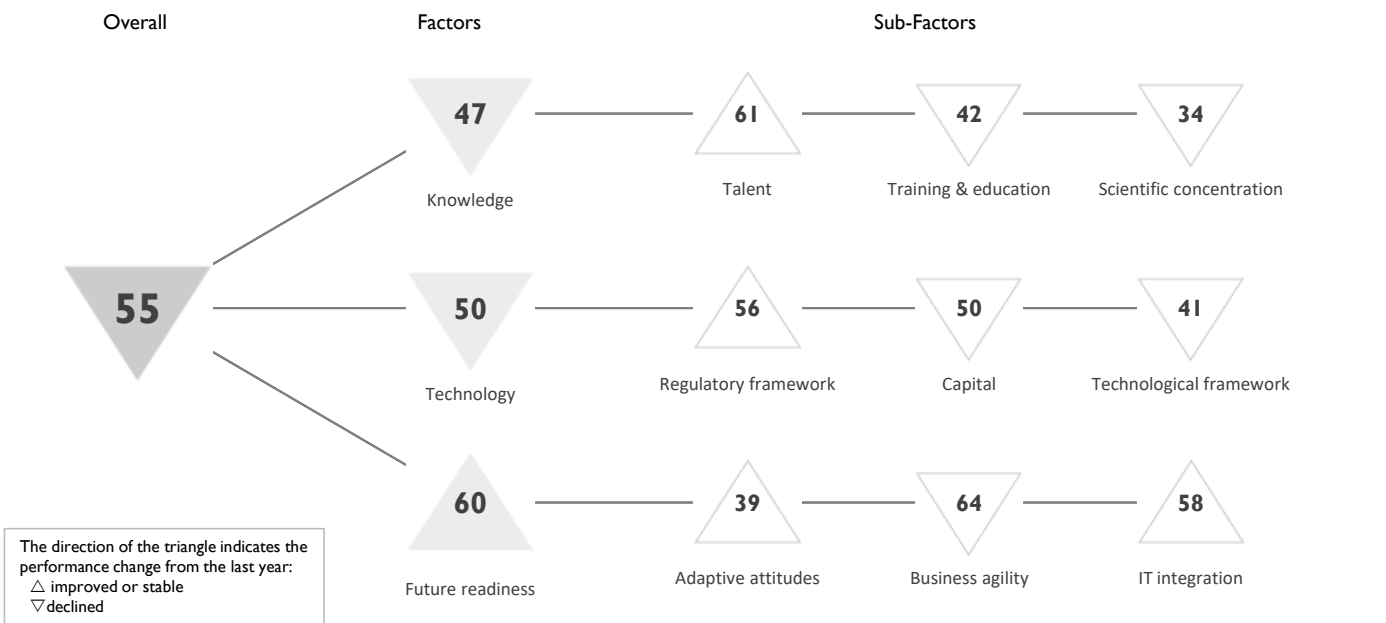
Adaptive attitudes	Rank
▶ E-Participation	26
Internet retailing	54
Tablet possession	52
▷ Smartphone possession	58
Attitudes toward globalization	31

Business agility	Rank
Opportunities and threats	54
World robots distribution	50
Agility of companies	50
Use of big data and analytics	51
Knowledge transfer	44
▶ Entrepreneurial fear of failure	15

IT integration	Rank
E-Government	52
▶ Public-private partnerships	29
Cyber security	51
Software piracy	40

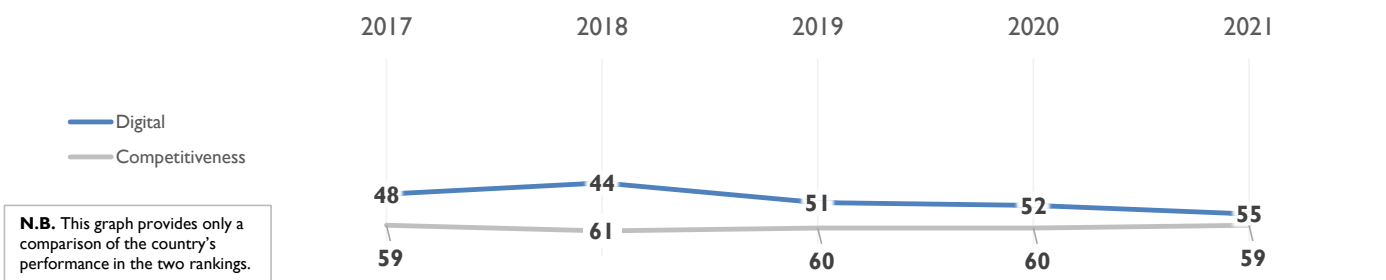
CROATIA

OVERALL PERFORMANCE (64 countries)



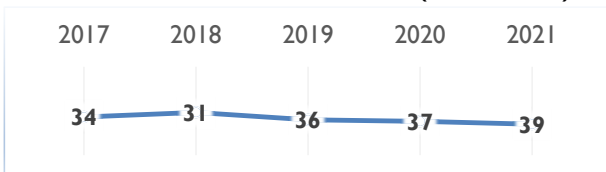
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	48	44	51	52	55
Knowledge	50	43	42	41	47
Technology	47	49	50	49	50
Future readiness	56	54	60	62	60

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	59	59	58	61	61
Training & education	41	36	31	26	42
Scientific concentration	35	32	33	32	34

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	37	▷	Employee training	64	Total expenditure on R&D (%)	37					
International experience	62	Total public expenditure on education	28	Total R&D personnel per capita	37						
Foreign highly-skilled personnel	61	Higher education achievement	43	▶ Female researchers	11						
Management of cities	62	▶ Pupil-teacher ratio (tertiary education)	9	R&D productivity by publication	46						
Digital/Technological skills	48	Graduates in Sciences	23	Scientific and technical employment	34						
Net flow of international students	53	Women with degrees	42	▶ High-tech patent grants	12						
				Robots in Education and R&D	41						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	52	55	59	59	56
Capital	52	52	50	43	50
Technological framework	40	43	41	40	41

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	48	IT & media stock market capitalization	22	Communications technology	41						
Enforcing contracts	24	Funding for technological development	55	▶ Mobile Broadband subscribers	16						
Immigration laws	59	Banking and financial services	61	Wireless broadband	49						
▷ Development & application of tech.	62	Country credit rating	54	Internet users	32						
Scientific research legislation	59	Venture capital	59	Internet bandwidth speed	46						
Intellectual property rights	57	▶ Investment in Telecommunications	6	High-tech exports (%)	46						

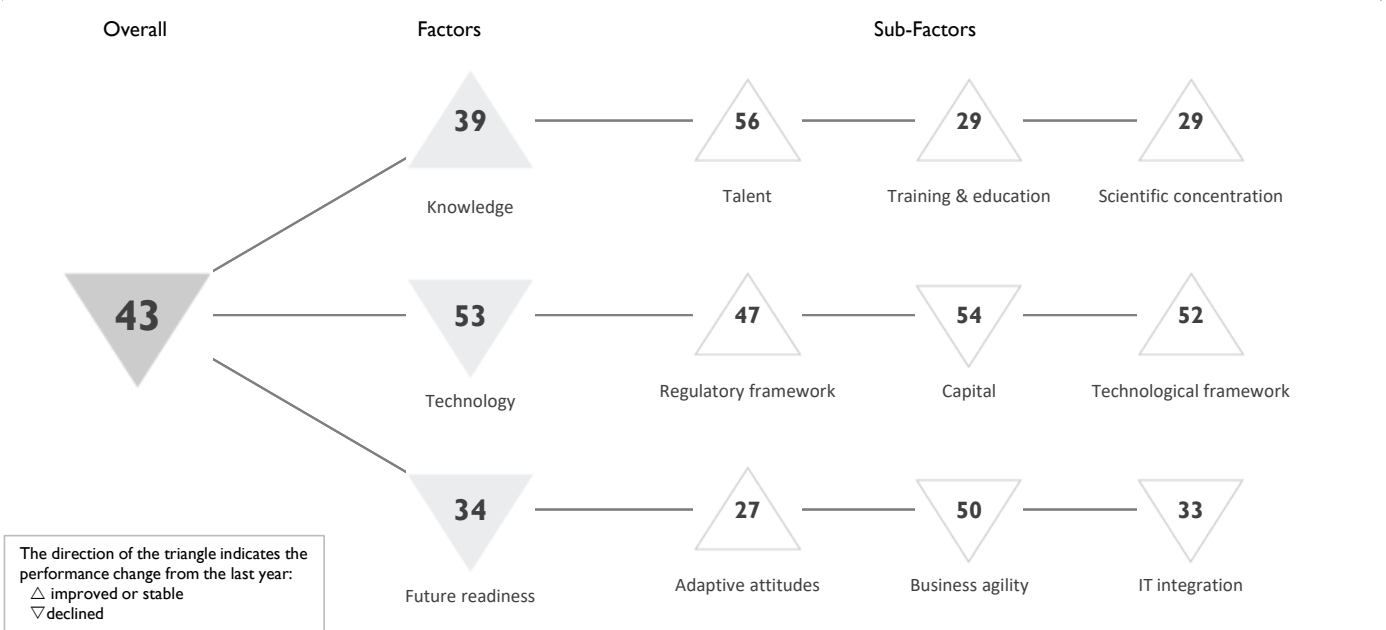
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	43	37	51	46	39
Business agility	62	63	62	63	64
IT integration	46	49	57	59	58

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	22	▷	Opportunities and threats	63	E-Government	44					
Internet retailing	52	World robots distribution	49	▷ Public-private partnerships	63						
Tablet possession	33	▷	Agility of companies	63	Cyber security	49					
Smartphone possession	30	Use of big data and analytics	61	Software piracy	43						
Attitudes toward globalization	60	Knowledge transfer	62								
		Entrepreneurial fear of failure	49								

CYPRUS

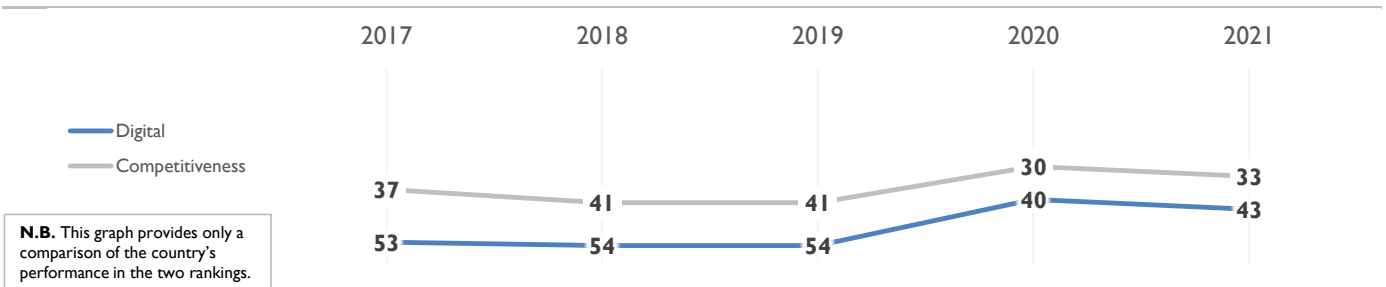
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

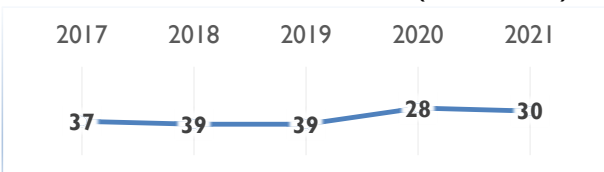
	2017	2018	2019	2020	2021
OVERALL	53	54	54	40	43
Knowledge	46	55	55	40	39
Technology	54	56	59	52	53
Future readiness	54	44	40	29	34

COMPETITIVENESS & DIGITAL RANKINGS

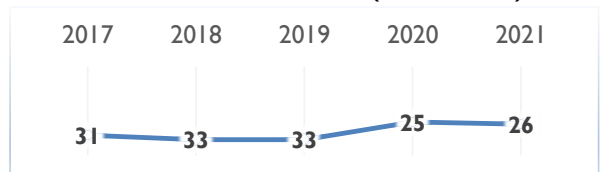


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	56	62	62	57	56
Training & education	22	29	33	30	29
Scientific concentration	51	52	53	35	29

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	42	Employee training	39	Total expenditure on R&D (%)	50	International experience	31	Total R&D personnel per capita	42	Female researchers	26
Foreign highly-skilled personnel	26	Total public expenditure on education	20	R&D productivity by publication	56	Management of cities	33	▶ Higher education achievement	10	▶ Scientific and technical employment	6
Digital/Technological skills	38	Pupil-teacher ratio (tertiary education)	29	▶ Graduates in Sciences	61	▶ High-tech patent grants	6	▶ Women with degrees	17	Robots in Education and R&D	-
▷ Net flow of international students	62										

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	45	51	56	47	47
Capital	54	60	60	52	54
Technological framework	54	49	48	52	52

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	29	IT & media stock market capitalization	45	Communications technology	34	▷ Enforcing contracts	59	Funding for technological development	48	▷ Mobile Broadband subscribers	60
Immigration laws	52	Banking and financial services	47	Wireless broadband	44	Development & application of tech.	41	Country credit rating	55	Internet users	33
Scientific research legislation	38	Venture capital	57	Internet bandwidth speed	53	Intellectual property rights	42	Investment in Telecommunications	29	High-tech exports (%)	20

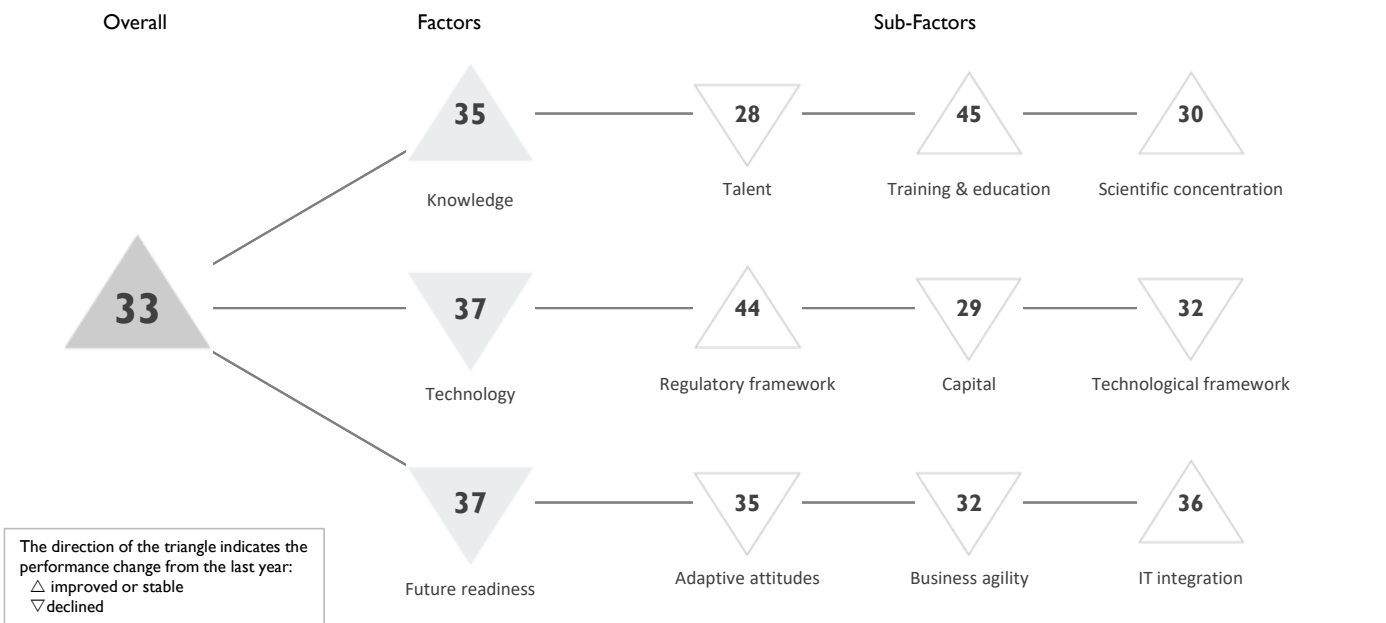
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	56	45	34	28	27
Business agility	51	45	57	42	50
IT integration	47	46	38	29	33

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
▶ E-Participation	14	Opportunities and threats	53	E-Government	18	Internet retailing	-	Public-private partnerships	46	Cyber security	38
Tablet possession	38	World robots distribution	-	Software piracy	34	Smartphone possession	-	Use of big data and analytics	60	Knowledge transfer	51
Attitudes toward globalization	48	Entrepreneurial fear of failure	20								

CZECH REPUBLIC

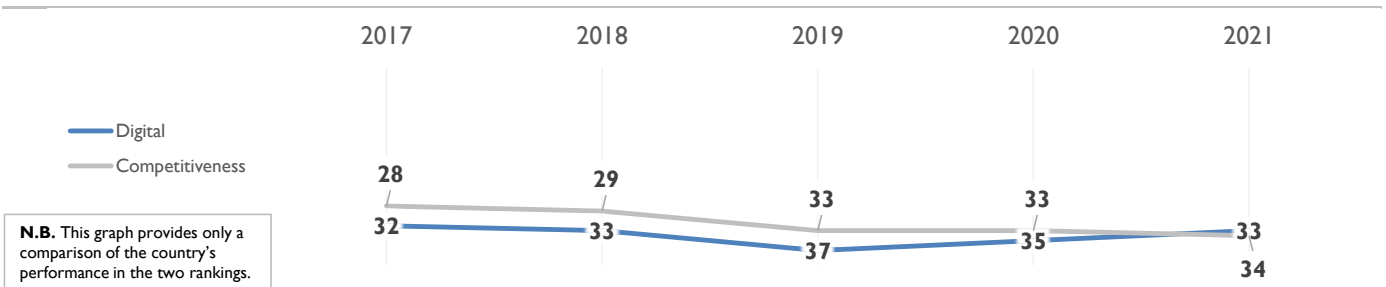
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

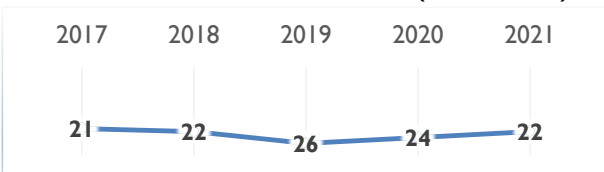
	2017	2018	2019	2020	2021
OVERALL	32	33	37	35	33
Knowledge	36	38	37	37	35
Technology	26	31	34	36	37
Future readiness	37	34	39	36	37

COMPETITIVENESS & DIGITAL RANKINGS

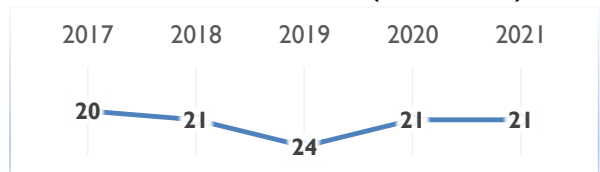


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



CZECH REPUBLIC

- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	26	29	35	26	28
Training & education	49	55	44	46	45
Scientific concentration	34	36	30	31	30

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	21	Employee training	45	Total expenditure on R&D (%)	19						
International experience	34	Total public expenditure on education	26	▶ Total R&D personnel per capita	18						
Foreign highly-skilled personnel	45	Higher education achievement	48	▷ Female researchers	50						
Management of cities	34	Pupil-teacher ratio (tertiary education)	35	R&D productivity by publication	35						
Digital/Technological skills	41	Graduates in Sciences	25	Scientific and technical employment	29						
▶ Net flow of international students	13	Women with degrees	44	High-tech patent grants	35						
				▶ Robots in Education and R&D	17						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	43	44	43	45	44
Capital	15	19	28	27	29
Technological framework	15	18	28	28	32

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
▷ Starting a business	56	▶ IT & media stock market capitalization	17	Communications technology	28						
▷ Enforcing contracts	52	Funding for technological development	38	Mobile Broadband subscribers	29						
Immigration laws	21	Banking and financial services	24	Wireless broadband	27						
Development & application of tech.	43	Country credit rating	21	Internet users	35						
Scientific research legislation	33	Venture capital	27	Internet bandwidth speed	40						
Intellectual property rights	34	Investment in Telecommunications	46	High-tech exports (%)	18						

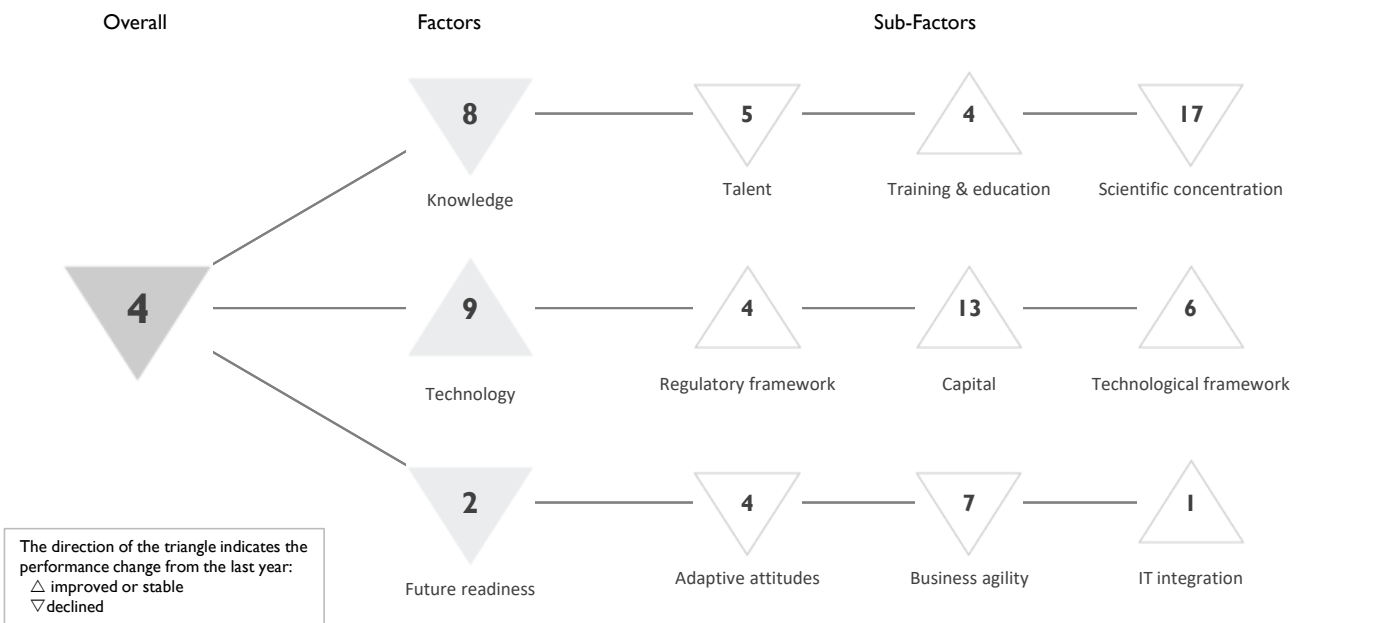
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	42	34	46	34	35
Business agility	33	25	37	27	32
IT integration	33	34	35	36	36

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
▷ E-Participation	50	Opportunities and threats	38	E-Government	35						
Internet retailing	20	▶ World robots distribution	16	▷ Public-private partnerships	52						
Tablet possession	45	Agility of companies	40	Cyber security	41						
Smartphone possession	27	Use of big data and analytics	38	Software piracy	20						
Attitudes toward globalization	49	Knowledge transfer	37								
		Entrepreneurial fear of failure	-								

DENMARK

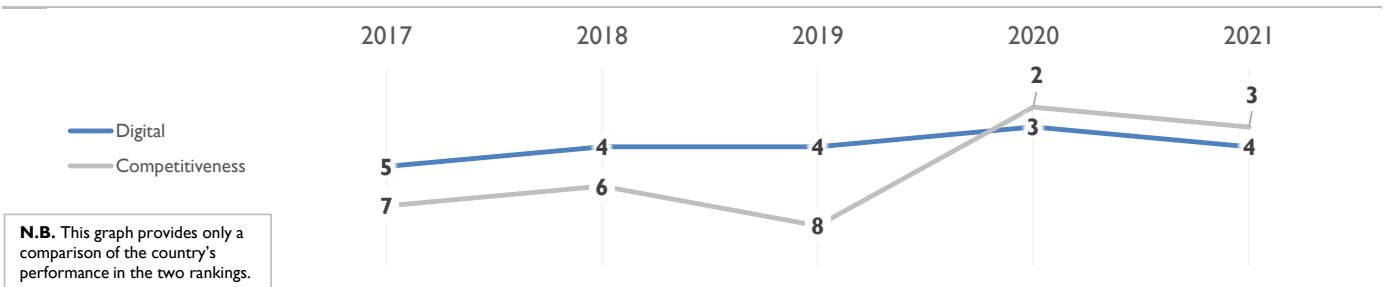
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

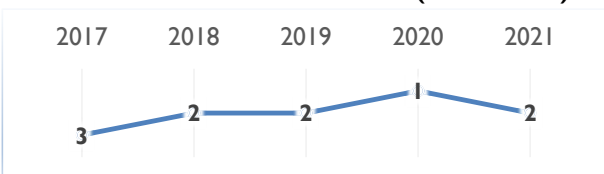
	2017	2018	2019	2020	2021
OVERALL	5	4	4	3	4
Knowledge	8	8	6	6	8
Technology	10	10	11	9	9
Future readiness	1	1	2	1	2

COMPETITIVENESS & DIGITAL RANKINGS

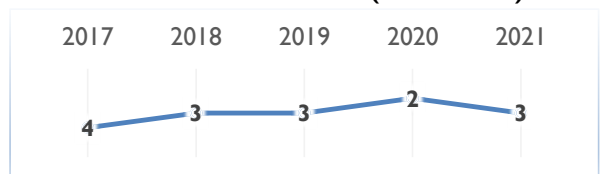


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	6	6	6	4	5
Training & education	5	3	6	9	4
Scientific concentration	19	14	17	15	17

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	12	Employee training	2	Total expenditure on R&D (%)	10
International experience	10	Total public expenditure on education	7	▶ Total R&D personnel per capita	2
Foreign highly-skilled personnel	14	Higher education achievement	25	Female researchers	32
▶ Management of cities	1	Pupil-teacher ratio (tertiary education)	4	▷ R&D productivity by publication	45
Digital/Technological skills	3	▷ Graduates in Sciences	40	Scientific and technical employment	19
Net flow of international students	9	Women with degrees	22	▷ High-tech patent grants	37
				Robots in Education and R&D	27

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	8	8	10	4	4
Capital	25	22	27	23	13
Technological framework	5	5	8	6	6

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	26	▷ IT & media stock market capitalization	50	Communications technology	2
Enforcing contracts	13	Funding for technological development	5	Mobile Broadband subscribers	9
Immigration laws	25	Banking and financial services	7	Wireless broadband	9
Development & application of tech.	3	▶ Country credit rating	1	Internet users	5
Scientific research legislation	4	Venture capital	7	Internet bandwidth speed	5
Intellectual property rights	2	▷ Investment in Telecommunications	35	High-tech exports (%)	33

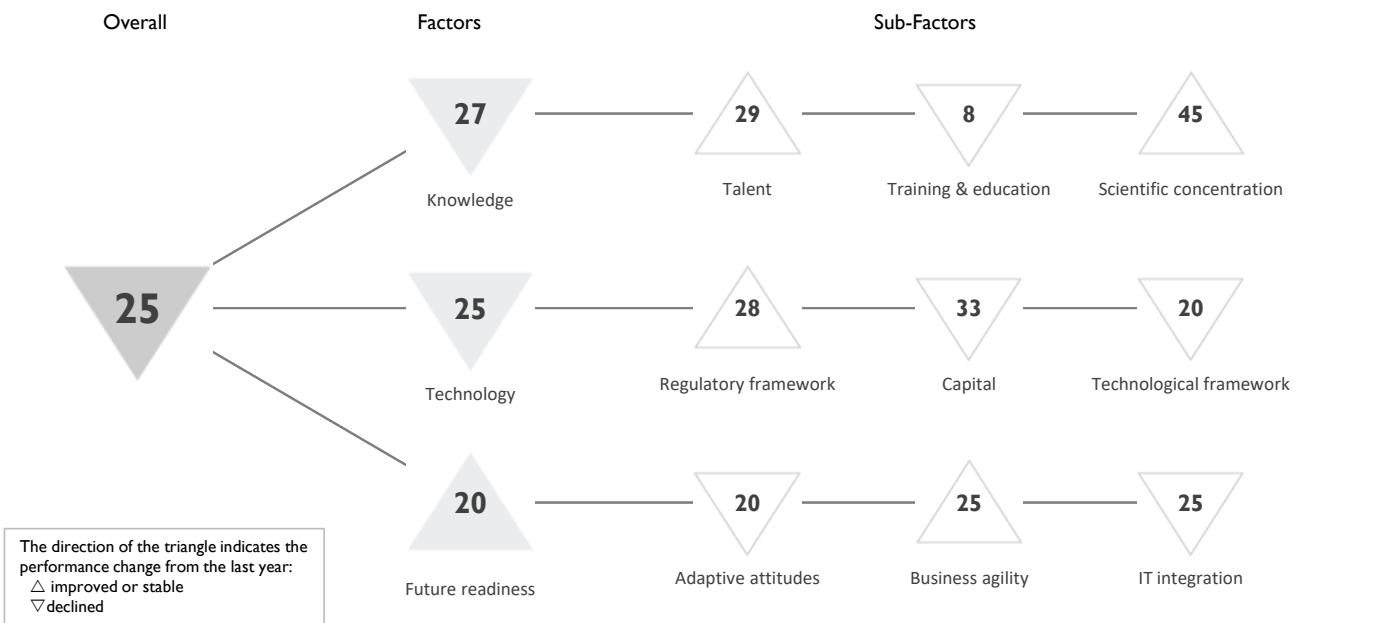
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	1	5	1	2	4
Business agility	11	6	10	5	7
IT integration	11	5	1	1	1

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	9	Opportunities and threats	6	▶ E-Government	1
Internet retailing	5	World robots distribution	29	▶ Public-private partnerships	1
Tablet possession	20	Agility of companies	2	Cyber security	16
Smartphone possession	11	Use of big data and analytics	13	Software piracy	8
Attitudes toward globalization	3	Knowledge transfer	3		
		Entrepreneurial fear of failure	-		

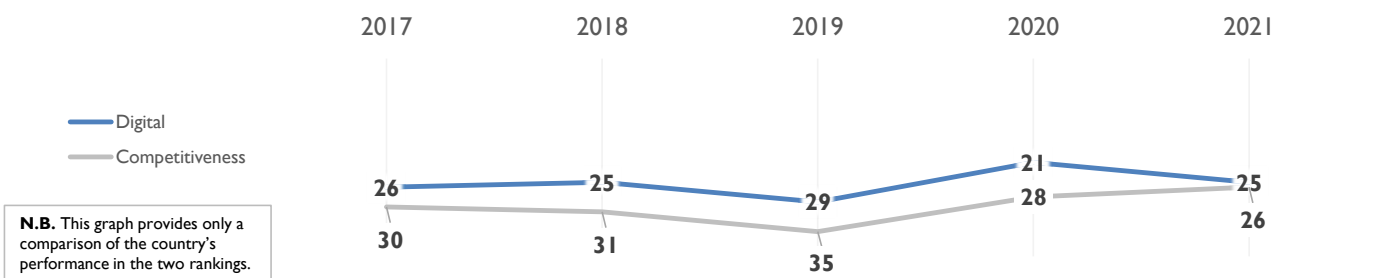
ESTONIA

OVERALL PERFORMANCE (64 countries)



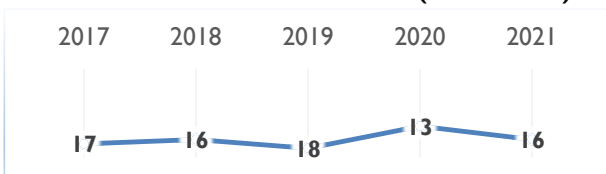
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	26	25	29	21	25
Knowledge	28	29	30	23	27
Technology	19	20	22	23	25
Future readiness	26	26	30	20	20

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	40	34	37	31	29
Training & education	2	17	10	3	8
Scientific concentration	38	39	46	47	45

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
▶ Educational assessment PISA - Math	7	Employee training	16	Total expenditure on R&D (%)	23
International experience	46	Total public expenditure on education	9	Total R&D personnel per capita	29
Foreign highly-skilled personnel	28	Higher education achievement	33	Female researchers	18
Management of cities	39	▷ Pupil-teacher ratio (tertiary education)	16	▷ R&D productivity by publication	60
Digital/Technological skills	43	Graduates in Sciences	18	Scientific and technical employment	31
Net flow of international students	33	Women with degrees	11	High-tech patent grants	24
				▷ Robots in Education and R&D	50

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	23	25	31	30	28
Capital	18	21	24	29	33
Technological framework	18	15	16	17	20

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	7	▷ IT & media stock market capitalization	54	Communications technology	40
Enforcing contracts	8	Funding for technological development	25	Mobile Broadband subscribers	38
▷ Immigration laws	50	Banking and financial services	28	▶ Wireless broadband	4
Development & application of tech.	29	Country credit rating	24	Internet users	15
Scientific research legislation	35	Venture capital	17	Internet bandwidth speed	33
Intellectual property rights	33	Investment in Telecommunications	39	High-tech exports (%)	25

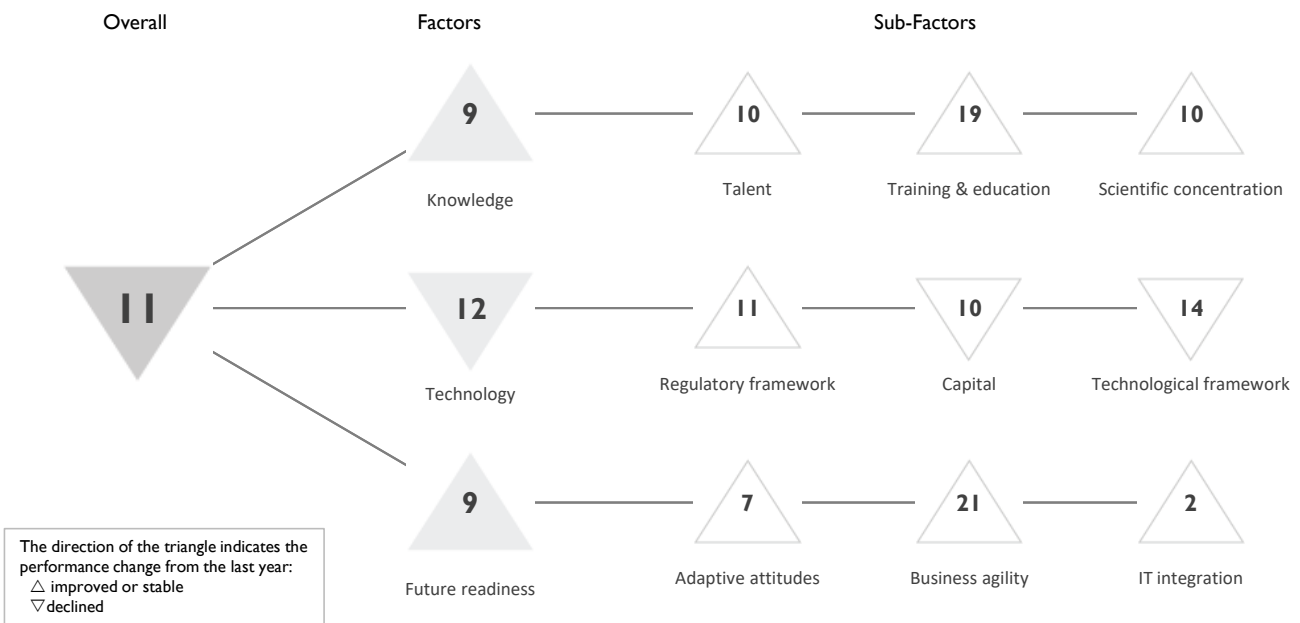
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	31	24	26	18	20
Business agility	19	29	43	26	25
IT integration	25	22	26	22	25

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
▶ E-Participation	1	Opportunities and threats	24	▶ E-Government	3
Internet retailing	21	World robots distribution	47	▷ Public-private partnerships	50
▶ Tablet possession	6	Agility of companies	12	Cyber security	20
Smartphone possession	31	Use of big data and analytics	34	Software piracy	30
Attitudes toward globalization	33	Knowledge transfer	36		
		Entrepreneurial fear of failure	13		

FINLAND

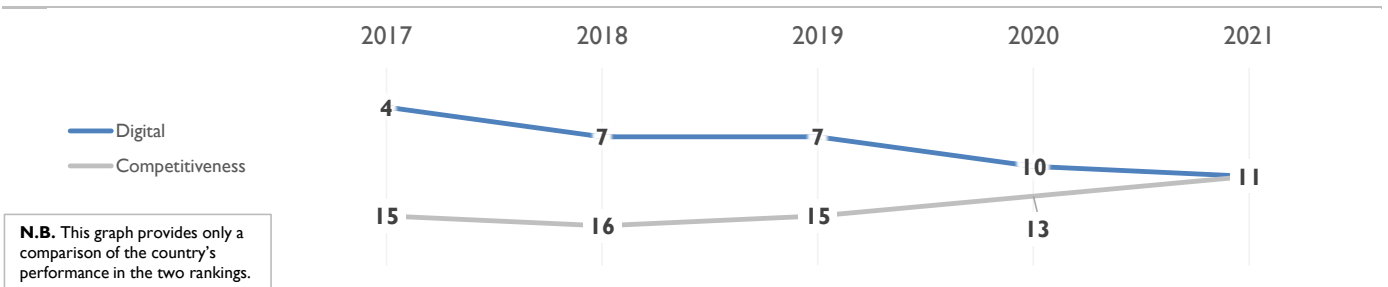
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

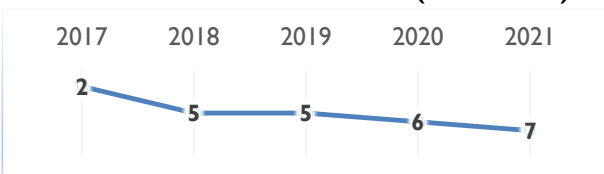
	2017	2018	2019	2020	2021
OVERALL	4	7	7	10	11
Knowledge	9	9	9	15	9
Technology	4	4	8	10	12
Future readiness	4	8	7	9	9

COMPETITIVENESS & DIGITAL RANKINGS

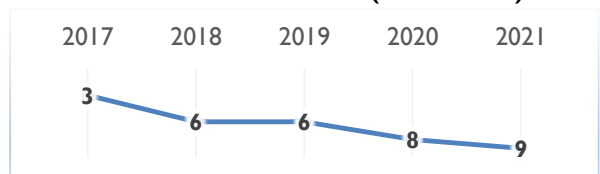


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	10	13	9	11	10
Training & education	8	9	16	20	19
Scientific concentration	12	9	10	12	10

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	15	Employee training	7	Total expenditure on R&D (%)	12
International experience	18	Total public expenditure on education	14	Total R&D personnel per capita	8
Foreign highly-skilled personnel	39	Higher education achievement	35	Female researchers	38
Management of cities	4	▷ Pupil-teacher ratio (tertiary education)	48	▷ R&D productivity by publication	50
▶ Digital/Technological skills	1	Graduates in Sciences	16	Scientific and technical employment	9
Net flow of international students	17	Women with degrees	7	High-tech patent grants	9
				Robots in Education and R&D	24

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	2	4	9	13	11
Capital	10	9	11	6	10
Technological framework	8	6	13	10	14

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	18	IT & media stock market capitalization	23	▶ Communications technology	1
Enforcing contracts	34	▶ Funding for technological development	2	Mobile Broadband subscribers	5
▷ Immigration laws	48	Banking and financial services	3	Wireless broadband	6
Development & application of tech.	4	Country credit rating	12	Internet users	18
▶ Scientific research legislation	3	Venture capital	5	Internet bandwidth speed	30
▶ Intellectual property rights	3	▷ Investment in Telecommunications	54	▷ High-tech exports (%)	44

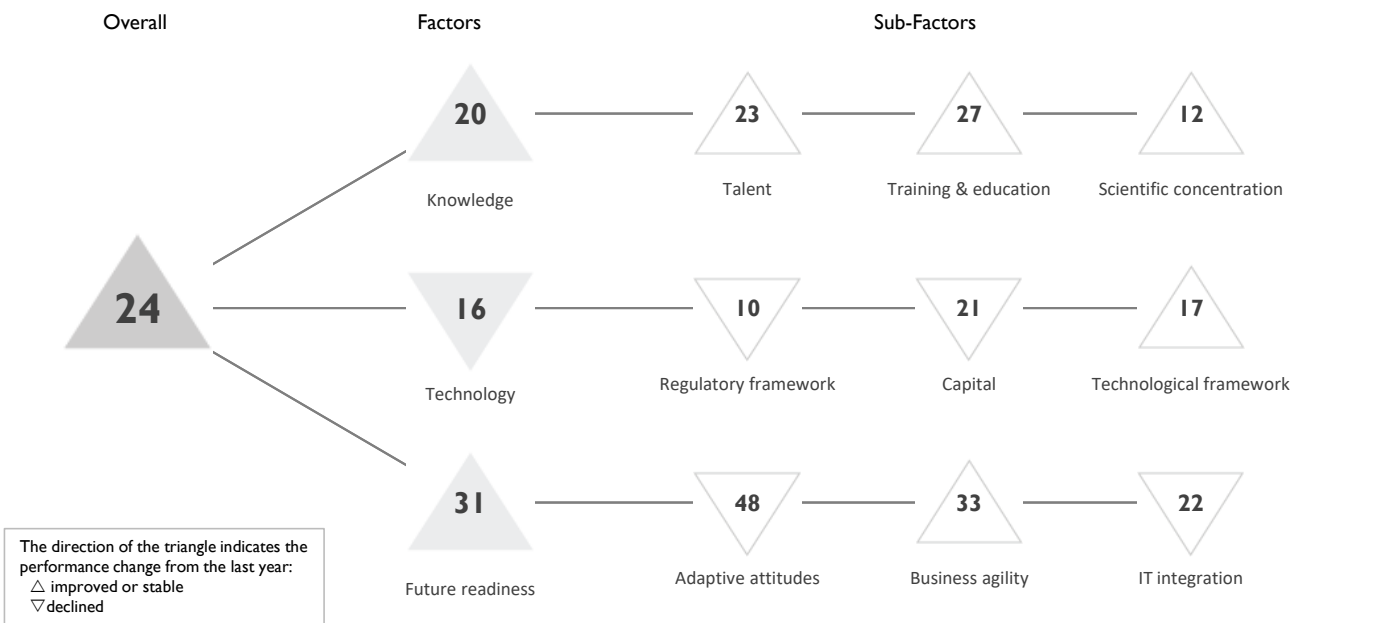
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	3	6	6	10	7
Business agility	17	22	27	22	21
IT integration	2	1	2	2	2

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	14	Opportunities and threats	36	E-Government	4
Internet retailing	11	World robots distribution	34	Public-private partnerships	6
Tablet possession	8	Agility of companies	25	Cyber security	5
Smartphone possession	12	Use of big data and analytics	16	Software piracy	13
Attitudes toward globalization	7	Knowledge transfer	5		
		Entrepreneurial fear of failure	25		

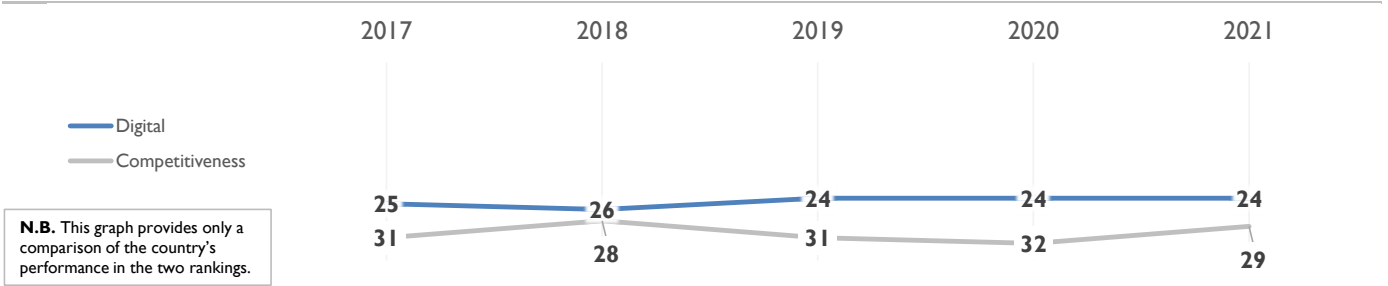
FRANCE

OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	25	26	24	24	24
Knowledge	19	20	20	20	20
Technology	22	19	16	15	16
Future readiness	28	27	29	31	31

COMPETITIVENESS & DIGITAL RANKINGS

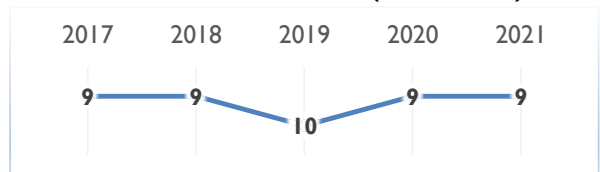


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	24	21	24	25	23
Training & education	35	33	28	36	27
Scientific concentration	10	17	12	13	12

Talent	Rank
Educational assessment PISA - Math	24
International experience	47
Foreign highly-skilled personnel	30
Management of cities	17
Digital/Technological skills	30
Net flow of international students	19

Training & education	Rank
Employee training	30
Total public expenditure on education	21
Higher education achievement	23
Pupil-teacher ratio (tertiary education)	40
Graduates in Sciences	26
Women with degrees	30

Scientific concentration	Rank
Total expenditure on R&D (%)	15
Total R&D personnel per capita	21
Female researchers	46
R&D productivity by publication	15
Scientific and technical employment	16
High-tech patent grants	15
▶ Robots in Education and R&D	5

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	15	5	8	9	10
Capital	26	25	18	20	21
Technological framework	25	28	22	19	17

Regulatory framework	Rank
Starting a business	21
Enforcing contracts	15
▶ Immigration laws	14
Development & application of tech.	21
Scientific research legislation	21
Intellectual property rights	15

Capital	Rank
IT & media stock market capitalization	28
Funding for technological development	22
Banking and financial services	34
Country credit rating	15
Venture capital	23
Investment in Telecommunications	20

Technological framework	Rank
Communications technology	20
Mobile Broadband subscribers	25
Wireless broadband	36
Internet users	28
▶ Internet bandwidth speed	14
▶ High-tech exports (%)	10

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	26	32	36	36	48
Business agility	44	36	39	36	33
IT integration	20	19	19	21	22

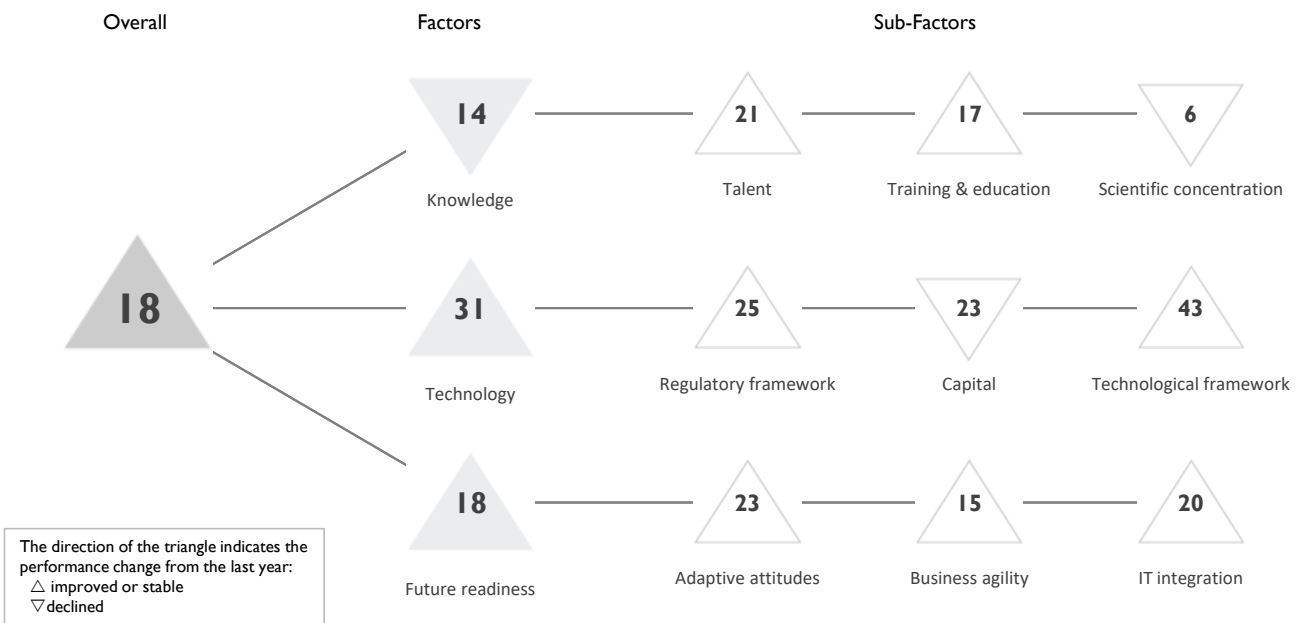
Adaptive attitudes	Rank
E-Participation	18
Internet retailing	19
▷ Tablet possession	48
Smartphone possession	39
▷ Attitudes toward globalization	64

Business agility	Rank
▷ Opportunities and threats	52
▶ World robots distribution	8
▷ Agility of companies	53
▷ Use of big data and analytics	52
Knowledge transfer	28
Entrepreneurial fear of failure	23

IT integration	Rank
E-Government	19
Public-private partnerships	20
Cyber security	28
Software piracy	20

GERMANY

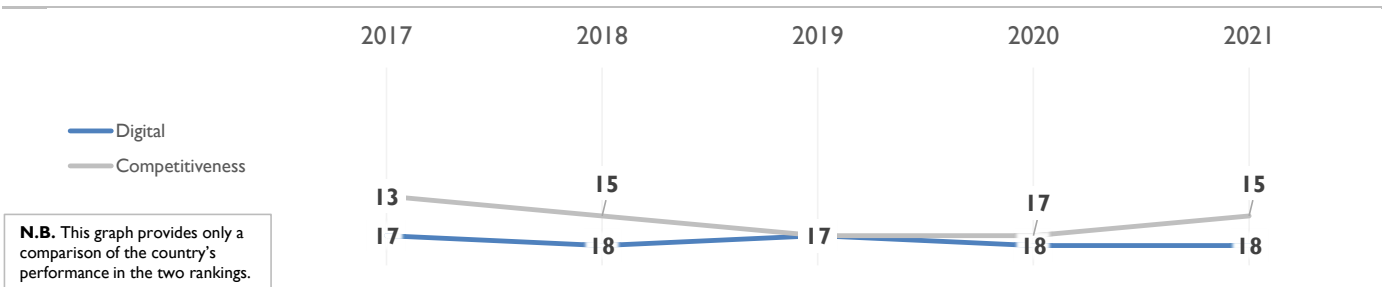
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

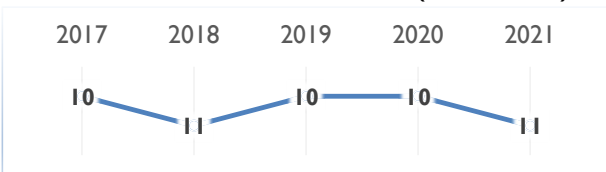
	2017	2018	2019	2020	2021
OVERALL	17	18	17	18	18
Knowledge	13	14	12	12	14
Technology	21	21	31	31	31
Future readiness	18	20	16	19	18

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	16	22	25	22	21
Training & education	15	19	14	17	17
Scientific concentration	15	10	4	5	6

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	19	Employee training	6	Total expenditure on R&D (%)	8						
International experience	15	Total public expenditure on education	39	Total R&D personnel per capita	11						
Foreign highly-skilled personnel	17	Higher education achievement	46	Female researchers	49						
Management of cities	18	▶ Pupil-teacher ratio (tertiary education)	3	R&D productivity by publication	12						
▷ Digital/Technological skills	54	▶ Graduates in Sciences	3	Scientific and technical employment	26						
Net flow of international students	15	Women with degrees	43	High-tech patent grants	18						
				▶ Robots in Education and R&D	2						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	20	23	27	28	25
Capital	19	16	17	16	23
Technological framework	26	27	40	45	43

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	51	IT & media stock market capitalization	11	▷ Communications technology	55						
Enforcing contracts	12	Funding for technological development	31	▷ Mobile Broadband subscribers	56						
Immigration laws	10	Banking and financial services	31	Wireless broadband	46						
Development & application of tech.	44	▶ Country credit rating	1	Internet users	16						
Scientific research legislation	28	Venture capital	30	Internet bandwidth speed	32						
Intellectual property rights	9	Investment in Telecommunications	42	High-tech exports (%)	27						

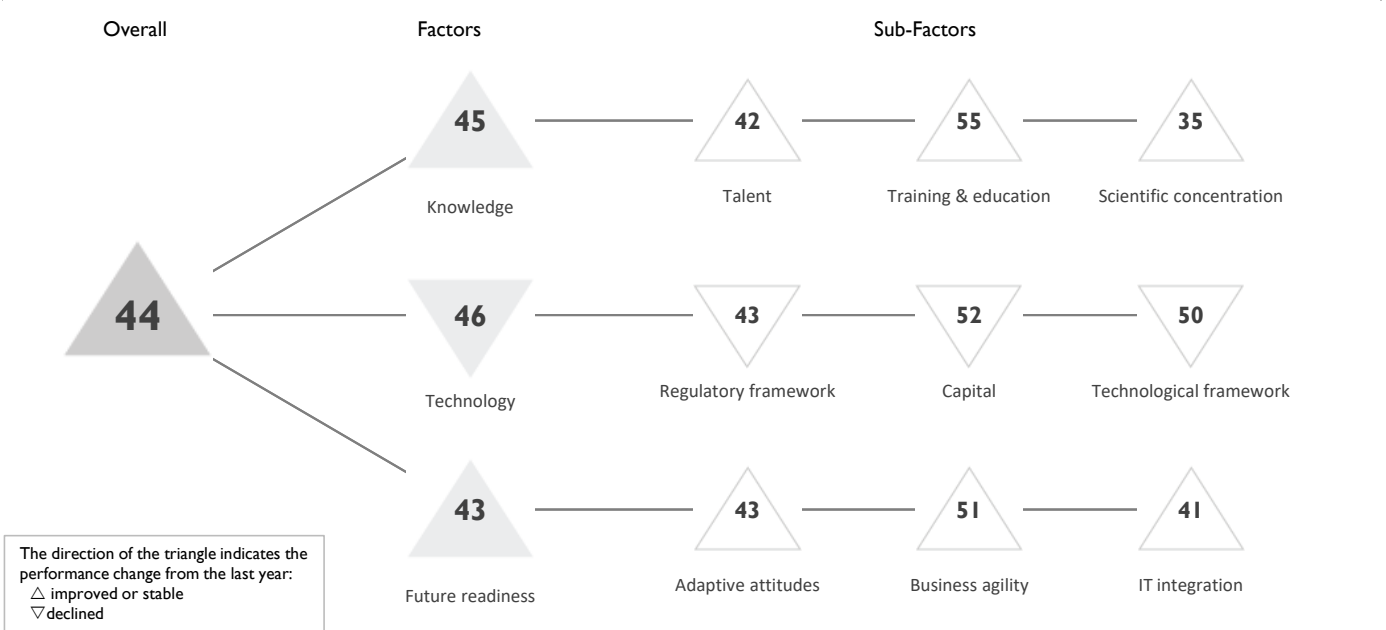
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	22	22	16	23	23
Business agility	18	20	11	15	15
IT integration	16	18	17	20	20

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	45	▷ Opportunities and threats	55	E-Government	24						
Internet retailing	13	▶ World robots distribution	5	Public-private partnerships	37						
Tablet possession	22	Agility of companies	38	Cyber security	24						
Smartphone possession	23	▷ Use of big data and analytics	53	Software piracy	8						
Attitudes toward globalization	35	Knowledge transfer	14								
		Entrepreneurial fear of failure	7								

GREECE

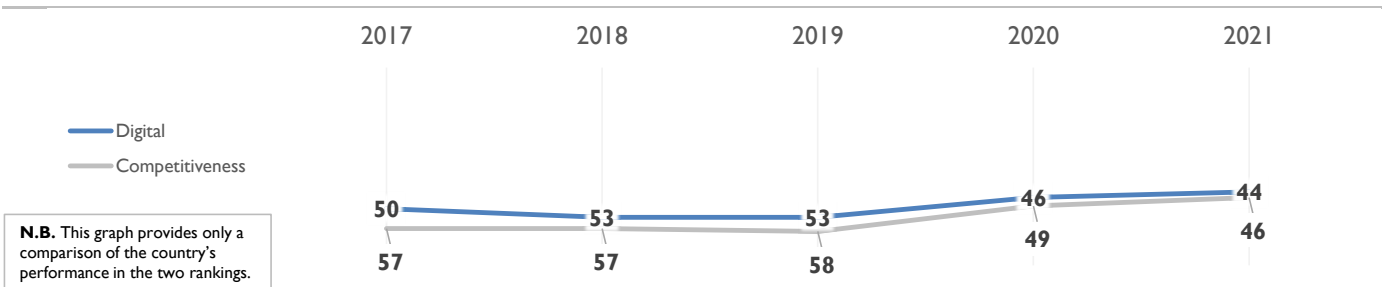
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

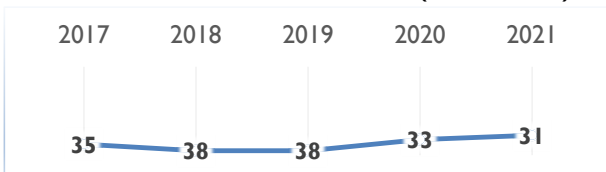
	2017	2018	2019	2020	2021
OVERALL	50	53	53	46	44
Knowledge	51	51	53	48	45
Technology	52	51	54	43	46
Future readiness	47	46	53	46	43

COMPETITIVENESS & DIGITAL RANKINGS

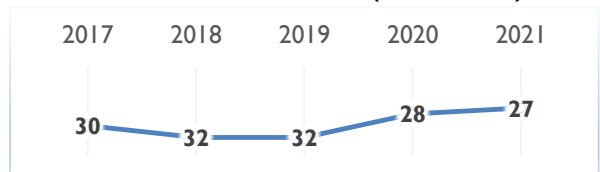


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	47	50	53	50	42
Training & education	55	58	60	56	55
Scientific concentration	33	37	34	36	35

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	41	Employee training	44	Total expenditure on R&D (%)	31	International experience	19	Total public expenditure on education	44	Total R&D personnel per capita	27
Foreign highly-skilled personnel	52	Higher education achievement	34	Female researchers	28	Management of cities	48	Pupil-teacher ratio (tertiary education)	59	R&D productivity by publication	33
Digital/Technological skills	36	Graduates in Sciences	15	Scientific and technical employment	20	Net flow of international students	54	Women with degrees	35	High-tech patent grants	47
				Robots in Education and R&D	39						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	49	47	52	41	43
Capital	58	54	52	49	52
Technological framework	49	48	49	46	50

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	6	IT & media stock market capitalization	14	Communications technology	51	Enforcing contracts	60	Funding for technological development	41	Mobile Broadband subscribers	41
Immigration laws	23	Banking and financial services	58	Wireless broadband	32	Development & application of tech.	36	Country credit rating	57	Internet users	52
Scientific research legislation	43	Venture capital	49	Internet bandwidth speed	49	Intellectual property rights	45	Investment in Telecommunications	22	High-tech exports (%)	32

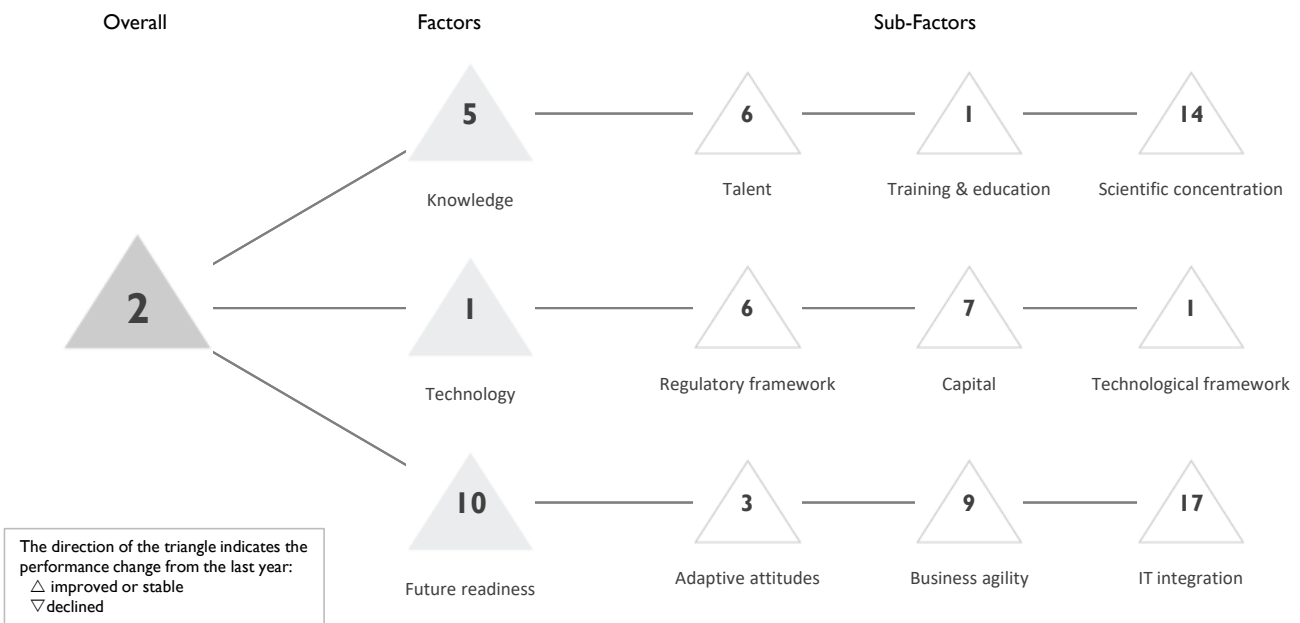
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	41	50	41	44	43
Business agility	53	49	60	55	51
IT integration	48	47	50	45	41

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	41	Opportunities and threats	42	E-Government	37	Internet retailing	33	World robots distribution	44	Public-private partnerships	30
Tablet possession	41	Agility of companies	51	Cyber security	42	Smartphone possession	49	Use of big data and analytics	45	Software piracy	52
Attitudes toward globalization	45	Knowledge transfer	50	Entrepreneurial fear of failure	27						

HONG KONG SAR

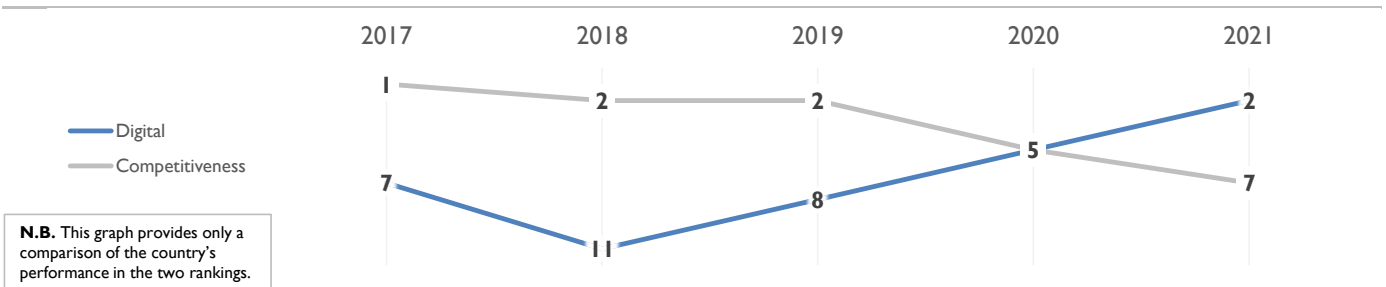
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

	2017	2018	2019	2020	2021
OVERALL	7	11	8	5	2
Knowledge	6	5	7	7	5
Technology	3	6	4	2	1
Future readiness	17	24	15	10	10

COMPETITIVENESS & DIGITAL RANKINGS

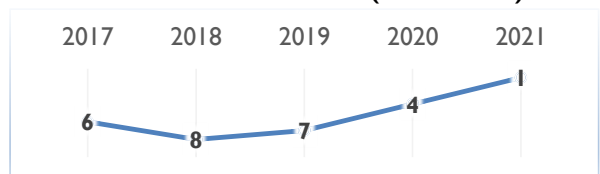


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (35 countries)



HONG KONG SAR

- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	4	5	4	7	6
Training & education	27	13	12	5	1
Scientific concentration	7	5	16	17	14

Talent	Rank
Educational assessment PISA - Math	3
International experience	4
Foreign highly-skilled personnel	16
Management of cities	5
Digital/Technological skills	15
Net flow of international students	35

Training & education	Rank
Employee training	14
▷ Total public expenditure on education	37
Higher education achievement	9
Pupil-teacher ratio (tertiary education)	30
▶ Graduates in Sciences	1
Women with degrees	-

Scientific concentration	Rank
▷ Total expenditure on R&D (%)	42
Total R&D personnel per capita	30
Female researchers	-
R&D productivity by publication	21
Scientific and technical employment	2
High-tech patent grants	2
▷ Robots in Education and R&D	55

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	6	14	12	7	6
Capital	6	6	6	12	7
Technological framework	9	11	3	2	1

Regulatory framework	Rank
Starting a business	4
Enforcing contracts	25
Immigration laws	11
Development & application of tech.	11
Scientific research legislation	19
Intellectual property rights	7

Capital	Rank
IT & media stock market capitalization	5
Funding for technological development	11
Banking and financial services	6
Country credit rating	16
Venture capital	8
▷ Investment in Telecommunications	58

Technological framework	Rank
Communications technology	7
Mobile Broadband subscribers	17
Wireless broadband	5
Internet users	21
Internet bandwidth speed	2
▶ High-tech exports (%)	1

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	9	11	12	4	3
Business agility	25	26	8	14	9
IT integration	21	25	22	19	17

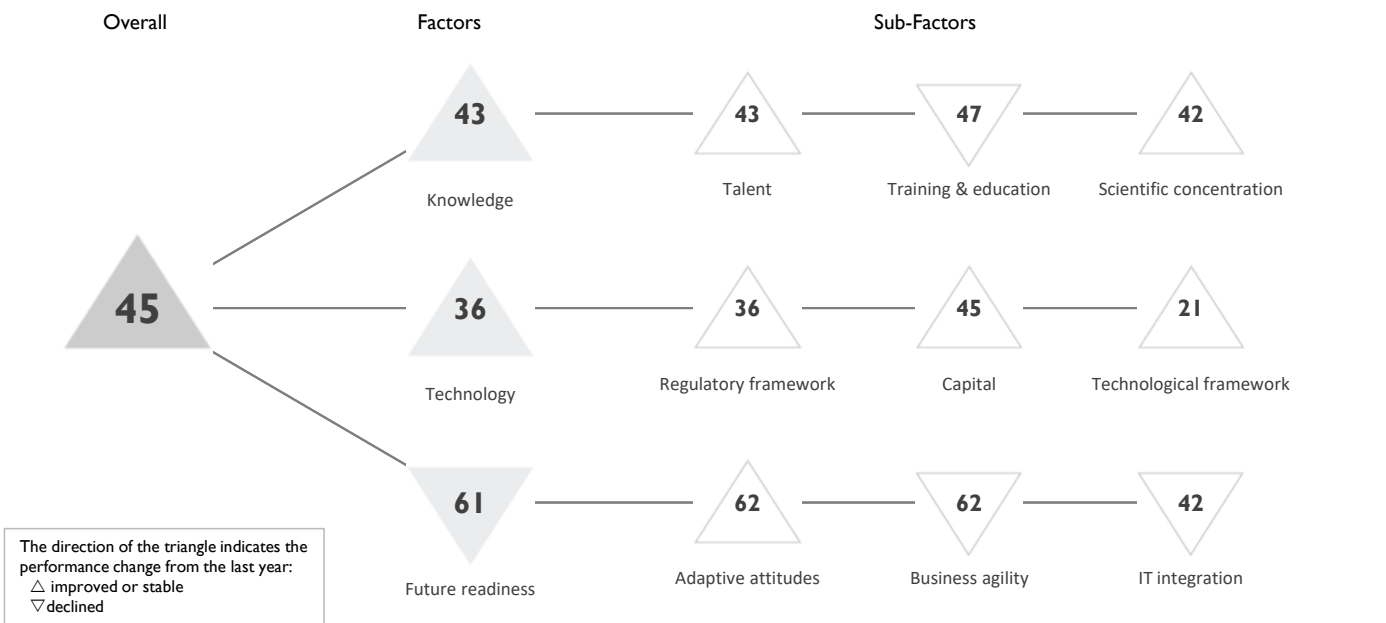
Adaptive attitudes	Rank
E-Participation	-
Internet retailing	17
Tablet possession	7
▶ Smartphone possession	1
Attitudes toward globalization	5

Business agility	Rank
▶ Opportunities and threats	1
▷ World robots distribution	38
▶ Agility of companies	1
Use of big data and analytics	12
Knowledge transfer	12
Entrepreneurial fear of failure	24

IT integration	Rank
E-Government	-
Public-private partnerships	8
Cyber security	11
Software piracy	28

HUNGARY

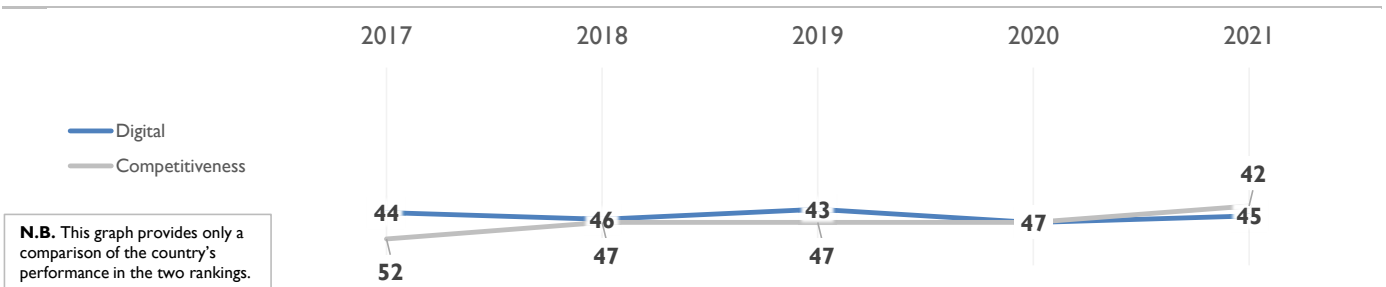
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

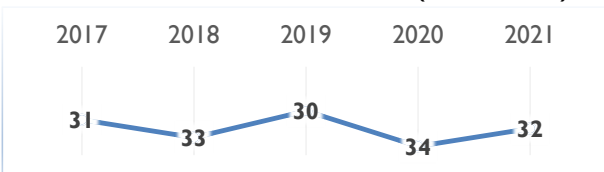
	2017	2018	2019	2020	2021
OVERALL	44	46	43	47	45
Knowledge	48	48	44	44	43
Technology	38	40	36	39	36
Future readiness	55	58	57	60	61

COMPETITIVENESS & DIGITAL RANKINGS

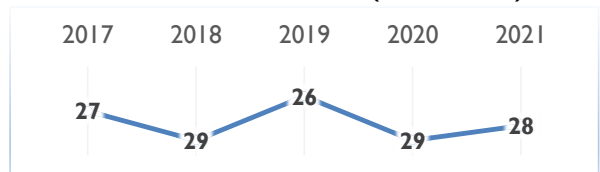


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	46	46	47	44	43
Training & education	43	48	43	45	47
Scientific concentration	46	51	45	44	42

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	35	Employee training	51	Total expenditure on R&D (%)	25	Total R&D personnel per capita	25	Female researchers	48	R&D productivity by publication	48
International experience	36	Total public expenditure on education	29	Total R&D personnel per capita	25	Female researchers	48	R&D productivity by publication	48	Scientific and technical employment	36
Foreign highly-skilled personnel	51	Higher education achievement	50	Female researchers	48	R&D productivity by publication	48	Scientific and technical employment	36	High-tech patent grants	38
Management of cities	44	▶ Pupil-teacher ratio (tertiary education)	21	R&D productivity by publication	48	Scientific and technical employment	36	High-tech patent grants	38	Robots in Education and R&D	29
▷ Digital/Technological skills	58	Graduates in Sciences	37	Scientific and technical employment	36	High-tech patent grants	38	Robots in Education and R&D	29		
▶ Net flow of international students	18	Women with degrees	40	High-tech patent grants	38	Robots in Education and R&D	29				

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	29	35	35	39	36
Capital	44	51	46	46	45
Technological framework	45	46	19	24	21

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	38	IT & media stock market capitalization	34	Communications technology	42	Mobile Broadband subscribers	14	Wireless broadband	54	Internet users	34
▶ Enforcing contracts	22	Funding for technological development	35	▶ Mobile Broadband subscribers	14	Wireless broadband	54	Internet users	34	▶ Internet bandwidth speed	4
Immigration laws	30	Banking and financial services	40	Wireless broadband	54	Internet users	34	▶ Internet bandwidth speed	4	High-tech exports (%)	22
Development & application of tech.	39	Country credit rating	47	Internet users	34	▶ Internet bandwidth speed	4	High-tech exports (%)	22		
Scientific research legislation	39	Venture capital	42	▶ Internet bandwidth speed	4	High-tech exports (%)	22				
Intellectual property rights	40	Investment in Telecommunications	28	High-tech exports (%)	22						

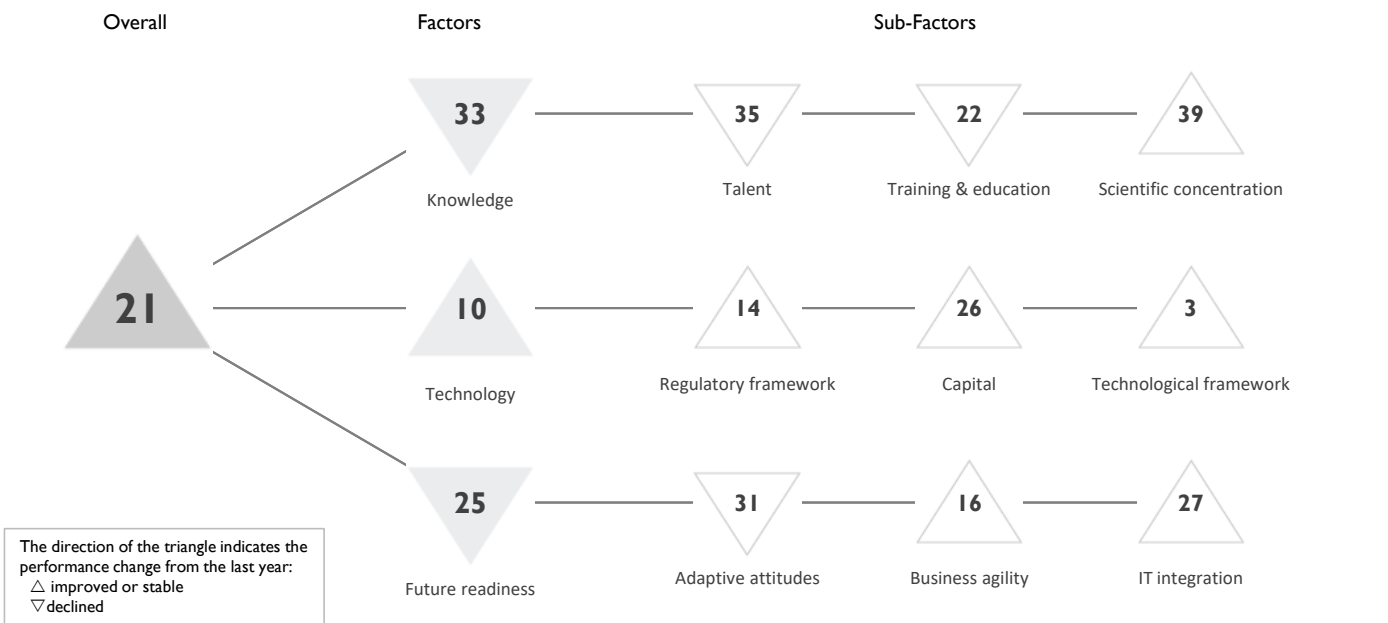
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	57	62	62	62	62
Business agility	58	56	53	59	62
IT integration	38	36	37	41	42

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	55	▶ Opportunities and threats	60	E-Government	44	Public-private partnerships	48	Cyber security	55	Software piracy	27
Internet retailing	39	World robots distribution	26	Public-private partnerships	48	Cyber security	55	Software piracy	27		
Tablet possession	51	▶ Agility of companies	59	Cyber security	55	Software piracy	27				
▷ Smartphone possession	59	Use of big data and analytics	57	Software piracy	27						
▷ Attitudes toward globalization	63	Knowledge transfer	45								
		Entrepreneurial fear of failure	32								

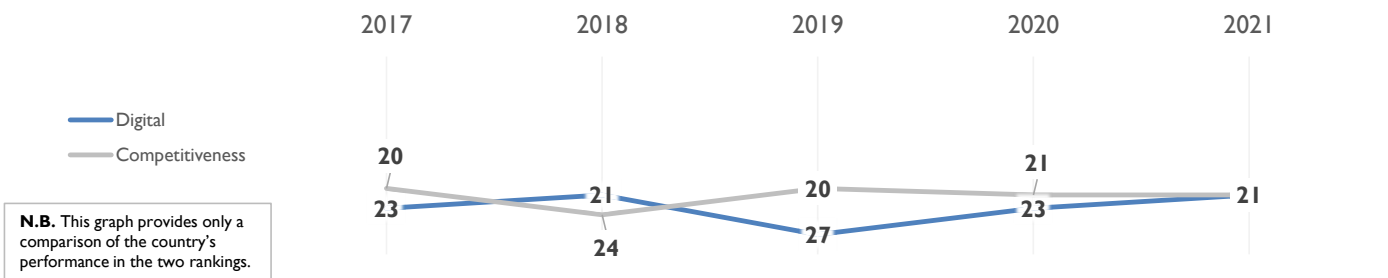
ICELAND

OVERALL PERFORMANCE (64 countries)



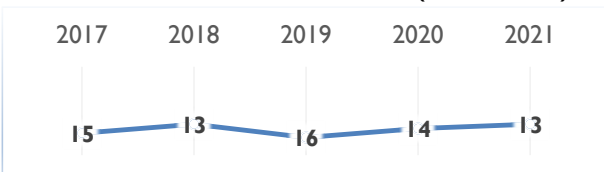
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	23	21	27	23	21
Knowledge	30	28	29	27	33
Technology	20	18	20	21	10
Future readiness	21	19	26	22	25

COMPETITIVENESS & DIGITAL RANKINGS

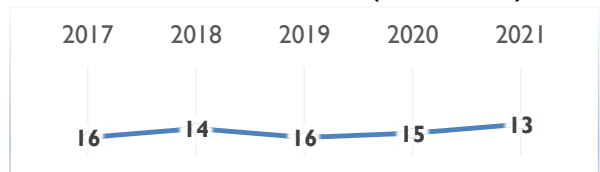


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	38	37	34	33	35
Training & education	7	18	18	15	22
Scientific concentration	37	35	39	46	39

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	25	Employee training	31	Total expenditure on R&D (%)	13	Total R&D personnel per capita	7	Female researchers	13	R&D productivity by publication	62
International experience	40	▶ Total public expenditure on education	4	Scientific and technical employment	12	High-tech patent grants	53	▶ Robots in Education and R&D	55		
Foreign highly-skilled personnel	37	Higher education achievement	26								
Management of cities	35	Pupil-teacher ratio (tertiary education)	38								
▶ Digital/Technological skills	4	▷ Graduates in Sciences	53								
▷ Net flow of international students	60	Women with degrees	8								

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	22	18	15	15	14
Capital	43	40	39	35	26
Technological framework	11	12	15	16	3

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	34	IT & media stock market capitalization	-	▶ Communications technology	4	Mobile Broadband subscribers	7	Wireless broadband	10	▶ Internet users	2
Enforcing contracts	26	Funding for technological development	23	Internet bandwidth speed	13	High-tech exports (%)	6				
Immigration laws	6	Banking and financial services	26								
Development & application of tech.	13	Country credit rating	33								
Scientific research legislation	20	Venture capital	35								
Intellectual property rights	16	Investment in Telecommunications	23								

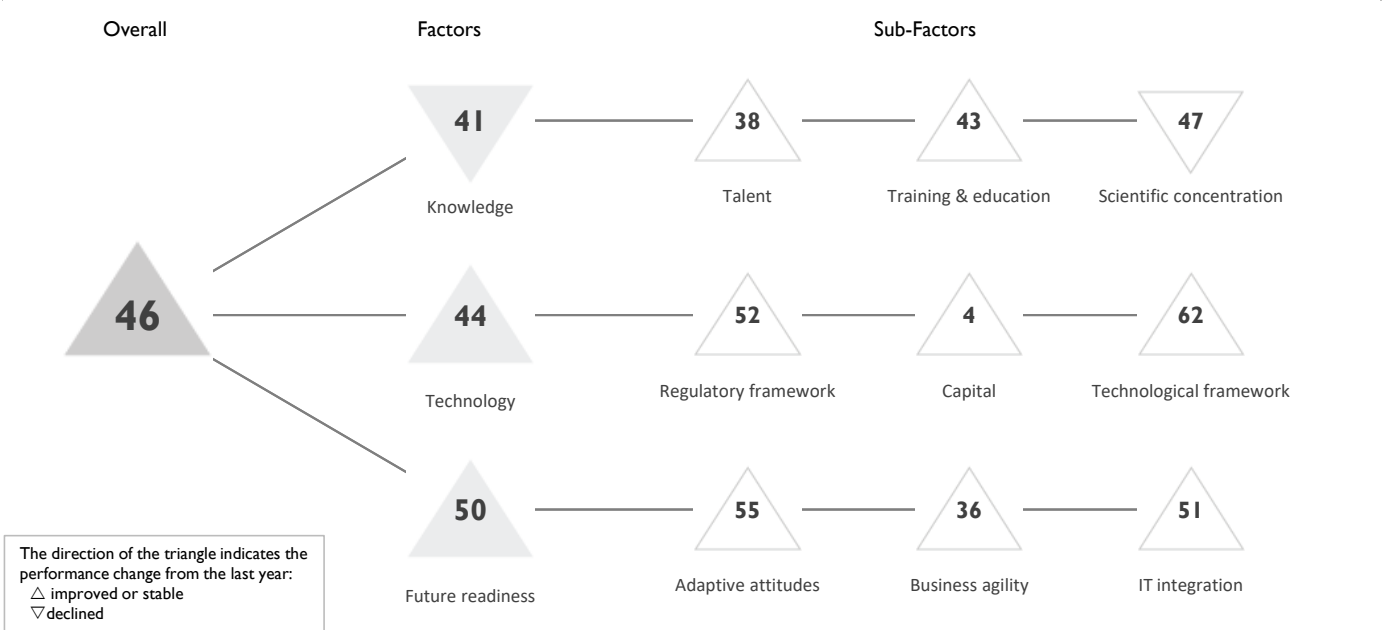
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	16	18	28	25	31
Business agility	10	11	24	19	16
IT integration	28	28	28	27	27

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	42	▶ Opportunities and threats	4	E-Government	12	Public-private partnerships	33	Cyber security	26	Software piracy	34
Internet retailing	35	▷ World robots distribution	56								
Tablet possession	-	Agility of companies	5								
Smartphone possession	-	Use of big data and analytics	20								
Attitudes toward globalization	10	Knowledge transfer	20								
		Entrepreneurial fear of failure	-								

INDIA

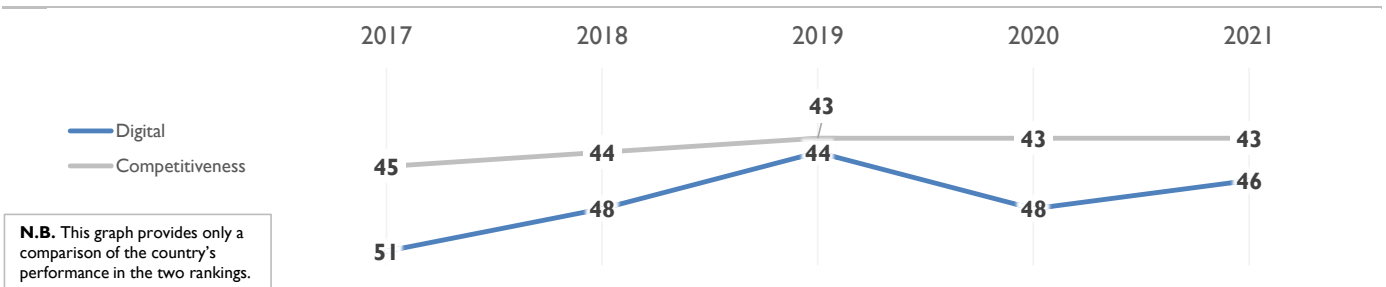
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

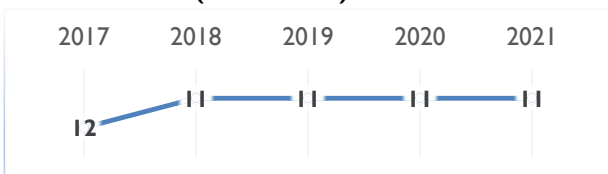
	2017	2018	2019	2020	2021
OVERALL	51	48	44	48	46
Knowledge	37	46	38	39	41
Technology	59	53	49	50	44
Future readiness	51	48	46	56	50

COMPETITIVENESS & DIGITAL RANKINGS

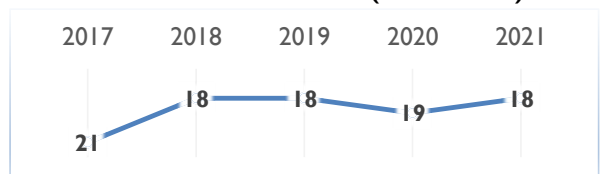


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	43	43	38	41	38
Training & education	57	59	47	51	43
Scientific concentration	6	26	28	29	47

Talent	Rank
Educational assessment PISA - Math	-
International experience	35
Foreign highly-skilled personnel	41
Management of cities	45
Digital/Technological skills	21
Net flow of international students	43

Training & education	Rank
Employee training	34
Total public expenditure on education	35
Higher education achievement	53
Pupil-teacher ratio (tertiary education)	57
▶ Graduates in Sciences	6
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	47
Total R&D personnel per capita	53
Female researchers	-
▶ R&D productivity by publication	2
▷ Scientific and technical employment	61
High-tech patent grants	49
Robots in Education and R&D	21

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	59	56	55	53	52
Capital	28	3	3	7	4
Technological framework	63	62	62	62	62

Regulatory framework	Rank
Starting a business	57
▷ Enforcing contracts	63
Immigration laws	42
Development & application of tech.	26
Scientific research legislation	24
Intellectual property rights	44

Capital	Rank
▶ IT & media stock market capitalization	12
Funding for technological development	29
Banking and financial services	25
Country credit rating	53
Venture capital	22
▶ Investment in Telecommunications	1

Technological framework	Rank
Communications technology	36
Mobile Broadband subscribers	45
▷ Wireless broadband	63
▷ Internet users	64
Internet bandwidth speed	52
High-tech exports (%)	40

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	59	54	54	55	55
Business agility	29	33	29	52	36
IT integration	56	56	56	55	51

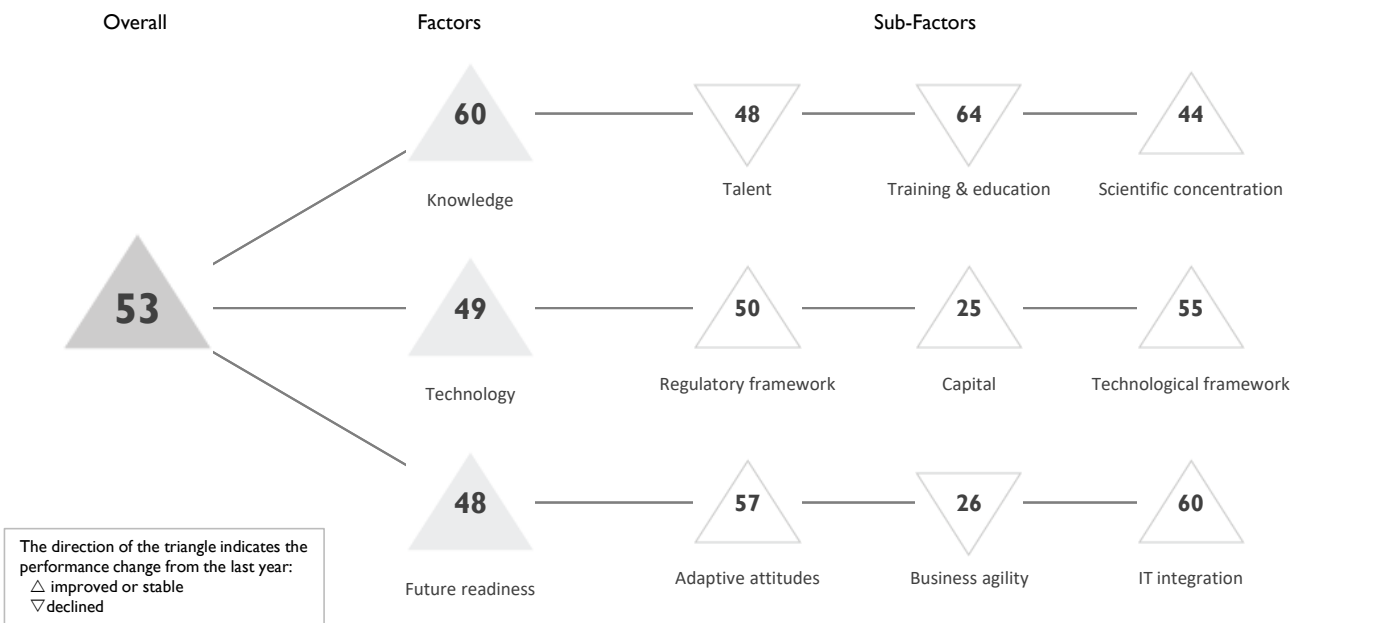
Adaptive attitudes	Rank
E-Participation	28
Internet retailing	57
▷ Tablet possession	60
Smartphone possession	52
Attitudes toward globalization	22

Business agility	Rank
Opportunities and threats	16
▶ World robots distribution	12
Agility of companies	24
Use of big data and analytics	15
Knowledge transfer	29
Entrepreneurial fear of failure	55

IT integration	Rank
E-Government	59
Public-private partnerships	23
Cyber security	32
Software piracy	48

INDONESIA

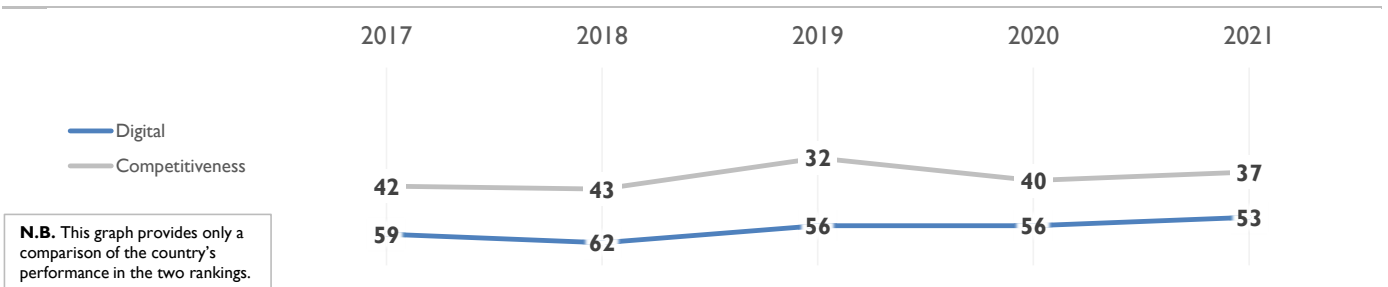
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

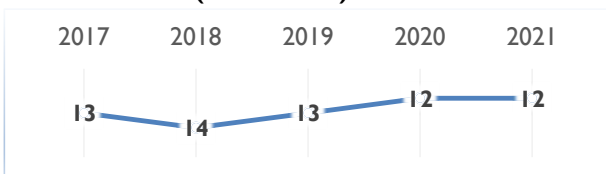
	2017	2018	2019	2020	2021
OVERALL	59	62	56	56	53
Knowledge	58	61	56	63	60
Technology	56	59	47	54	49
Future readiness	62	62	58	48	48

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	48	51	42	43	48
Training & education	59	61	61	63	64
Scientific concentration	54	58	52	51	44

Talent	Rank
Educational assessment PISA - Math	57
International experience	38
Foreign highly-skilled personnel	21
Management of cities	38
Digital/Technological skills	47
Net flow of international students	40

Training & education	Rank
Employee training	18
Total public expenditure on education	56
Higher education achievement	59
Pupil-teacher ratio (tertiary education)	58
Graduates in Sciences	50
Women with degrees	54

Scientific concentration	Rank
Total expenditure on R&D (%)	57
Total R&D personnel per capita	55
▶ Female researchers	15
▶ R&D productivity by publication	4
Scientific and technical employment	-
High-tech patent grants	58
Robots in Education and R&D	43

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	61	57	51	51	50
Capital	37	34	26	41	25
Technological framework	58	60	56	55	55

Regulatory framework	Rank
▷ Starting a business	60
Enforcing contracts	58
Immigration laws	28
Development & application of tech.	34
Scientific research legislation	42
Intellectual property rights	48

Capital	Rank
IT & media stock market capitalization	26
Funding for technological development	32
Banking and financial services	17
Country credit rating	45
Venture capital	20
▶ Investment in Telecommunications	11

Technological framework	Rank
Communications technology	46
Mobile Broadband subscribers	43
Wireless broadband	42
▷ Internet users	62
▷ Internet bandwidth speed	62
High-tech exports (%)	48

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	63	61	60	58	57
Business agility	35	46	21	24	26
IT integration	61	60	60	60	60

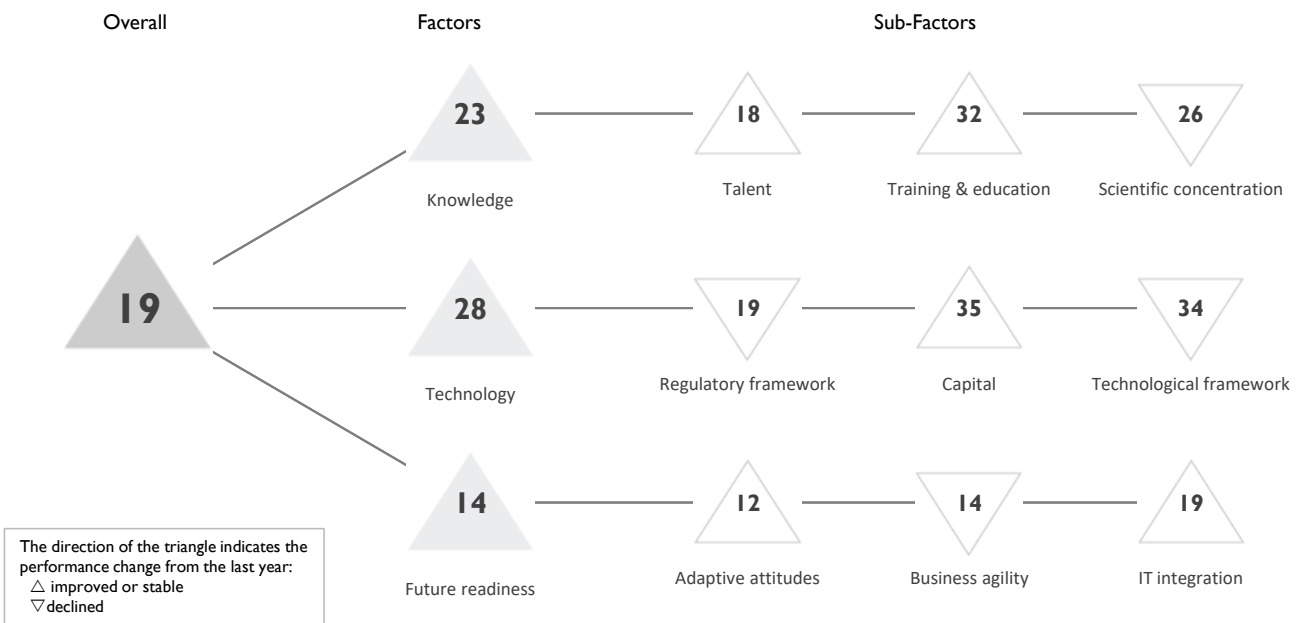
Adaptive attitudes	Rank
E-Participation	45
Internet retailing	48
▷ Tablet possession	59
Smartphone possession	54
▶ Attitudes toward globalization	13

Business agility	Rank
Opportunities and threats	26
World robots distribution	27
Agility of companies	22
Use of big data and analytics	32
Knowledge transfer	30
▶ Entrepreneurial fear of failure	17

IT integration	Rank
E-Government	57
Public-private partnerships	21
Cyber security	35
▷ Software piracy	62

IRELAND

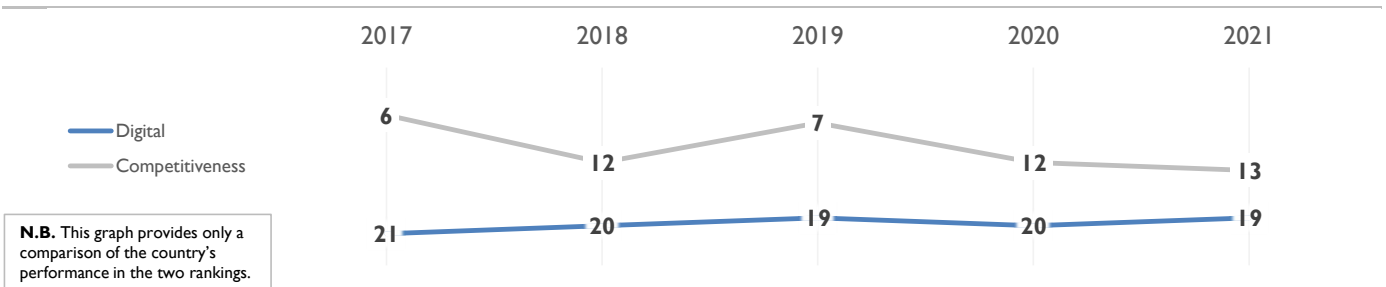
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

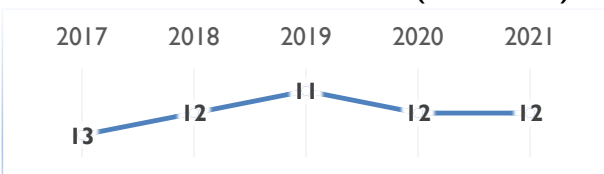
	2017	2018	2019	2020	2021
OVERALL	21	20	19	20	19
Knowledge	25	22	24	24	23
Technology	25	29	28	30	28
Future readiness	10	13	5	14	14

COMPETITIVENESS & DIGITAL RANKINGS

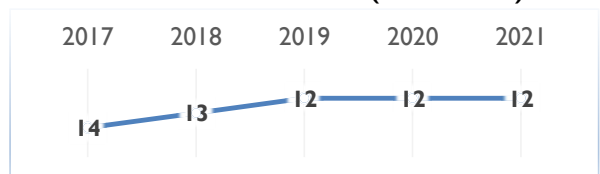


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	15	14	10	19	18
Training & education	34	34	30	35	32
Scientific concentration	31	24	29	25	26

Talent	Rank
Educational assessment PISA - Math	20
International experience	12
▶ Foreign highly-skilled personnel	9
Management of cities	31
Digital/Technological skills	23
Net flow of international students	21

Training & education	Rank
Employee training	15
▷ Total public expenditure on education	54
Higher education achievement	11
▷ Pupil-teacher ratio (tertiary education)	51
Graduates in Sciences	35
Women with degrees	15

Scientific concentration	Rank
Total expenditure on R&D (%)	32
Total R&D personnel per capita	17
Female researchers	31
R&D productivity by publication	41
Scientific and technical employment	17
High-tech patent grants	10
Robots in Education and R&D	37

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	14	20	13	14	19
Capital	49	53	49	45	35
Technological framework	13	13	24	30	34

Regulatory framework	Rank
Starting a business	12
▷ Enforcing contracts	48
▶ Immigration laws	9
Development & application of tech.	18
Scientific research legislation	10
Intellectual property rights	18

Capital	Rank
▷ IT & media stock market capitalization	58
Funding for technological development	14
Banking and financial services	30
Country credit rating	26
Venture capital	18
▷ Investment in Telecommunications	59

Technological framework	Rank
Communications technology	48
Mobile Broadband subscribers	40
Wireless broadband	34
Internet users	25
Internet bandwidth speed	36
High-tech exports (%)	11

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	12	10	3	12	12
Business agility	2	3	9	9	14
IT integration	24	24	20	25	19

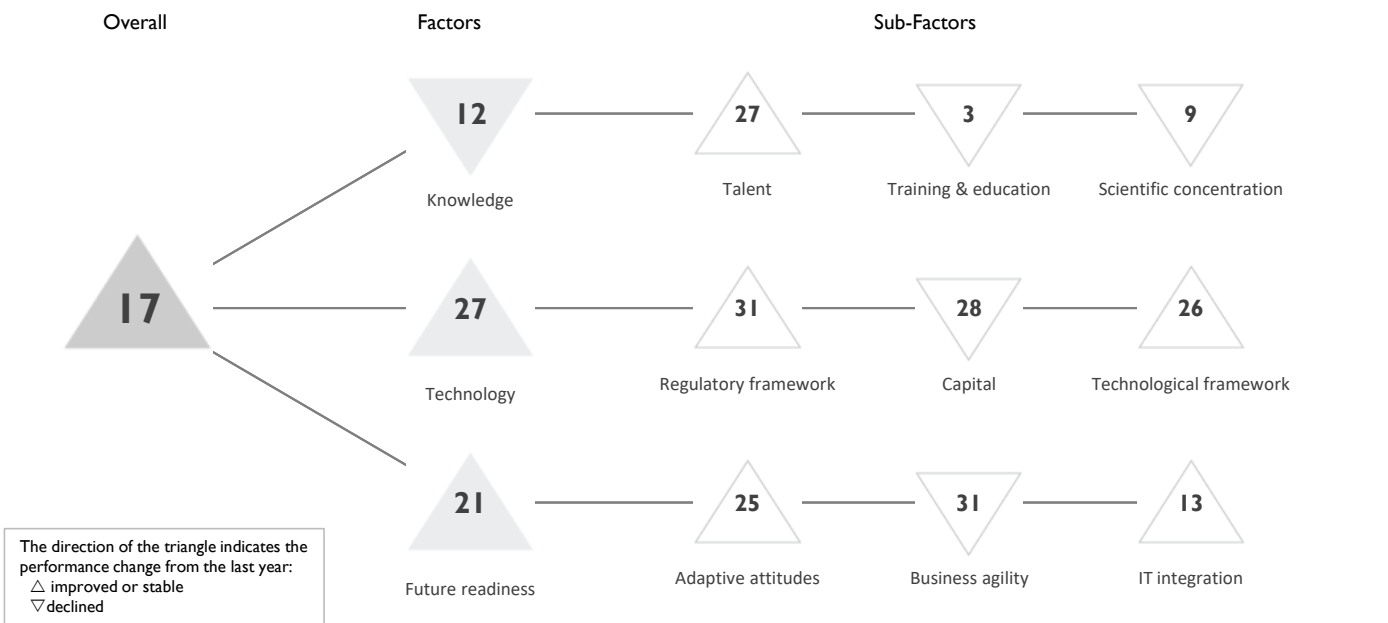
Adaptive attitudes	Rank
E-Participation	28
▶ Internet retailing	7
Tablet possession	16
Smartphone possession	10
▶ Attitudes toward globalization	8

Business agility	Rank
Opportunities and threats	10
World robots distribution	43
▶ Agility of companies	9
Use of big data and analytics	30
Knowledge transfer	16
Entrepreneurial fear of failure	12

IT integration	Rank
E-Government	25
Public-private partnerships	25
Cyber security	13
Software piracy	19

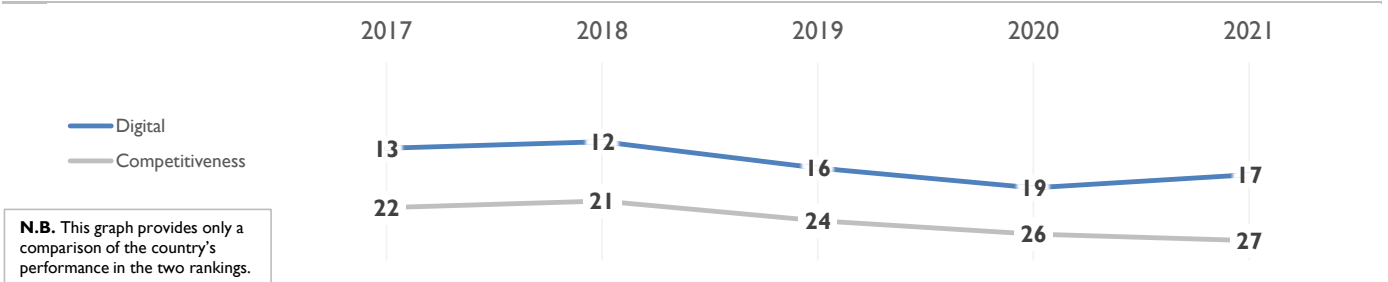
ISRAEL

OVERALL PERFORMANCE (64 countries)



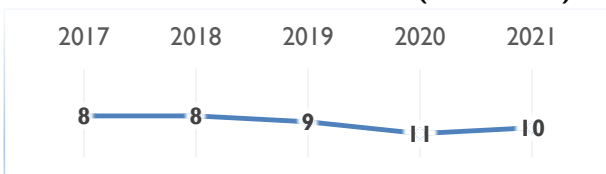
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	13	12	16	19	17
Knowledge	7	2	8	9	12
Technology	27	25	30	32	27
Future readiness	11	7	19	23	21

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	21	19	27	28	27
Training & education	11	2	3	1	3
Scientific concentration	2	2	5	3	9

Talent	Rank
Educational assessment PISA - Math	38
International experience	16
Foreign highly-skilled personnel	33
Management of cities	25
Digital/Technological skills	20
Net flow of international students	46

Training & education	Rank
Employee training	40
▶ Total public expenditure on education	3
Higher education achievement	27
Pupil-teacher ratio (tertiary education)	-
Graduates in Sciences	-
▶ Women with degrees	5

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	1
Total R&D personnel per capita	-
Female researchers	-
▷ R&D productivity by publication	52
▶ Scientific and technical employment	7
High-tech patent grants	16
Robots in Education and R&D	38

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	26	30	32	32	31
Capital	27	20	20	26	28
Technological framework	28	20	35	36	26

Regulatory framework	Rank
Starting a business	17
▷ Enforcing contracts	47
Immigration laws	46
Development & application of tech.	22
Scientific research legislation	11
Intellectual property rights	24

Capital	Rank
IT & media stock market capitalization	9
Funding for technological development	21
Banking and financial services	38
Country credit rating	25
Venture capital	24
▷ Investment in Telecommunications	56

Technological framework	Rank
Communications technology	46
Mobile Broadband subscribers	21
Wireless broadband	18
Internet users	37
Internet bandwidth speed	34
High-tech exports (%)	14

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	18	17	21	26	25
Business agility	9	2	19	29	31
IT integration	7	4	16	14	13

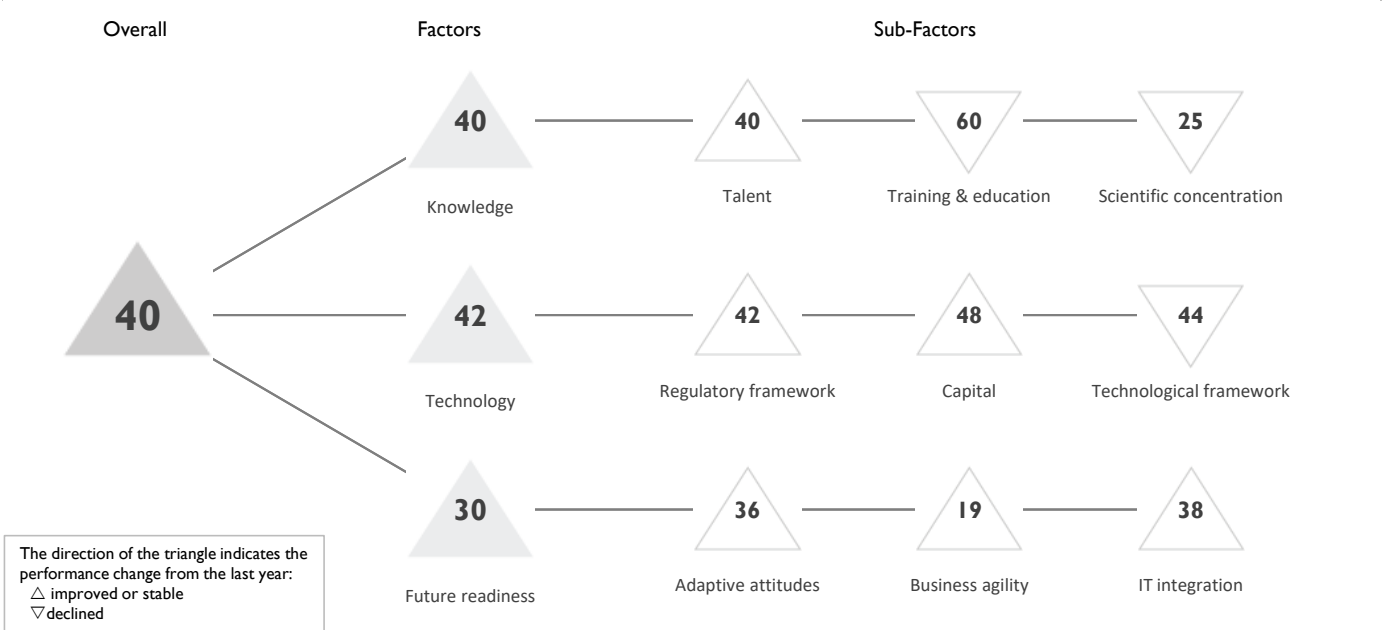
Adaptive attitudes	Rank
▷ E-Participation	51
Internet retailing	25
Tablet possession	19
Smartphone possession	13
Attitudes toward globalization	20

Business agility	Rank
Opportunities and threats	22
World robots distribution	39
Agility of companies	43
Use of big data and analytics	7
Knowledge transfer	7
▷ Entrepreneurial fear of failure	52

IT integration	Rank
E-Government	28
Public-private partnerships	16
▶ Cyber security	2
Software piracy	17

ITALY

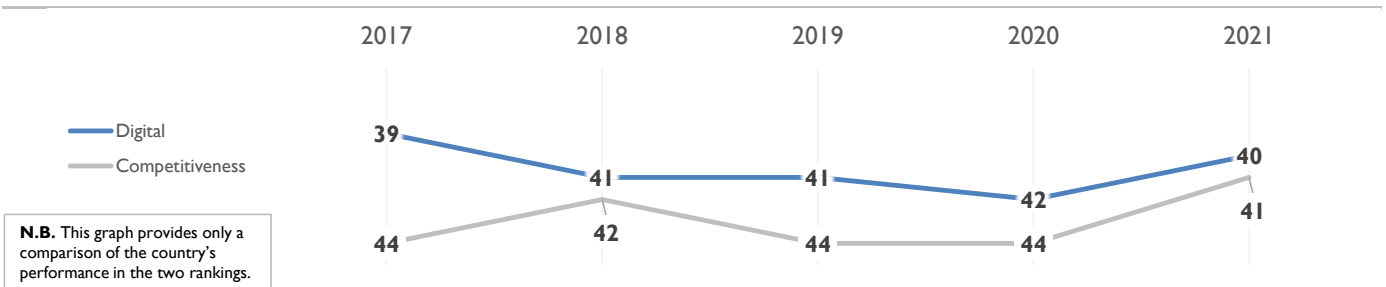
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

	2017	2018	2019	2020	2021
OVERALL	39	41	41	42	40
Knowledge	42	42	41	42	40
Technology	45	41	46	46	42
Future readiness	30	36	31	38	30

COMPETITIVENESS & DIGITAL RANKINGS

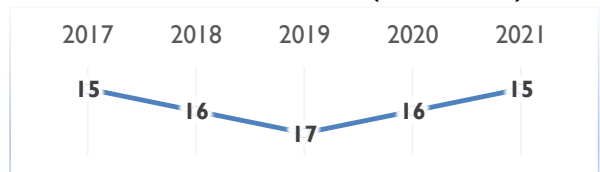


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	44	41	44	42	40
Training & education	46	56	57	58	60
Scientific concentration	32	28	23	22	25

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	30	▷ Employee training	53	Total expenditure on R&D (%)	26						
▷ International experience	51	Total public expenditure on education	45	Total R&D personnel per capita	24						
Foreign highly-skilled personnel	48	▷ Higher education achievement	52	Female researchers	37						
Management of cities	37	▷ Pupil-teacher ratio (tertiary education)	50	▶ R&D productivity by publication	9						
Digital/Technological skills	46	Graduates in Sciences	34	▶ Scientific and technical employment	14						
Net flow of international students	34	Women with degrees	48	High-tech patent grants	48						
				▶ Robots in Education and R&D	11						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	42	41	44	48	42
Capital	53	49	53	54	48
Technological framework	42	44	46	43	44

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	42	IT & media stock market capitalization	37	Communications technology	45						
▷ Enforcing contracts	56	Funding for technological development	44	Mobile Broadband subscribers	47						
Immigration laws	19	Banking and financial services	50	Wireless broadband	25						
Development & application of tech.	46	Country credit rating	50	Internet users	38						
Scientific research legislation	41	Venture capital	44	Internet bandwidth speed	43						
Intellectual property rights	25	Investment in Telecommunications	15	High-tech exports (%)	47						

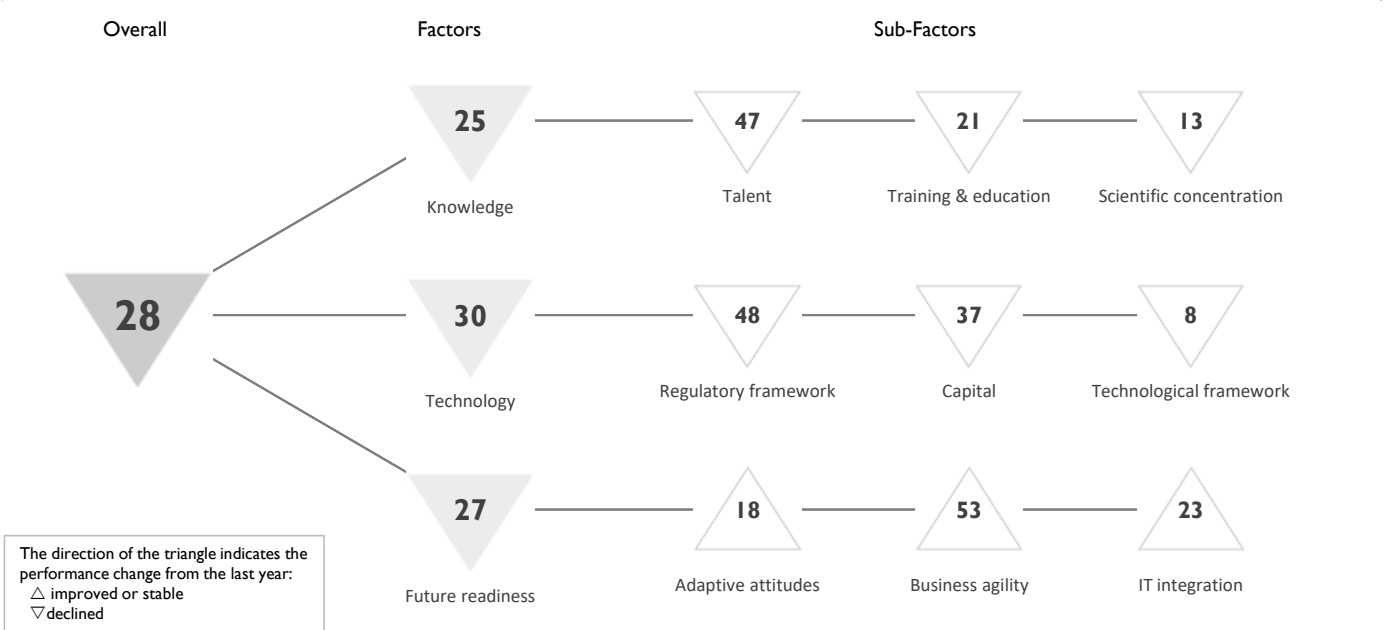
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	27	36	35	42	36
Business agility	30	32	31	23	19
IT integration	35	32	34	39	38

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	35	Opportunities and threats	29	E-Government	34						
Internet retailing	28	▶ World robots distribution	6	Public-private partnerships	43						
Tablet possession	42	Agility of companies	37	Cyber security	39						
Smartphone possession	49	Use of big data and analytics	50	Software piracy	33						
Attitudes toward globalization	41	Knowledge transfer	34								
		▶ Entrepreneurial fear of failure	5								

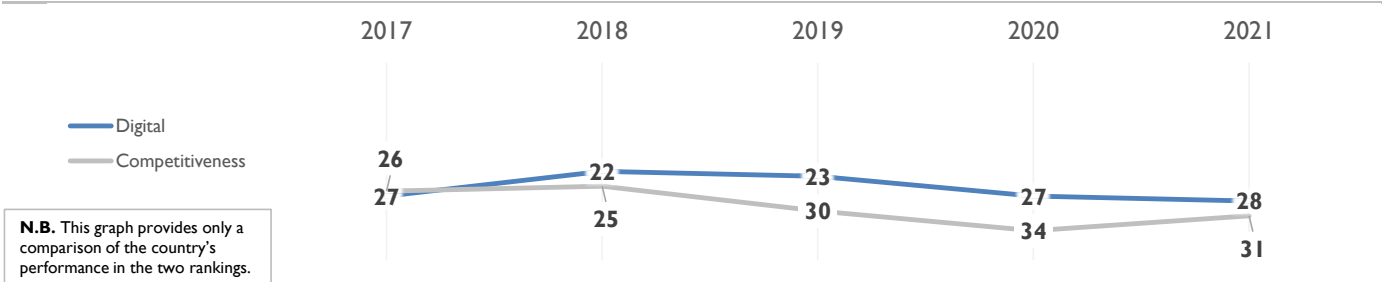
JAPAN

OVERALL PERFORMANCE (64 countries)



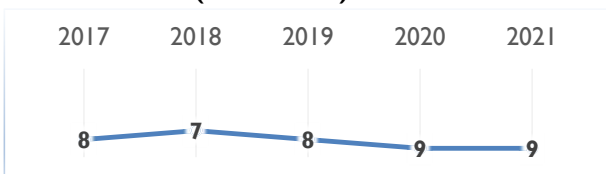
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	27	22	23	27	28
Knowledge	29	18	25	22	25
Technology	23	23	24	26	30
Future readiness	25	25	24	26	27

COMPETITIVENESS & DIGITAL RANKINGS

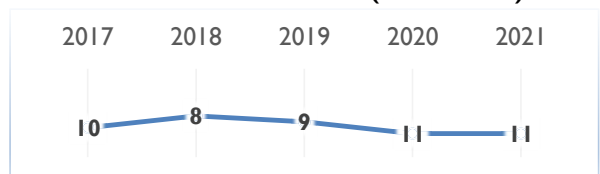


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	41	36	46	46	47
Training & education	31	14	19	18	21
Scientific concentration	16	12	11	11	13

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	5	Employee training	27	Total expenditure on R&D (%)	5						
▷ International experience	64	Total public expenditure on education	57	Total R&D personnel per capita	20						
Foreign highly-skilled personnel	49	Higher education achievement	8	Female researchers	55						
Management of cities	15	▶ Pupil-teacher ratio (tertiary education)	1	R&D productivity by publication	14						
▷ Digital/Technological skills	62	Graduates in Sciences	44	Scientific and technical employment	40						
Net flow of international students	26	Women with degrees	6	High-tech patent grants	5						
				▶ Robots in Education and R&D	4						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	37	40	42	44	48
Capital	33	33	37	33	37
Technological framework	6	4	2	5	8

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	44	IT & media stock market capitalization	10	Communications technology	37						
Enforcing contracts	36	Funding for technological development	36	Mobile Broadband subscribers	11						
Immigration laws	62	Banking and financial services	36	▶ Wireless broadband	2						
Development & application of tech.	49	Country credit rating	28	Internet users	14						
Scientific research legislation	47	Venture capital	36	Internet bandwidth speed	17						
Intellectual property rights	27	Investment in Telecommunications	53	High-tech exports (%)	24						

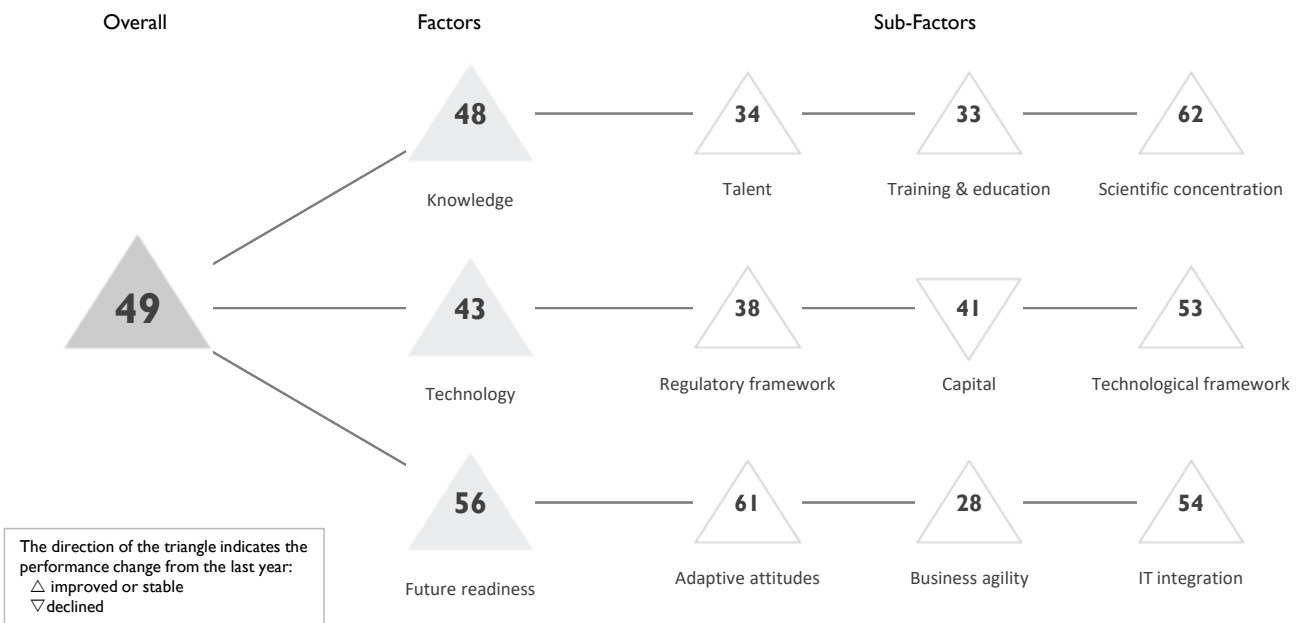
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	14	13	15	19	18
Business agility	57	55	41	56	53
IT integration	18	15	18	23	23

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	4	▷ Opportunities and threats	62	E-Government	14						
Internet retailing	15	▶ World robots distribution	2	Public-private partnerships	42						
Tablet possession	24	▷ Agility of companies	64	Cyber security	44						
Smartphone possession	21	▷ Use of big data and analytics	63	▶ Software piracy	2						
Attitudes toward globalization	46	Knowledge transfer	40								
		Entrepreneurial fear of failure	33								

JORDAN

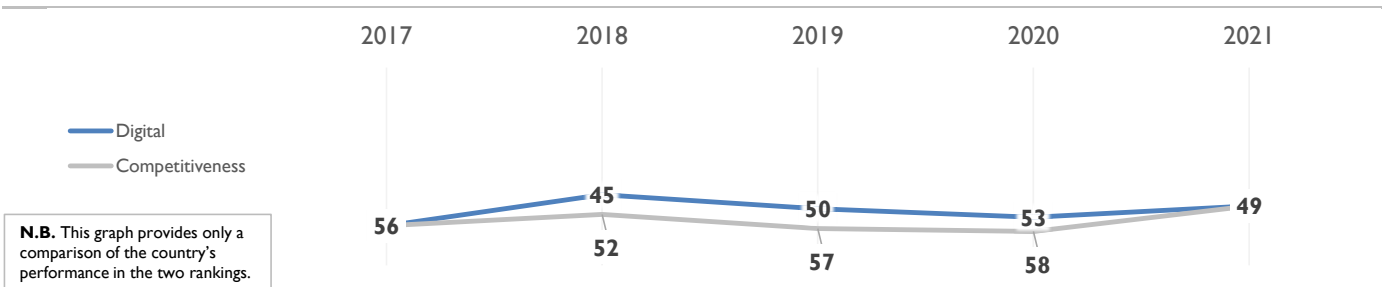
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

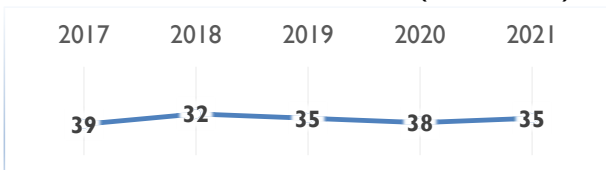
	2017	2018	2019	2020	2021
OVERALL	56	45	50	53	49
Knowledge	61	56	49	54	48
Technology	50	48	53	44	43
Future readiness	48	41	52	58	56

COMPETITIVENESS & DIGITAL RANKINGS

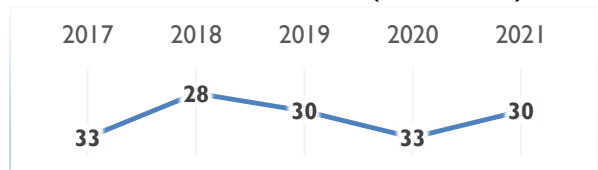


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	55	39	43	40	34
Training & education	58	41	32	33	33
Scientific concentration	62	63	63	63	62

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▶ Educational assessment PISA - Math	53	▶ Employee training	12	Total expenditure on R&D (%)	46	▶ International experience	13	▷ Total public expenditure on education	60	Total R&D personnel per capita	54
Foreign highly-skilled personnel	32	Higher education achievement	-	Female researchers	54	Management of cities	29	Pupil-teacher ratio (tertiary education)	23	R&D productivity by publication	55
Digital/Technological skills	18	Graduates in Sciences	22	Scientific and technical employment	43	Net flow of international students	20	Women with degrees	-	High-tech patent grants	51
				Robots in Education and R&D	-						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	53	43	47	42	38
Capital	30	39	41	38	41
Technological framework	53	54	55	53	53

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	50	IT & media stock market capitalization	48	Communications technology	35	Enforcing contracts	53	Funding for technological development	24	Mobile Broadband subscribers	44
Immigration laws	26	▶ Banking and financial services	18	Wireless broadband	52	Development & application of tech.	25	Country credit rating	59	Internet users	48
Scientific research legislation	27	Venture capital	21	Internet bandwidth speed	50	Intellectual property rights	31	Investment in Telecommunications	24	▷ High-tech exports (%)	61

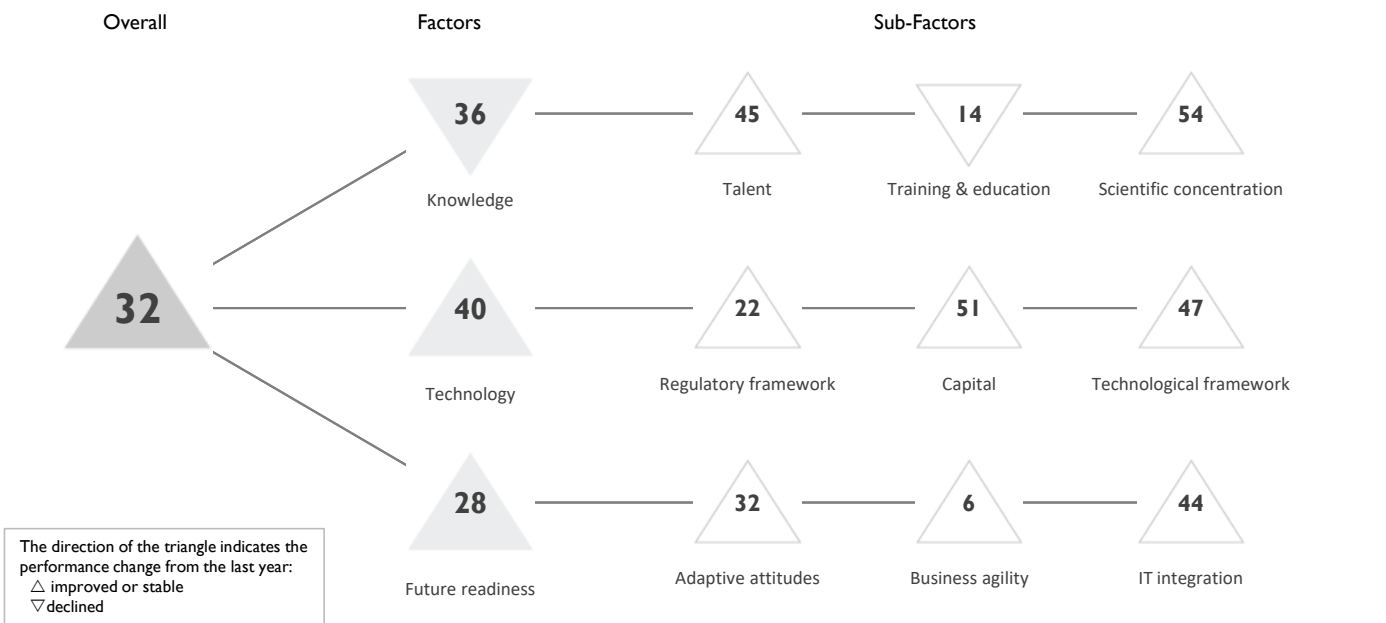
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	55	58	61	61	61
Business agility	34	23	22	37	28
IT integration	50	42	54	57	54

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
▷ E-Participation	61	Opportunities and threats	33	▷ E-Government	61	▷ Internet retailing	60	Public-private partnerships	27	▶ Cyber security	14
Tablet possession	54	World robots distribution	-	Software piracy	46	Smartphone possession	25	Agility of companies	27		
Attitudes toward globalization	34	▶ Use of big data and analytics	1					Knowledge transfer	22		
		Entrepreneurial fear of failure	51								

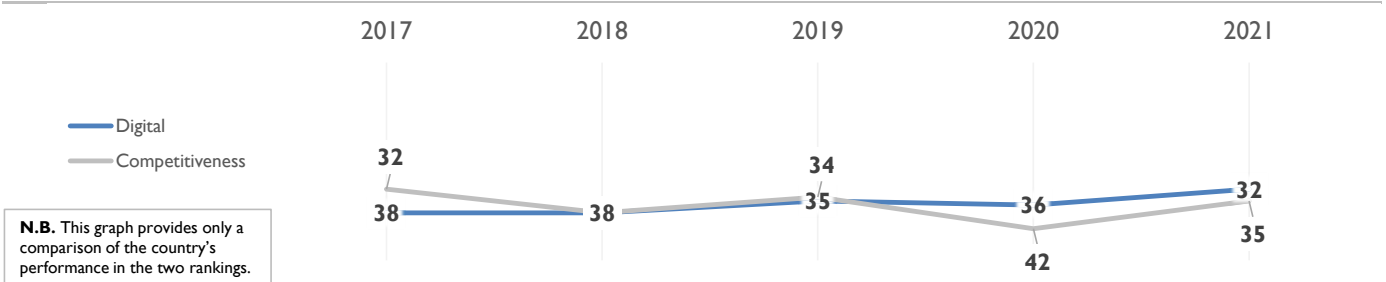
KAZAKHSTAN

OVERALL PERFORMANCE (64 countries)



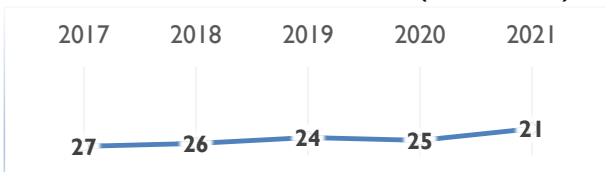
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	38	38	35	36	32
Knowledge	40	35	32	34	36
Technology	35	39	39	41	40
Future readiness	38	40	35	33	28

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



KAZAKHSTAN

- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	36	44	39	49	45
Training & education	21	6	1	4	14
Scientific concentration	56	55	55	54	54

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	47	Employee training	22	▷ Total expenditure on R&D (%)	60	Total R&D personnel per capita	49	▷ Female researchers	3	R&D productivity by publication	24
International experience	29	▷ Total public expenditure on education	62	▷ Scientific and technical employment	54	High-tech patent grants	57	Robots in Education and R&D	-		
Foreign highly-skilled personnel	25	▶ Higher education achievement	1								
Management of cities	32	Pupil-teacher ratio (tertiary education)	39								
Digital/Technological skills	50	Graduates in Sciences	31								
▷ Net flow of international students	59	▶ Women with degrees	3								

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	18	22	16	23	22
Capital	51	59	54	55	51
Technological framework	35	42	43	48	47

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	11	IT & media stock market capitalization	-	Communications technology	51	Mobile Broadband subscribers	49	Wireless broadband	56	Internet users	43
▶ Enforcing contracts	4	Funding for technological development	27	Internet bandwidth speed	54	High-tech exports (%)	9				
Immigration laws	24	Banking and financial services	41								
Development & application of tech.	33	Country credit rating	48								
Scientific research legislation	34	Venture capital	37								
Intellectual property rights	43	▷ Investment in Telecommunications	62								

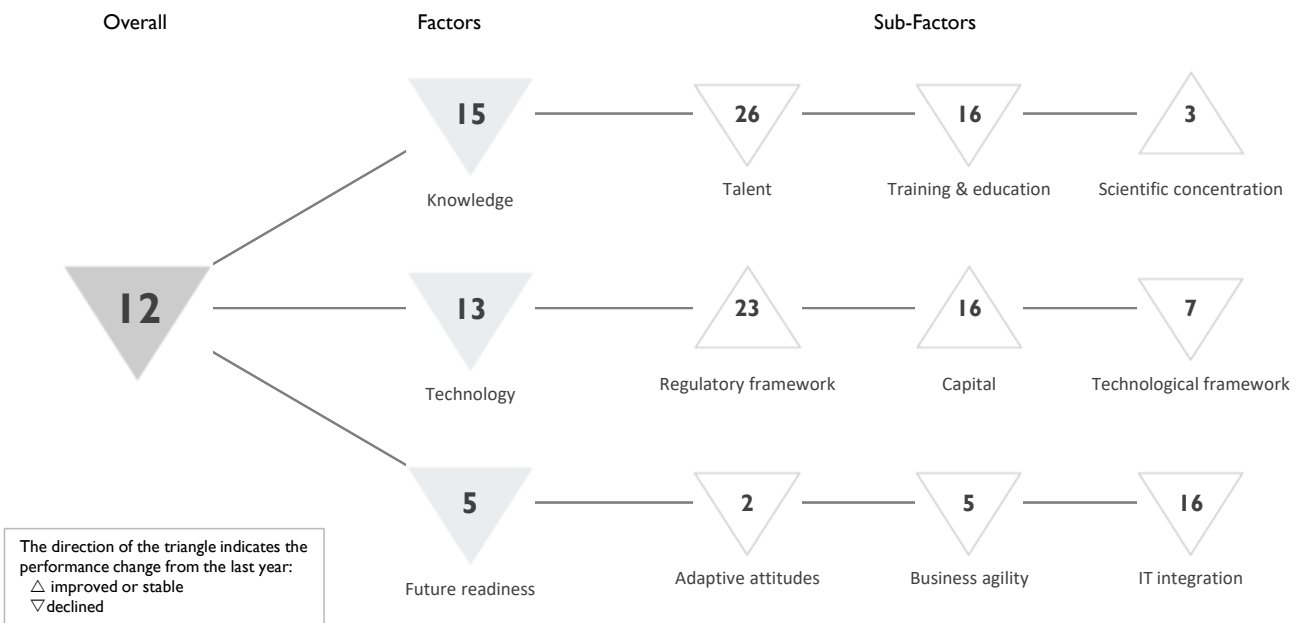
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	48	47	39	33	32
Business agility	27	43	15	13	6
IT integration	39	44	46	46	44

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	25	Opportunities and threats	27	E-Government	27	Public-private partnerships	28	Cyber security	43	▷ Software piracy	59
Internet retailing	49	World robots distribution	-								
Tablet possession	43	Agility of companies	30								
Smartphone possession	28	Use of big data and analytics	6								
Attitudes toward globalization	27	Knowledge transfer	32								
		▶ Entrepreneurial fear of failure	1								

KOREA REP.

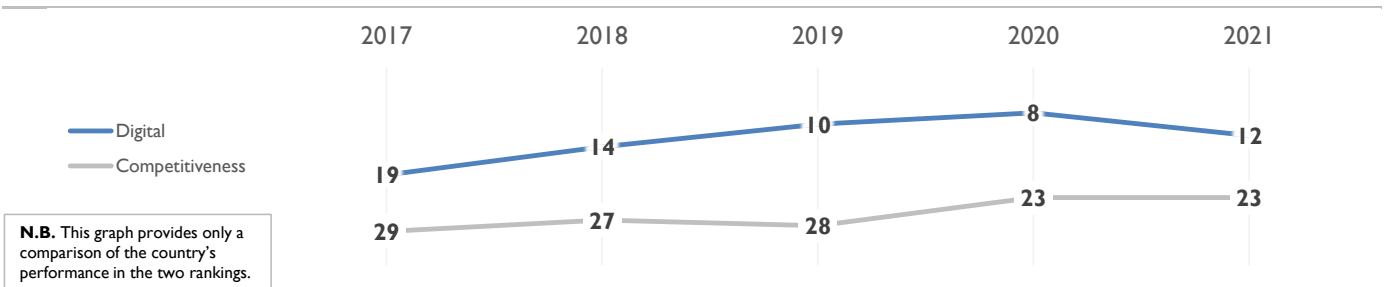
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

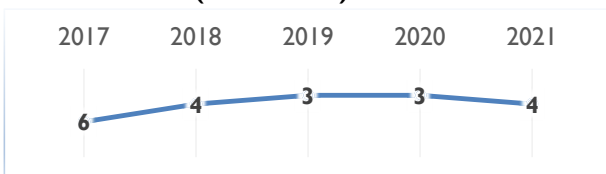
	2017	2018	2019	2020	2021
OVERALL	19	14	10	8	12
Knowledge	14	11	11	10	15
Technology	17	17	17	12	13
Future readiness	24	17	4	3	5

COMPETITIVENESS & DIGITAL RANKINGS

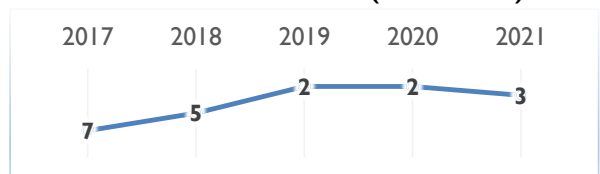


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	25	26	30	21	26
Training & education	13	8	5	11	16
Scientific concentration	9	7	6	4	3

Talent	Rank
Educational assessment PISA - Math	6
▷ International experience	52
▷ Foreign highly-skilled personnel	46
Management of cities	9
Digital/Technological skills	33
Net flow of international students	44

Training & education	Rank
Employee training	32
Total public expenditure on education	38
Higher education achievement	4
Pupil-teacher ratio (tertiary education)	33
Graduates in Sciences	11
Women with degrees	21

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	2
Total R&D personnel per capita	3
▷ Female researchers	53
R&D productivity by publication	27
Scientific and technical employment	33
High-tech patent grants	3
Robots in Education and R&D	12

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	28	27	26	26	23
Capital	41	44	29	25	16
Technological framework	2	2	7	3	7

Regulatory framework	Rank
Starting a business	19
▶ Enforcing contracts	2
Immigration laws	27
▷ Development & application of tech.	45
Scientific research legislation	30
Intellectual property rights	36

Capital	Rank
▶ IT & media stock market capitalization	2
Funding for technological development	34
Banking and financial services	42
Country credit rating	16
Venture capital	39
▷ Investment in Telecommunications	44

Technological framework	Rank
Communications technology	12
Mobile Broadband subscribers	10
Wireless broadband	21
Internet users	7
Internet bandwidth speed	12
High-tech exports (%)	7

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	10	3	4	1	2
Business agility	48	47	5	3	5
IT integration	23	20	21	15	16

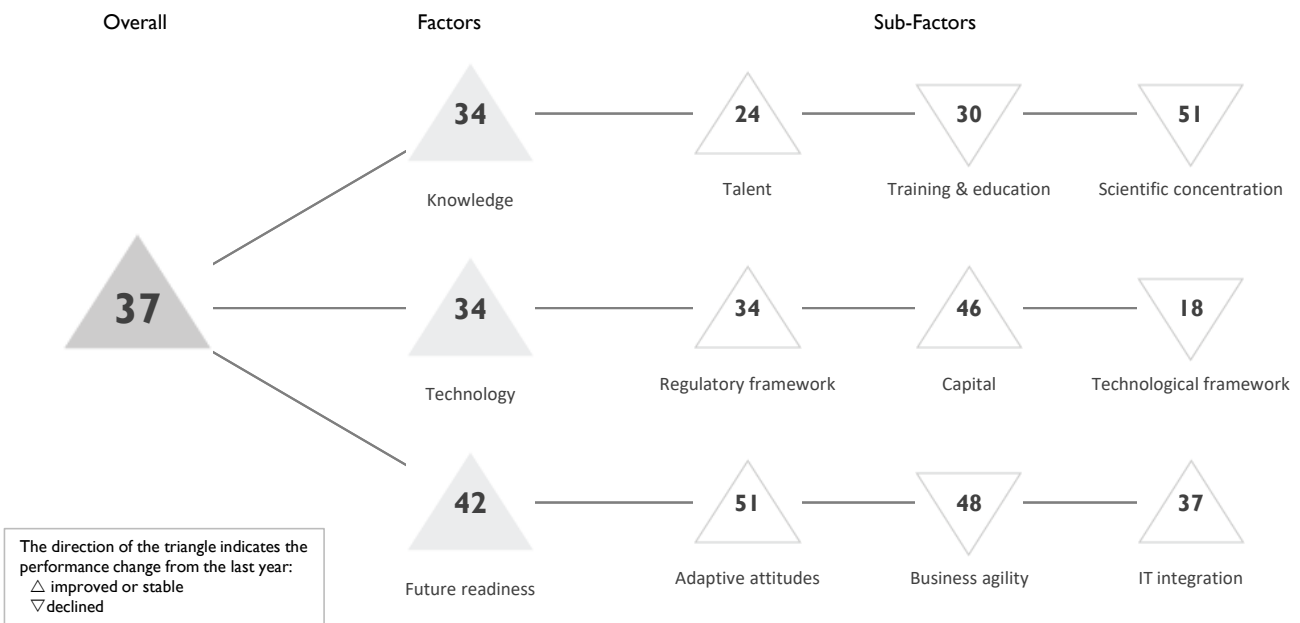
Adaptive attitudes	Rank
▶ E-Participation	1
▶ Internet retailing	2
Tablet possession	22
Smartphone possession	16
Attitudes toward globalization	17

Business agility	Rank
Opportunities and threats	20
World robots distribution	3
Agility of companies	18
Use of big data and analytics	26
Knowledge transfer	25
Entrepreneurial fear of failure	16

IT integration	Rank
E-Government	2
Public-private partnerships	38
Cyber security	23
Software piracy	20

LATVIA

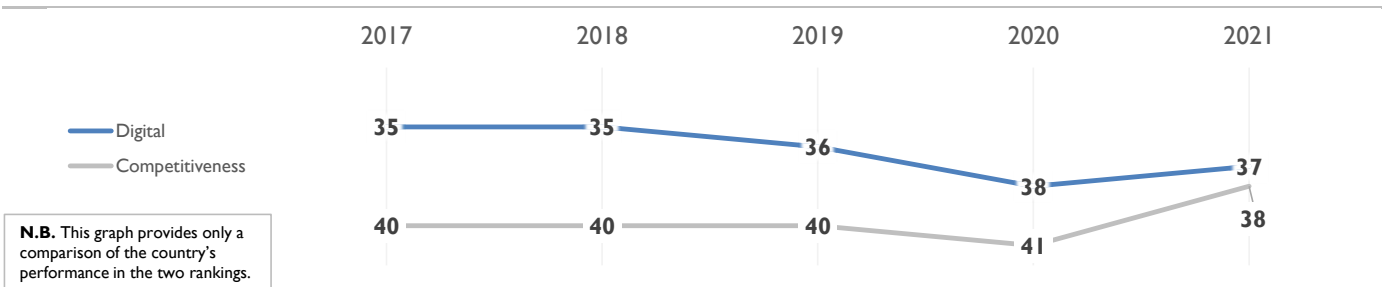
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

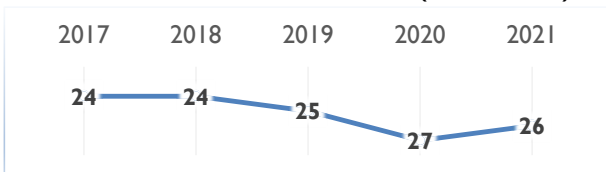
	2017	2018	2019	2020	2021
OVERALL	35	35	36	38	37
Knowledge	34	34	36	36	34
Technology	32	32	23	34	34
Future readiness	41	39	45	42	42

COMPETITIVENESS & DIGITAL RANKINGS

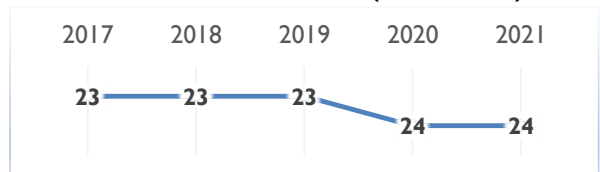


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	29	28	32	27	24
Training & education	20	28	27	27	30
Scientific concentration	47	46	47	49	51

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	23	Employee training	49	Total expenditure on R&D (%)	48	Total R&D personnel per capita	38	Female researchers	5	R&D productivity by publication	57
▶ International experience	14	▶ Total public expenditure on education	13	Higher education achievement	30	▶ Female researchers	5	▶ R&D productivity by publication	57	Scientific and technical employment	35
Foreign highly-skilled personnel	43	Higher education achievement	30	Pupil-teacher ratio (tertiary education)	18	▶ R&D productivity by publication	57	Scientific and technical employment	35	High-tech patent grants	33
Management of cities	40	Graduates in Sciences	48	Graduates in Sciences	48	Robots in Education and R&D	49	High-tech patent grants	33	Robots in Education and R&D	49
Digital/Technological skills	24	Women with degrees	25	Women with degrees	25						
Net flow of international students	25										

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	34	31	30	37	34
Capital	31	36	35	50	46
Technological framework	24	26	14	13	18

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	15	IT & media stock market capitalization	-	Communications technology	17	Mobile Broadband subscribers	19	Wireless broadband	15	Internet users	26
▶ Enforcing contracts	14	Funding for technological development	43	▶ Wireless broadband	15	Internet users	26	Internet bandwidth speed	24	High-tech exports (%)	23
▷ Immigration laws	57	▶ Banking and financial services	56	Internet bandwidth speed	24	High-tech exports (%)	23				
Development & application of tech.	35	Country credit rating	35								
Scientific research legislation	37	Venture capital	33								
Intellectual property rights	39	Investment in Telecommunications	50								

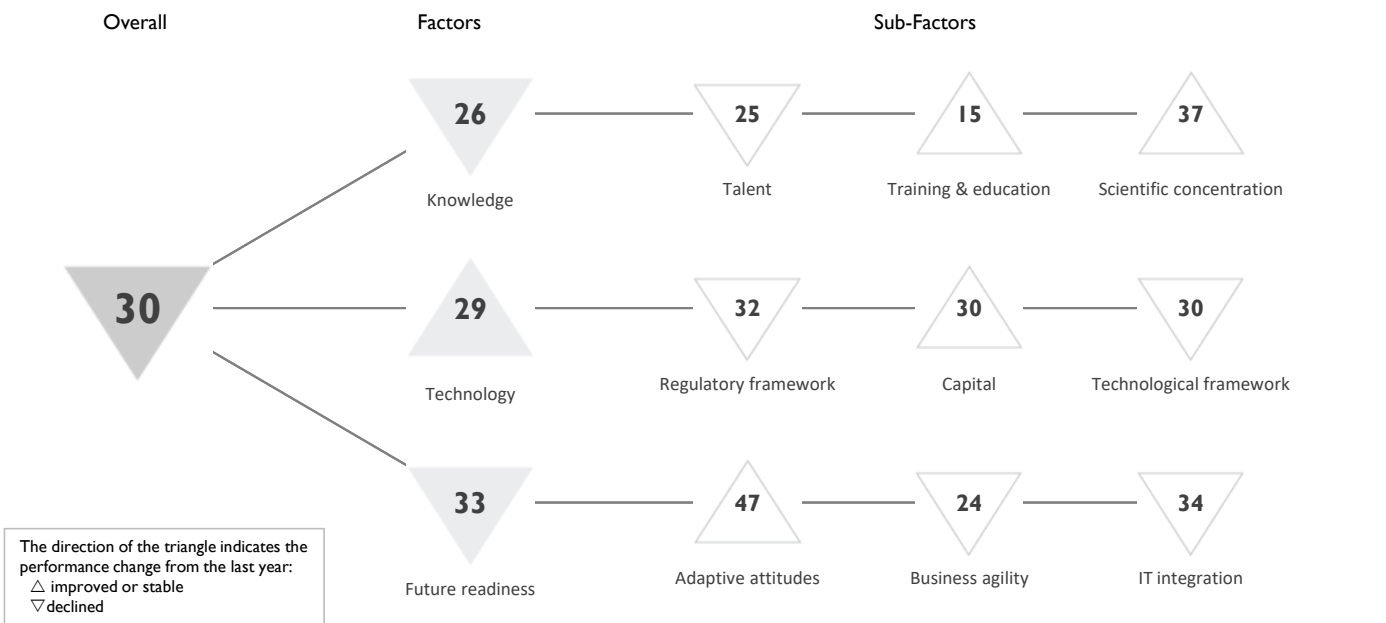
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	46	52	52	51	51
Business agility	41	41	47	45	48
IT integration	36	37	44	37	37

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
▷ E-Participation	59	Opportunities and threats	51	E-Government	43	Public-private partnerships	39	Cyber security	25	Software piracy	40
Internet retailing	34	▶ World robots distribution	54	Public-private partnerships	39	Cyber security	25	Software piracy	40		
Tablet possession	27	Agility of companies	39								
Smartphone possession	47	Use of big data and analytics	25								
Attitudes toward globalization	52	Knowledge transfer	39								
		Entrepreneurial fear of failure	42								

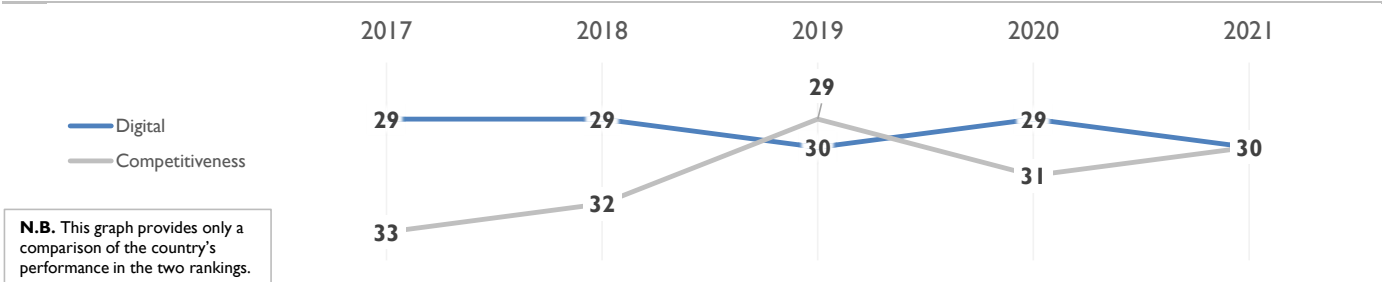
LITHUANIA

OVERALL PERFORMANCE (64 countries)



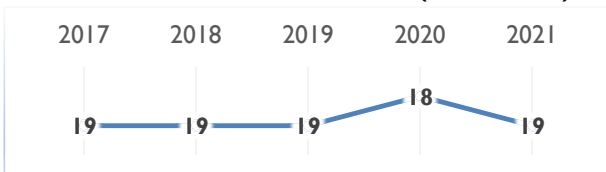
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	29	29	30	29	30
Knowledge	21	23	26	25	26
Technology	29	30	25	29	29
Future readiness	31	33	32	30	33

COMPETITIVENESS & DIGITAL RANKINGS

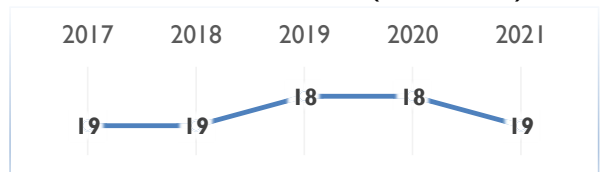


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	33	27	23	23	25
Training & education	6	16	13	16	15
Scientific concentration	28	31	41	40	37

Talent	Rank
Educational assessment PISA - Math	34
International experience	22
Foreign highly-skilled personnel	35
Management of cities	36
▶ Digital/Technological skills	5
▷ Net flow of international students	56

Training & education	Rank
Employee training	26
Total public expenditure on education	33
Higher education achievement	12
Pupil-teacher ratio (tertiary education)	12
Graduates in Sciences	20
Women with degrees	16

Scientific concentration	Rank
Total expenditure on R&D (%)	41
Total R&D personnel per capita	31
Female researchers	9
▷ R&D productivity by publication	54
Scientific and technical employment	28
High-tech patent grants	29
Robots in Education and R&D	48

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	27	28	24	27	32
Capital	42	35	36	42	30
Technological framework	17	22	21	18	30

Regulatory framework	Rank
Starting a business	20
▶ Enforcing contracts	7
▷ Immigration laws	55
Development & application of tech.	32
Scientific research legislation	36
Intellectual property rights	38

Capital	Rank
▶ IT & media stock market capitalization	6
Funding for technological development	30
Banking and financial services	46
Country credit rating	31
Venture capital	34
▷ Investment in Telecommunications	61

Technological framework	Rank
Communications technology	9
Mobile Broadband subscribers	48
Wireless broadband	17
Internet users	30
Internet bandwidth speed	21
High-tech exports (%)	34

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	35	41	45	47	47
Business agility	28	24	18	18	24
IT integration	29	31	32	32	34

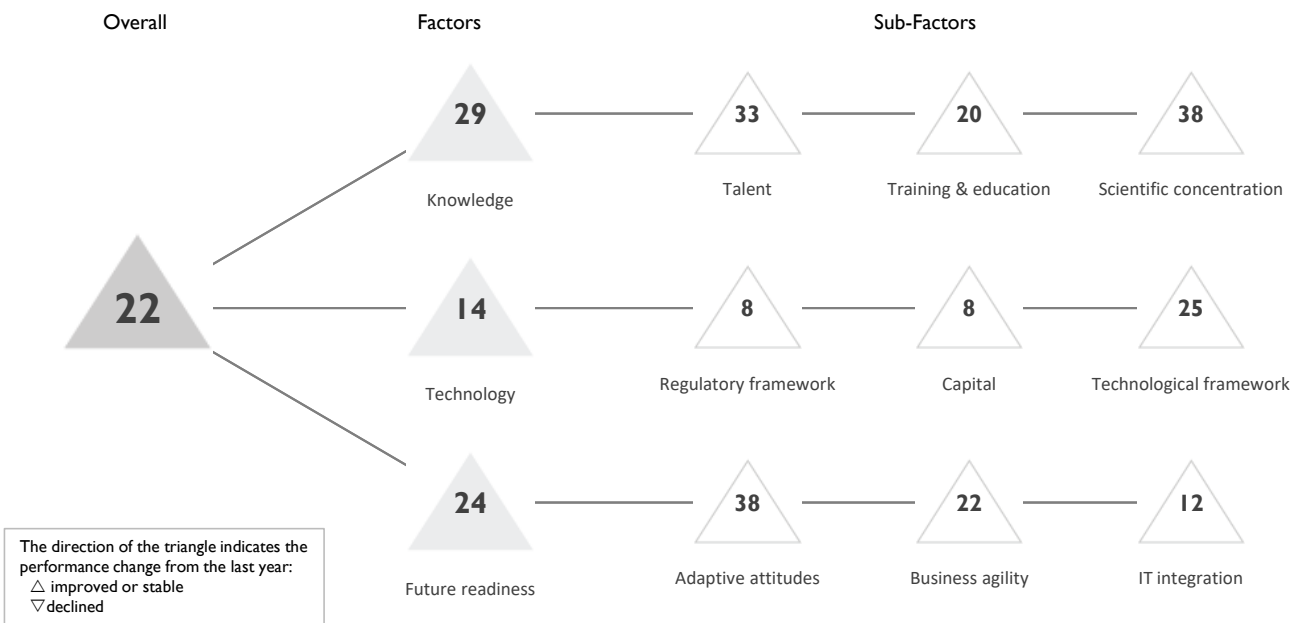
Adaptive attitudes	Rank
E-Participation	49
Internet retailing	30
Tablet possession	35
▷ Smartphone possession	53
Attitudes toward globalization	39

Business agility	Rank
▶ Opportunities and threats	2
World robots distribution	46
▶ Agility of companies	8
Use of big data and analytics	24
Knowledge transfer	42
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	20
Public-private partnerships	40
Cyber security	33
Software piracy	43

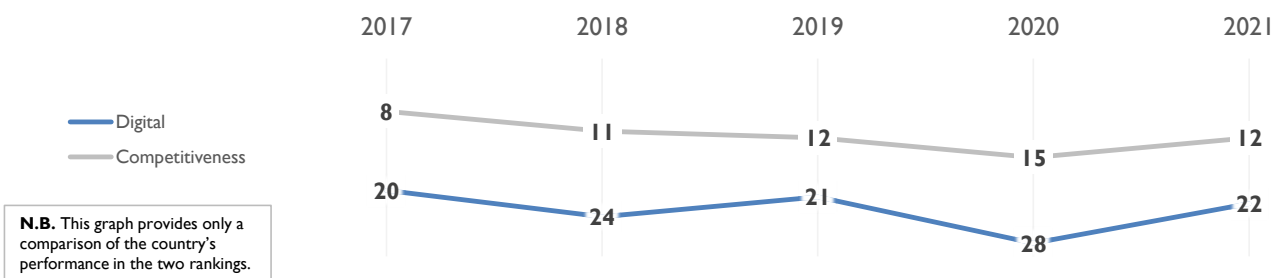
LUXEMBOURG

OVERALL PERFORMANCE (64 countries)



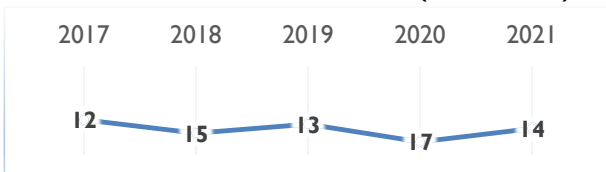
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	20	24	21	28	22
Knowledge	27	32	34	35	29
Technology	12	15	12	17	14
Future readiness	23	21	17	27	24

COMPETITIVENESS & DIGITAL RANKINGS

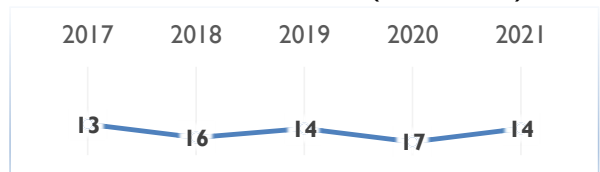


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	31	33	31	39	33
Training & education	30	26	24	23	20
Scientific concentration	23	44	42	41	38

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	32	Employee training	11	Total expenditure on R&D (%)	34
International experience	6	Total public expenditure on education	32	▶ Total R&D personnel per capita	5
Foreign highly-skilled personnel	5	Higher education achievement	13	Female researchers	47
Management of cities	12	Pupil-teacher ratio (tertiary education)	8	▷ R&D productivity by publication	61
Digital/Technological skills	22	Graduates in Sciences	52	Scientific and technical employment	22
▷ Net flow of international students	61	Women with degrees	9	High-tech patent grants	21
				Robots in Education and R&D	-

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	10	9	4	8	8
Capital	3	4	9	15	8
Technological framework	32	35	34	35	25

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	35	▶ IT & media stock market capitalization	3	Communications technology	14
Enforcing contracts	17	Funding for technological development	13	▷ Mobile Broadband subscribers	53
▶ Immigration laws	2	Banking and financial services	20	Wireless broadband	28
Development & application of tech.	14	▶ Country credit rating	1	Internet users	6
Scientific research legislation	9	Venture capital	18	Internet bandwidth speed	6
Intellectual property rights	13	▷ Investment in Telecommunications	63	High-tech exports (%)	53

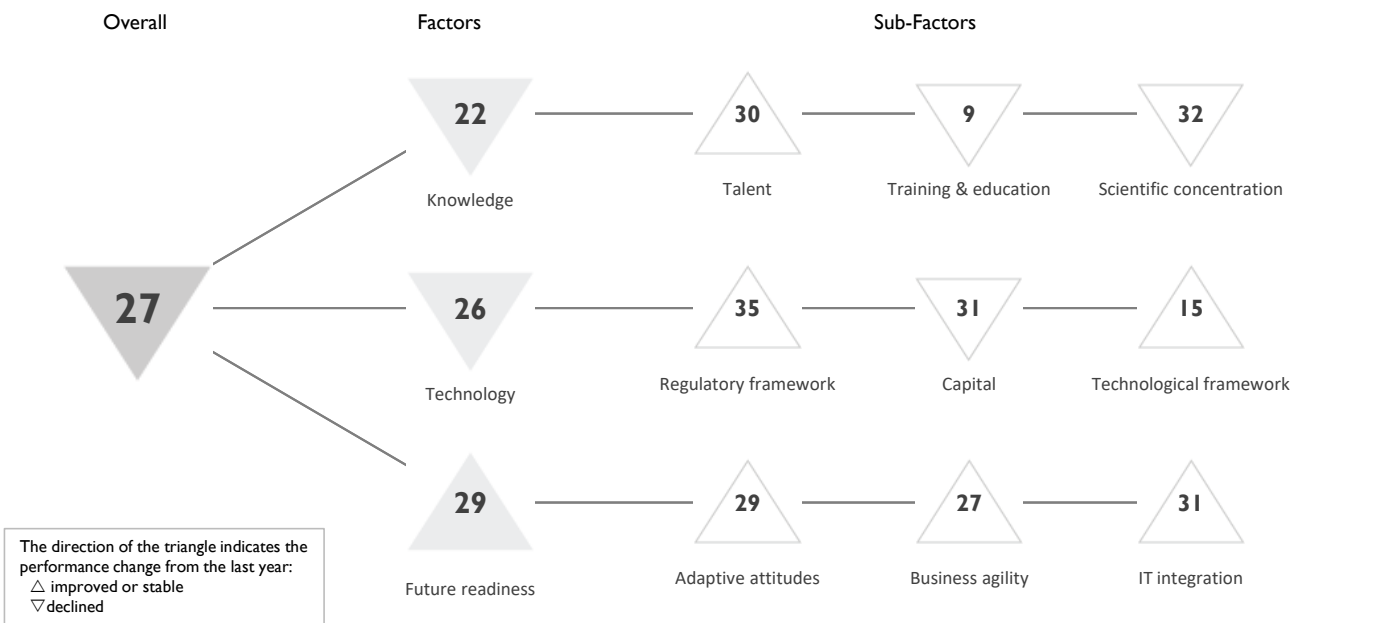
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	33	29	22	48	38
Business agility	16	17	20	34	22
IT integration	5	13	6	16	12

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
▷ E-Participation	53	Opportunities and threats	13	E-Government	30
Internet retailing	-	World robots distribution	-	Public-private partnerships	14
Tablet possession	-	Agility of companies	11	Cyber security	9
Smartphone possession	-	Use of big data and analytics	21	▶ Software piracy	4
Attitudes toward globalization	26	Knowledge transfer	18		
		Entrepreneurial fear of failure	40		

MALAYSIA

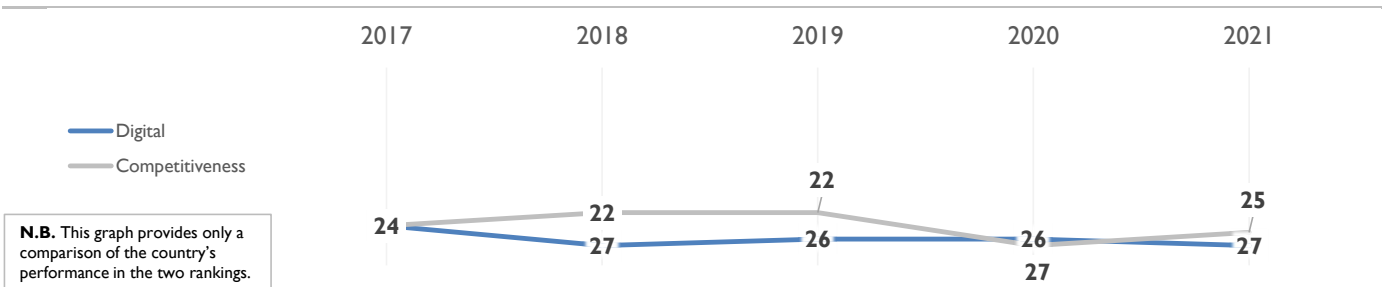
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

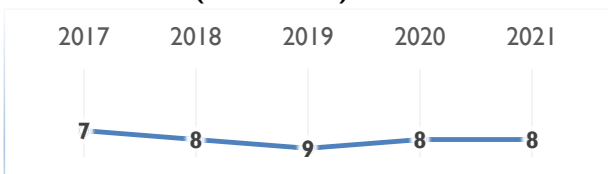
	2017	2018	2019	2020	2021
OVERALL	24	27	26	26	27
Knowledge	17	17	19	19	22
Technology	18	22	19	20	26
Future readiness	27	29	28	32	29

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	27	24	22	30	30
Training & education	3	10	11	8	9
Scientific concentration	26	30	27	26	32

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▷	Educational assessment PISA - Math	43		Employee training	25			Total expenditure on R&D (%)	40		
	International experience	30		Total public expenditure on education	40			Total R&D personnel per capita	39		
	Foreign highly-skilled personnel	23		Higher education achievement	41		▶	Female researchers	7		
	Management of cities	23		Pupil-teacher ratio (tertiary education)	28		▷	R&D productivity by publication	19		
	Digital/Technological skills	28		▶	Graduates in Sciences	2		Scientific and technical employment	47		
	Net flow of international students	27		▶	Women with degrees	4		High-tech patent grants	32		
								Robots in Education and R&D	26		

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	30	29	29	35	35
Capital	9	12	14	18	31
Technological framework	19	32	20	15	15

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
▷	Starting a business	52		IT & media stock market capitalization	25			Communications technology	43		
	Enforcing contracts	28		Funding for technological development	28			Mobile Broadband subscribers	26		
	Immigration laws	41		Banking and financial services	27			Wireless broadband	20		
	Development & application of tech.	23		Country credit rating	40			Internet users	40		
	Scientific research legislation	26		Venture capital	28			Internet bandwidth speed	35		
	Intellectual property rights	28		Investment in Telecommunications	26		▶	High-tech exports (%)	4		

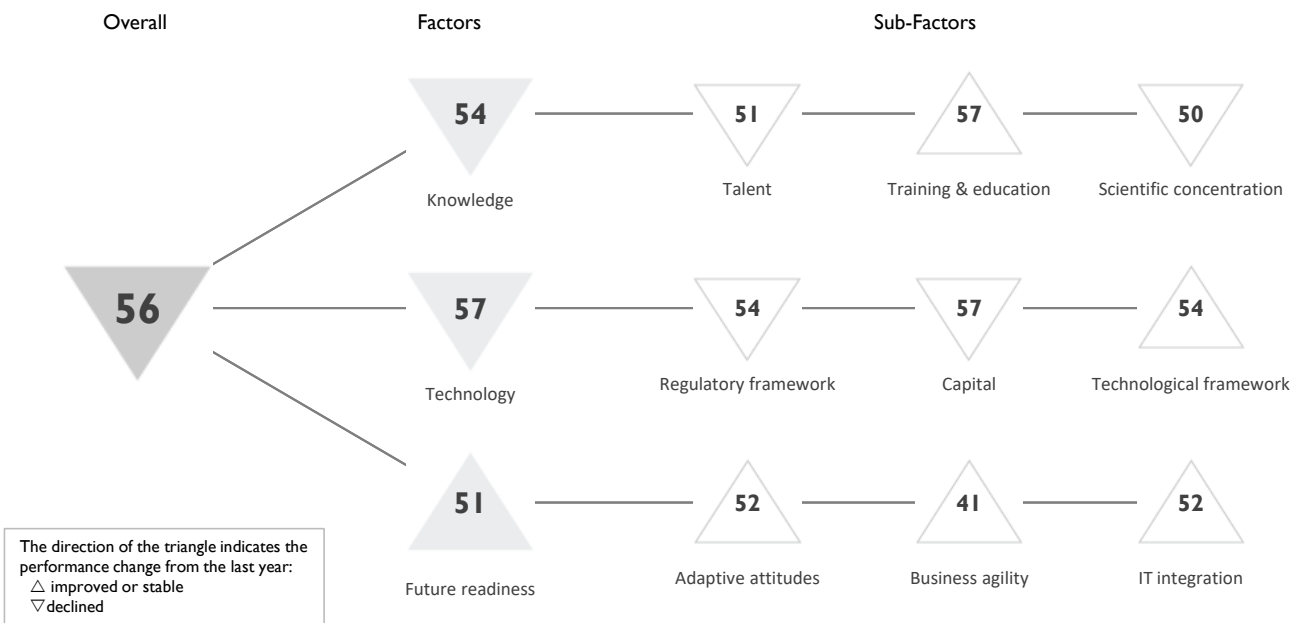
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	28	30	30	30	29
Business agility	12	15	17	30	27
IT integration	34	35	33	33	31

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
	E-Participation	28		Opportunities and threats	23			E-Government	41		
▷	Internet retailing	47		World robots distribution	22		▶	Public-private partnerships	17		
	Tablet possession	28		Agility of companies	28			Cyber security	27		
	Smartphone possession	26		Use of big data and analytics	22		▷	Software piracy	45		
	Attitudes toward globalization	18		Knowledge transfer	26						
				Entrepreneurial fear of failure	37						

MEXICO

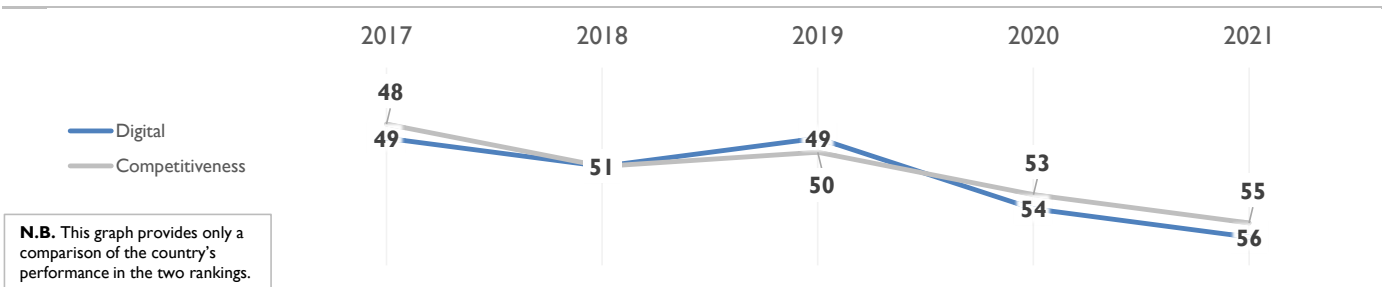
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

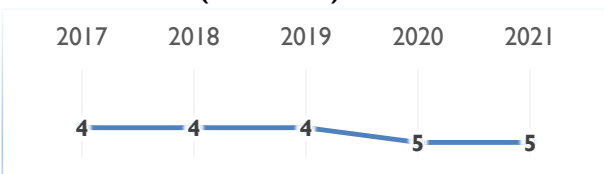
	2017	2018	2019	2020	2021
OVERALL	49	51	49	54	56
Knowledge	54	54	52	52	54
Technology	48	46	52	56	57
Future readiness	50	50	49	52	51

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	53	52	55	45	51
Training & education	44	51	53	57	57
Scientific concentration	57	53	40	43	50

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	51	Employee training	47	Total expenditure on R&D (%)	55						
▶ International experience	17	▷ Total public expenditure on education	58	Total R&D personnel per capita	52						
Foreign highly-skilled personnel	40	Higher education achievement	55	Female researchers	40						
Management of cities	53	▶ Pupil-teacher ratio (tertiary education)	17	▶ R&D productivity by publication	7						
Digital/Technological skills	51	Graduates in Sciences	28	Scientific and technical employment	49						
Net flow of international students	41	Women with degrees	53	High-tech patent grants	50						
				▶ Robots in Education and R&D	13						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	39	45	48	50	54
Capital	45	42	47	53	57
Technological framework	52	50	53	54	54

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	45	IT & media stock market capitalization	19	Communications technology	56						
Enforcing contracts	33	▷ Funding for technological development	61	Mobile Broadband subscribers	52						
Immigration laws	45	Banking and financial services	54	▷ Wireless broadband	58						
Development & application of tech.	57	Country credit rating	46	Internet users	54						
▷ Scientific research legislation	63	Venture capital	50	Internet bandwidth speed	51						
Intellectual property rights	52	Investment in Telecommunications	51	High-tech exports (%)	19						

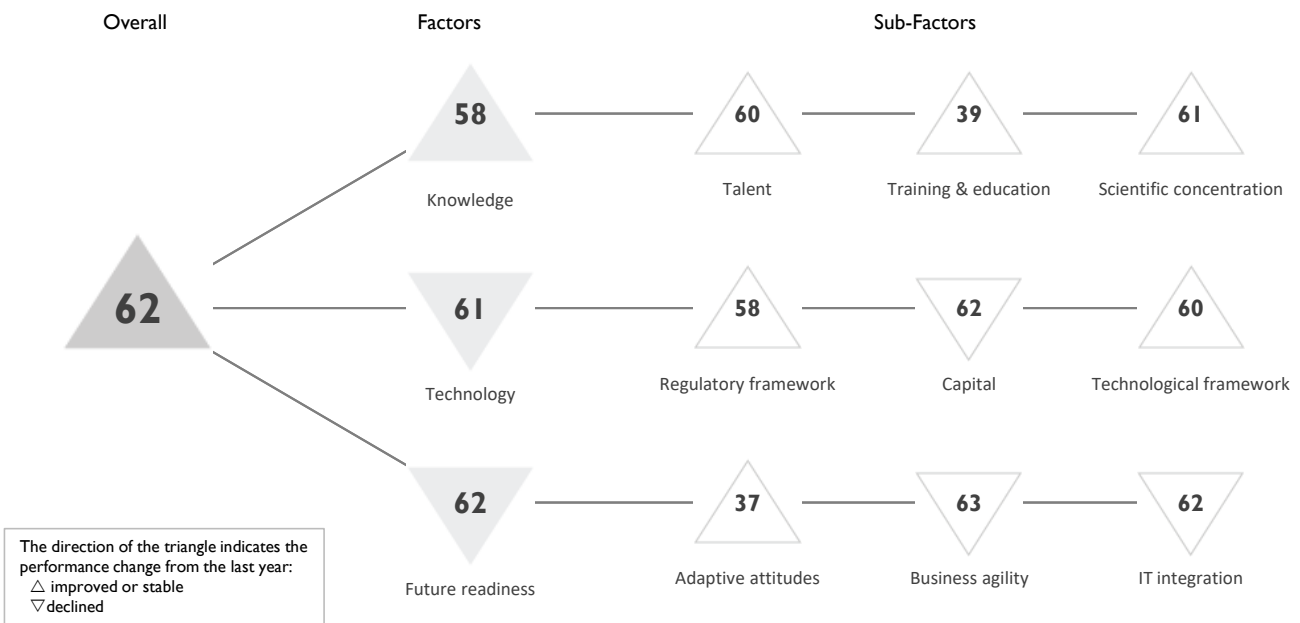
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	40	40	47	52	52
Business agility	55	57	51	50	41
IT integration	52	53	53	53	52

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	35	Opportunities and threats	43	E-Government	50						
Internet retailing	44	▶ World robots distribution	9	Public-private partnerships	45						
Tablet possession	49	Agility of companies	34	▷ Cyber security	61						
Smartphone possession	57	Use of big data and analytics	49	Software piracy	42						
Attitudes toward globalization	25	Knowledge transfer	43								
		Entrepreneurial fear of failure	45								

MONGOLIA

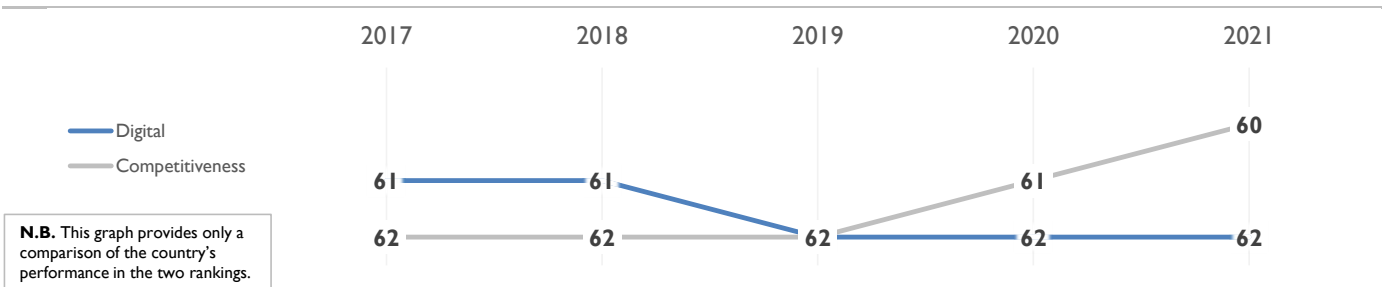
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

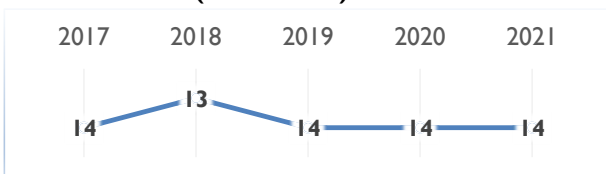
	2017	2018	2019	2020	2021
OVERALL	61	61	62	62	62
Knowledge	59	53	62	58	58
Technology	61	62	62	60	61
Future readiness	60	59	61	59	62

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	62	60	60	60	60
Training & education	38	24	45	41	39
Scientific concentration	60	60	60	61	61

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	-	▶ Employee training	17	Total expenditure on R&D (%)	61
International experience	63	Total public expenditure on education	31	Total R&D personnel per capita	46
Foreign highly-skilled personnel	56	Higher education achievement	42	▶ Female researchers	10
Management of cities	61	Pupil-teacher ratio (tertiary education)	54	R&D productivity by publication	59
Digital/Technological skills	55	Graduates in Sciences	27	Scientific and technical employment	57
Net flow of international students	57	▶ Women with degrees	23	▷ High-tech patent grants	63
				Robots in Education and R&D	-

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	57	58	62	58	58
Capital	61	55	58	60	62
Technological framework	59	61	58	60	60

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	43	IT & media stock market capitalization	-	▶ Communications technology	53
Enforcing contracts	44	Funding for technological development	60	▷ Mobile Broadband subscribers	63
Immigration laws	54	Banking and financial services	62	Wireless broadband	43
Development & application of tech.	59	Country credit rating	61	Internet users	61
Scientific research legislation	62	Venture capital	62	Internet bandwidth speed	60
▷ Intellectual property rights	63	▶ Investment in Telecommunications	14	High-tech exports (%)	57

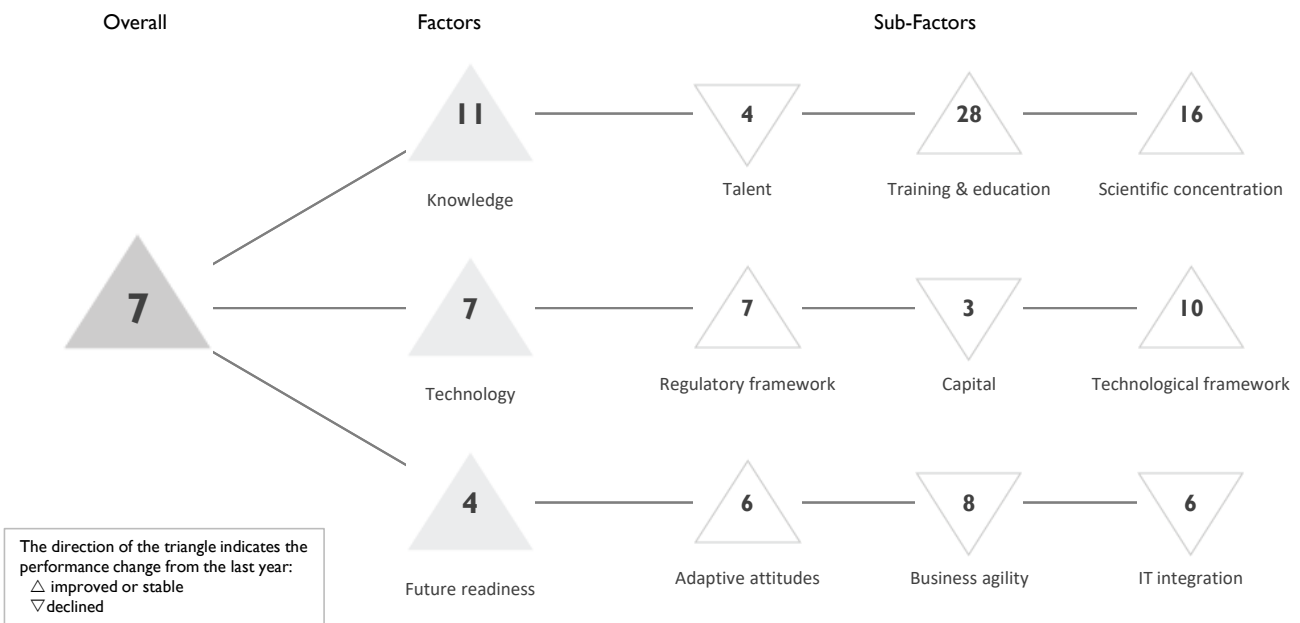
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	39	31	31	40	37
Business agility	63	61	63	61	63
IT integration	62	62	62	61	62

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	58	Opportunities and threats	59	E-Government	58
Internet retailing	-	World robots distribution	-	Public-private partnerships	60
Tablet possession	-	Agility of companies	58	▶ Cyber security	63
▶ Smartphone possession	14	Use of big data and analytics	62	Software piracy	-
Attitudes toward globalization	43	▷ Knowledge transfer	64		
		Entrepreneurial fear of failure	-		

NETHERLANDS

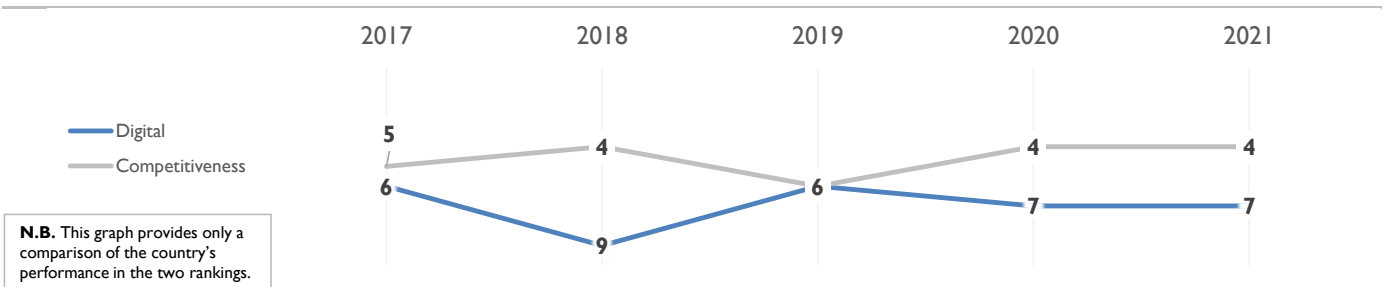
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

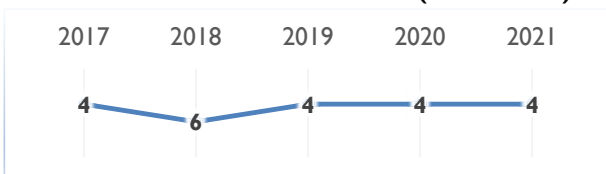
	2017	2018	2019	2020	2021
OVERALL	6	9	6	7	7
Knowledge	11	12	13	14	11
Technology	9	8	6	8	7
Future readiness	3	4	3	4	4

COMPETITIVENESS & DIGITAL RANKINGS

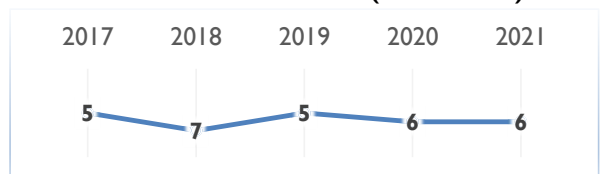


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



NETHERLANDS

- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	3	3	3	3	4
Training & education	32	31	36	29	28
Scientific concentration	18	16	19	16	16

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	8	Employee training	9	Total expenditure on R&D (%)	16
▶ International experience	3	Total public expenditure on education	24	Total R&D personnel per capita	9
Foreign highly-skilled personnel	4	Higher education achievement	20	▷ Female researchers	51
Management of cities	8	Pupil-teacher ratio (tertiary education)	25	R&D productivity by publication	28
Digital/Technological skills	6	▷ Graduates in Sciences	57	Scientific and technical employment	10
Net flow of international students	6	Women with degrees	28	High-tech patent grants	11
				Robots in Education and R&D	24

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	9	10	6	11	7
Capital	5	7	5	2	3
Technological framework	14	14	10	12	10

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	13	▶ IT & media stock market capitalization	4	Communications technology	6
▷ Enforcing contracts	45	Funding for technological development	6	Mobile Broadband subscribers	15
Immigration laws	4	Banking and financial services	11	▷ Wireless broadband	35
Development & application of tech.	8	▶ Country credit rating	1	Internet users	9
Scientific research legislation	12	Venture capital	4	Internet bandwidth speed	8
Intellectual property rights	6	▷ Investment in Telecommunications	45	High-tech exports (%)	15

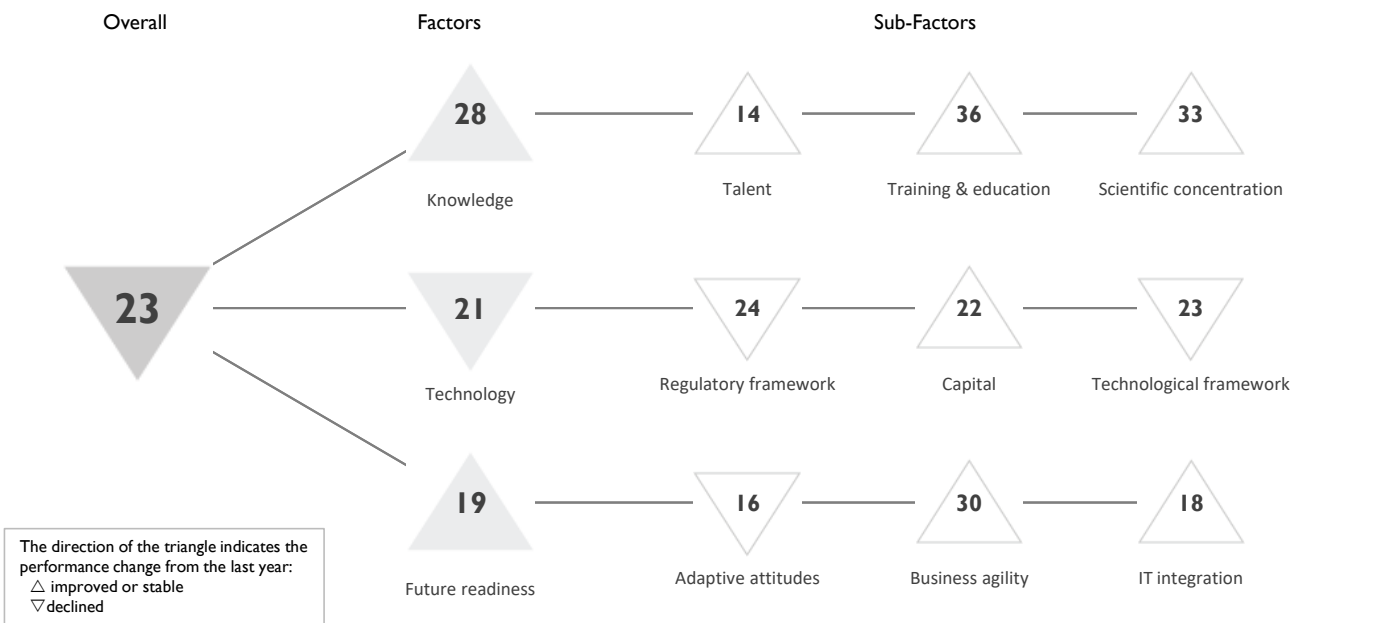
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	5	7	9	6	6
Business agility	7	12	7	7	8
IT integration	3	7	3	5	6

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	9	Opportunities and threats	14	E-Government	10
Internet retailing	6	World robots distribution	20	▶ Public-private partnerships	2
Tablet possession	14	Agility of companies	15	Cyber security	21
Smartphone possession	24	Use of big data and analytics	17	Software piracy	13
Attitudes toward globalization	6	▶ Knowledge transfer	2		
		Entrepreneurial fear of failure	4		

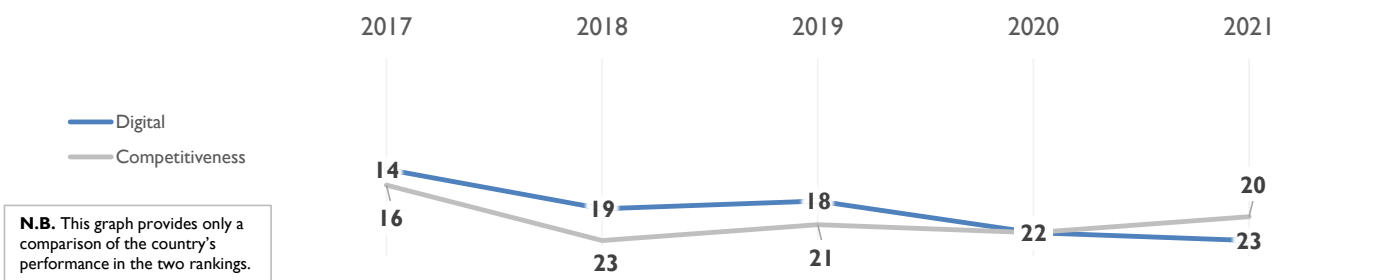
NEW ZEALAND

OVERALL PERFORMANCE (64 countries)



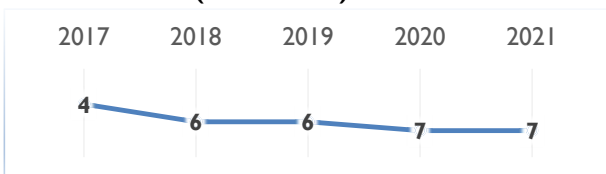
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	14	19	18	22	23
Knowledge	20	21	21	28	28
Technology	11	16	15	18	21
Future readiness	20	18	20	21	19

COMPETITIVENESS & DIGITAL RANKINGS

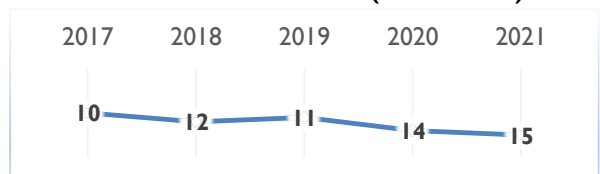


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	14	16	11	17	14
Training & education	36	37	34	37	36
Scientific concentration	20	15	26	34	33

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▶ Educational assessment PISA - Math	26	▶ Employee training	41	▶ Total expenditure on R&D (%)	28						
▶ International experience	28	▶ Total public expenditure on education	15	▶ Total R&D personnel per capita	16						
▶ Foreign highly-skilled personnel	10	▶ Higher education achievement	31	▶ Female researchers	-						
▷ Management of cities	49	▶ Pupil-teacher ratio (tertiary education)	37	▶ R&D productivity by publication	42						
▶ Digital/Technological skills	34	▶ Graduates in Sciences	46	▶ Scientific and technical employment	11						
▶ Net flow of international students	3	▶ Women with degrees	26	▶ High-tech patent grants	45						
				▶ Robots in Education and R&D	45						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	7	13	11	21	24
Capital	4	14	15	24	22
Technological framework	20	25	25	21	23

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
▶ Starting a business	1	▶ IT & media stock market capitalization	33	▶ Communications technology	21						
▶ Enforcing contracts	20	▶ Funding for technological development	40	▶ Mobile Broadband subscribers	42						
▷ Immigration laws	64	▶ Banking and financial services	12	▶ Wireless broadband	14						
▶ Development & application of tech.	15	▶ Country credit rating	14	▶ Internet users	22						
▶ Scientific research legislation	25	▶ Venture capital	32	▶ Internet bandwidth speed	18						
▶ Intellectual property rights	12	▶ Investment in Telecommunications	18	▶ High-tech exports (%)	43						

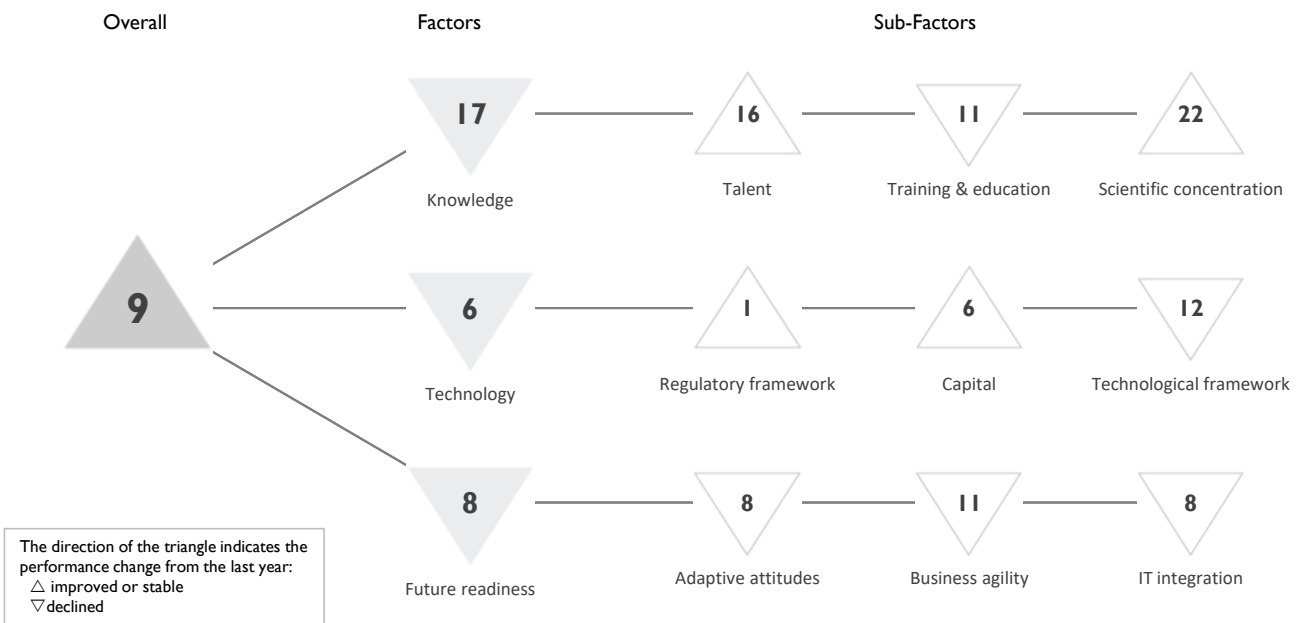
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	20	14	13	13	16
Business agility	26	35	32	46	30
IT integration	17	17	10	18	18

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
▶ E-Participation	4	▶ Opportunities and threats	21	▶ E-Government	8						
▶ Internet retailing	18	▶ World robots distribution	41	▷ Public-private partnerships	49						
▶ Tablet possession	13	▶ Agility of companies	23	▶ Cyber security	37						
▶ Smartphone possession	19	▶ Use of big data and analytics	33	▶ Software piracy	2						
▶ Attitudes toward globalization	24	▶ Knowledge transfer	27								
		▶ Entrepreneurial fear of failure	-								

NORWAY

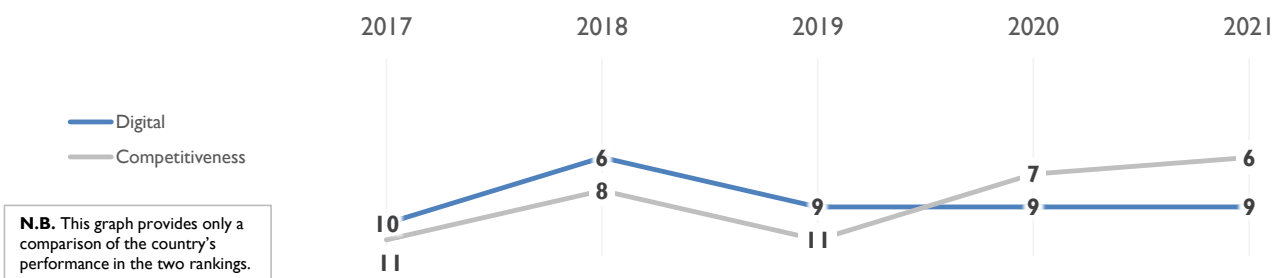
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

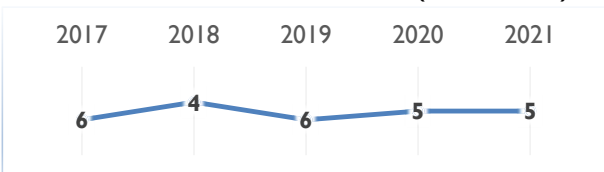
	2017	2018	2019	2020	2021
OVERALL	10	6	9	9	9
Knowledge	15	16	16	16	17
Technology	2	2	3	3	6
Future readiness	12	6	8	6	8

COMPETITIVENESS & DIGITAL RANKINGS

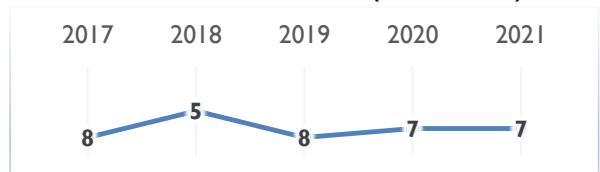


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	20	20	16	16	16
Training & education	12	11	17	10	11
Scientific concentration	22	20	21	23	22

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	18	Employee training	10	Total expenditure on R&D (%)	17
International experience	33	Total public expenditure on education	19	Total R&D personnel per capita	10
Foreign highly-skilled personnel	12	Higher education achievement	21	Female researchers	24
Management of cities	13	Pupil-teacher ratio (tertiary education)	5	▷ R&D productivity by publication	44
Digital/Technological skills	7	▷ Graduates in Sciences	43	Scientific and technical employment	21
▷ Net flow of international students	52	Women with degrees	19	High-tech patent grants	28
				Robots in Education and R&D	31

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	3	1	3	2	1
Capital	7	2	7	9	6
Technological framework	3	3	6	9	12

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	14	IT & media stock market capitalization	18	Communications technology	3
▶ Enforcing contracts	3	Funding for technological development	7	Mobile Broadband subscribers	28
Immigration laws	12	▶ Banking and financial services	2	Wireless broadband	32
Development & application of tech.	5	▶ Country credit rating	1	▶ Internet users	3
Scientific research legislation	6	Venture capital	6	Internet bandwidth speed	10
Intellectual property rights	5	▷ Investment in Telecommunications	34	High-tech exports (%)	16

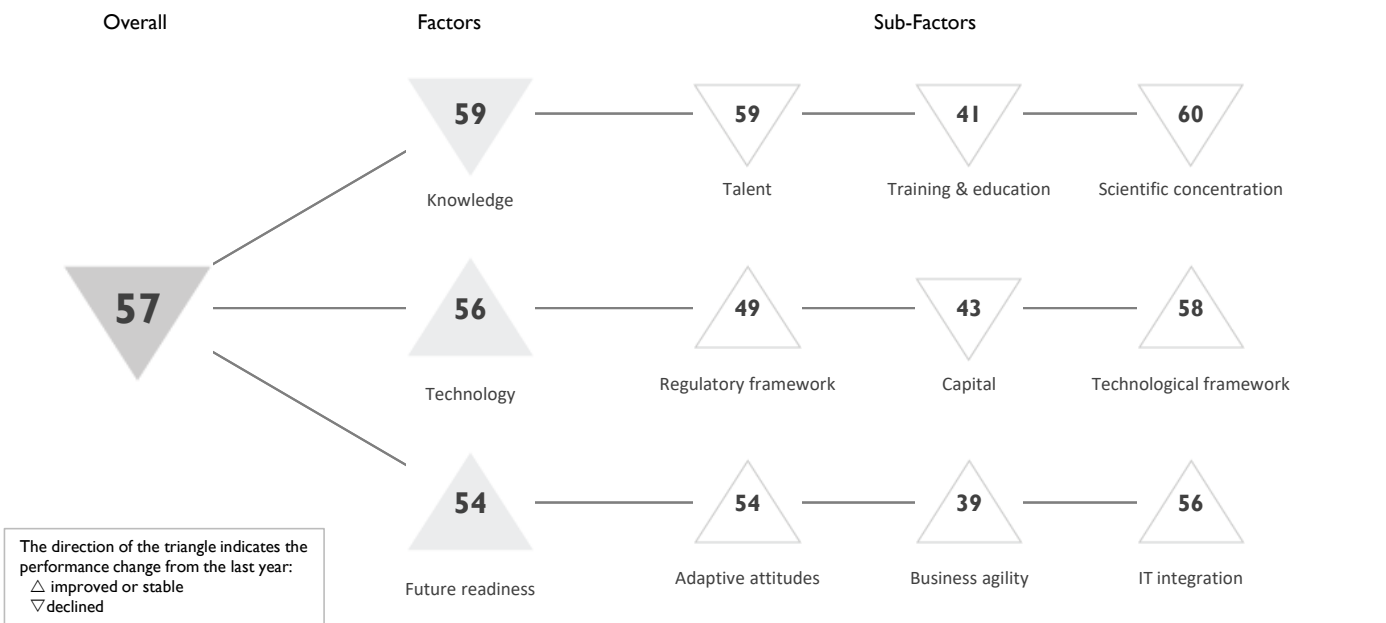
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	8	8	5	7	8
Business agility	20	14	23	8	11
IT integration	14	9	9	6	8

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	18	Opportunities and threats	12	E-Government	13
Internet retailing	9	▷ World robots distribution	42	Public-private partnerships	7
▶ Tablet possession	3	Agility of companies	14	Cyber security	18
Smartphone possession	5	Use of big data and analytics	9	Software piracy	10
Attitudes toward globalization	14	Knowledge transfer	10		
		Entrepreneurial fear of failure	9		

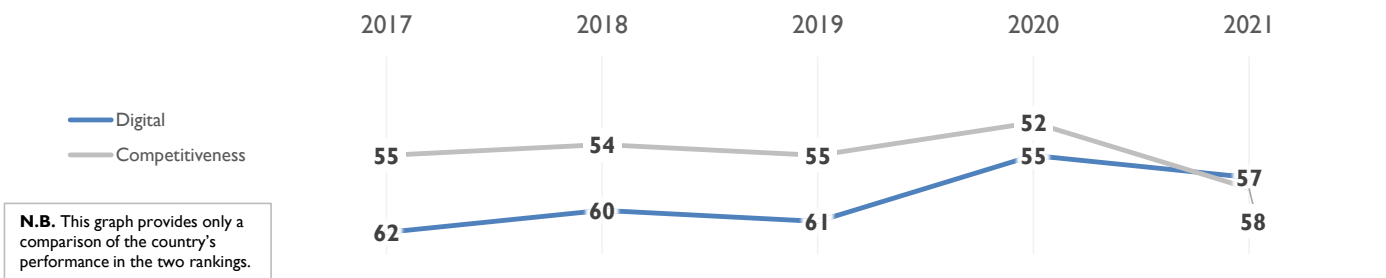
PERU

OVERALL PERFORMANCE (64 countries)



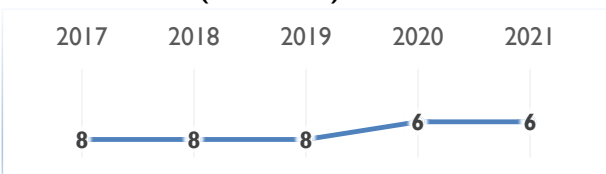
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	62	60	61	55	57
Knowledge	62	60	61	55	59
Technology	57	57	58	58	56
Future readiness	58	60	59	55	54

COMPETITIVENESS & DIGITAL RANKINGS

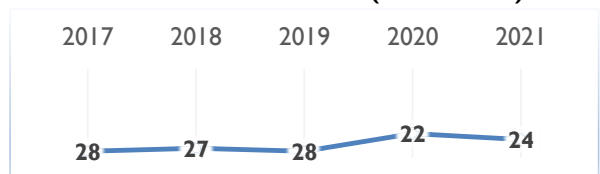


PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	61	58	59	58	59
Training & education	60	43	42	39	41
Scientific concentration	63	62	62	59	60

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	52	Employee training	56	▷ Total expenditure on R&D (%)	59	Total R&D personnel per capita	57	Female researchers	45	R&D productivity by publication	30
International experience	37	Total public expenditure on education	48	▷ Higher education achievement	5	Scientific and technical employment	56	High-tech patent grants	55	Robots in Education and R&D	41
Foreign highly-skilled personnel	26	▶ Pupil-teacher ratio (tertiary education)	52	▶ Graduates in Sciences	10						
▷ Management of cities	60	▶ Women with degrees	38								
▷ Digital/Technological skills	61										
Net flow of international students	-										

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	51	49	50	49	49
Capital	48	47	45	37	43
Technological framework	61	59	61	59	58

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	55	IT & media stock market capitalization	53	▷ Communications technology	60	Mobile Broadband subscribers	49	▷ Wireless broadband	60	Internet users	58
Enforcing contracts	46	Funding for technological development	54	▷ Internet bandwidth speed	57	High-tech exports (%)	58				
▶ Immigration laws	15	Banking and financial services	45								
Development & application of tech.	51	Country credit rating	41								
Scientific research legislation	54	Venture capital	41								
Intellectual property rights	53	▶ Investment in Telecommunications	9								

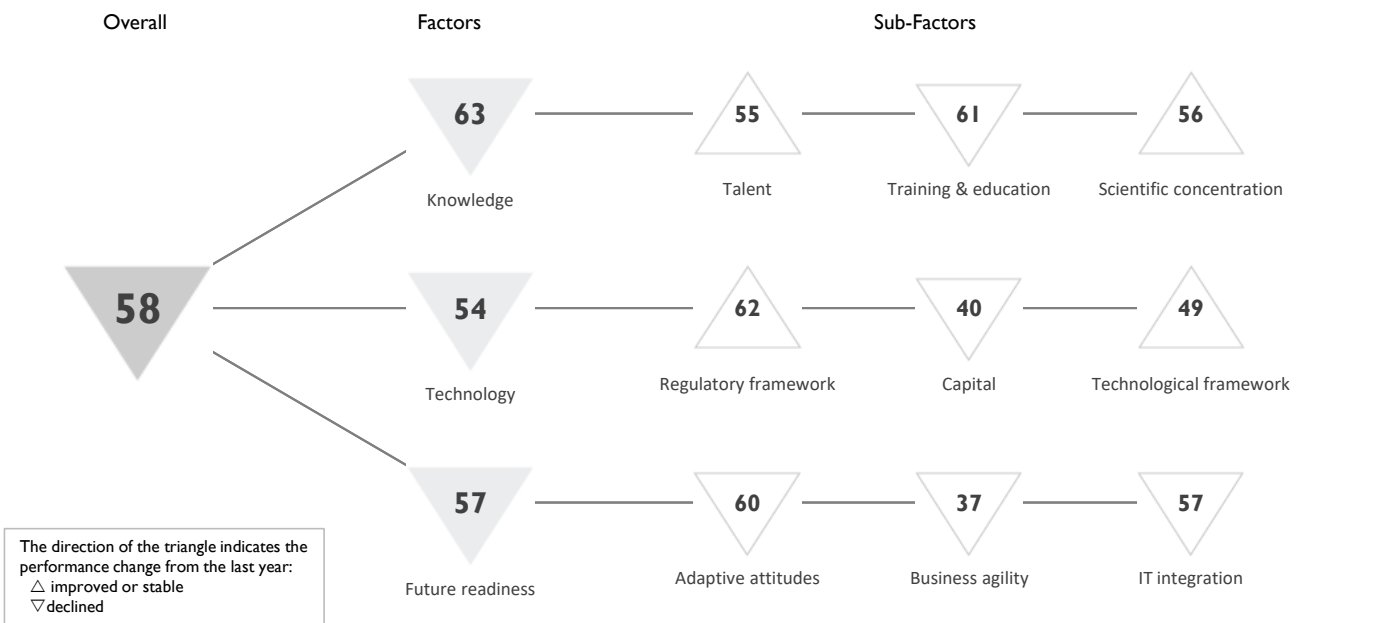
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	61	59	49	54	54
Business agility	50	50	59	47	39
IT integration	59	59	59	58	56

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	44	Opportunities and threats	48	E-Government	54	Public-private partnerships	41	Cyber security	47	Software piracy	53
Internet retailing	55	World robots distribution	55								
Tablet possession	53	Agility of companies	47								
Smartphone possession	45	Use of big data and analytics	48								
Attitudes toward globalization	30	Knowledge transfer	49								
		▶ Entrepreneurial fear of failure	8								

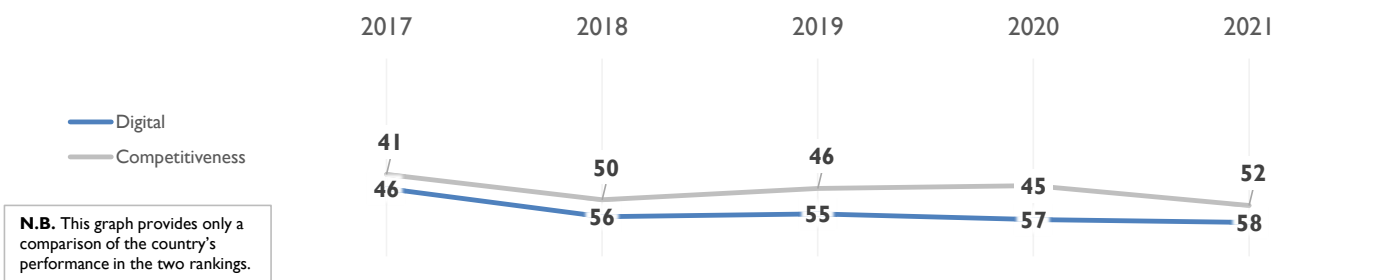
PHILIPPINES

OVERALL PERFORMANCE (64 countries)



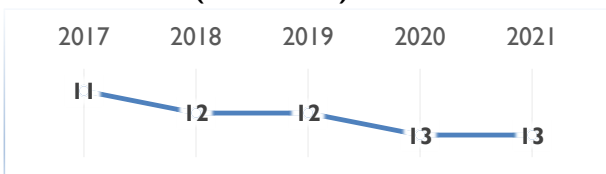
OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	46	56	55	57	58
Knowledge	53	50	51	62	63
Technology	51	58	55	53	54
Future readiness	43	52	54	54	57

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	39	48	41	55	55
Training & education	54	52	54	59	61
Scientific concentration	53	50	54	56	56

Talent	Rank
Educational assessment PISA - Math	59
International experience	32
Foreign highly-skilled personnel	42
Management of cities	47
Digital/Technological skills	53
Net flow of international students	38

Training & education	Rank
Employee training	35
Total public expenditure on education	53
Higher education achievement	57
Pupil-teacher ratio (tertiary education)	55
▶ Graduates in Sciences	14
Women with degrees	51

Scientific concentration	Rank
Total expenditure on R&D (%)	58
Total R&D personnel per capita	56
▶ Female researchers	4
R&D productivity by publication	29
Scientific and technical employment	60
High-tech patent grants	23
Robots in Education and R&D	53

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	62	61	60	62	62
Capital	29	43	40	39	40
Technological framework	50	52	51	49	49

Regulatory framework	Rank
▷ Starting a business	63
▷ Enforcing contracts	62
Immigration laws	39
Development & application of tech.	42
Scientific research legislation	48
Intellectual property rights	54

Capital	Rank
IT & media stock market capitalization	39
Funding for technological development	47
Banking and financial services	32
Country credit rating	43
Venture capital	43
▶ Investment in Telecommunications	12

Technological framework	Rank
▷ Communications technology	61
Mobile Broadband subscribers	54
Wireless broadband	29
▷ Internet users	60
▷ Internet bandwidth speed	61
▶ High-tech exports (%)	2

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	50	60	53	57	60
Business agility	23	31	42	32	37
IT integration	57	57	58	56	57

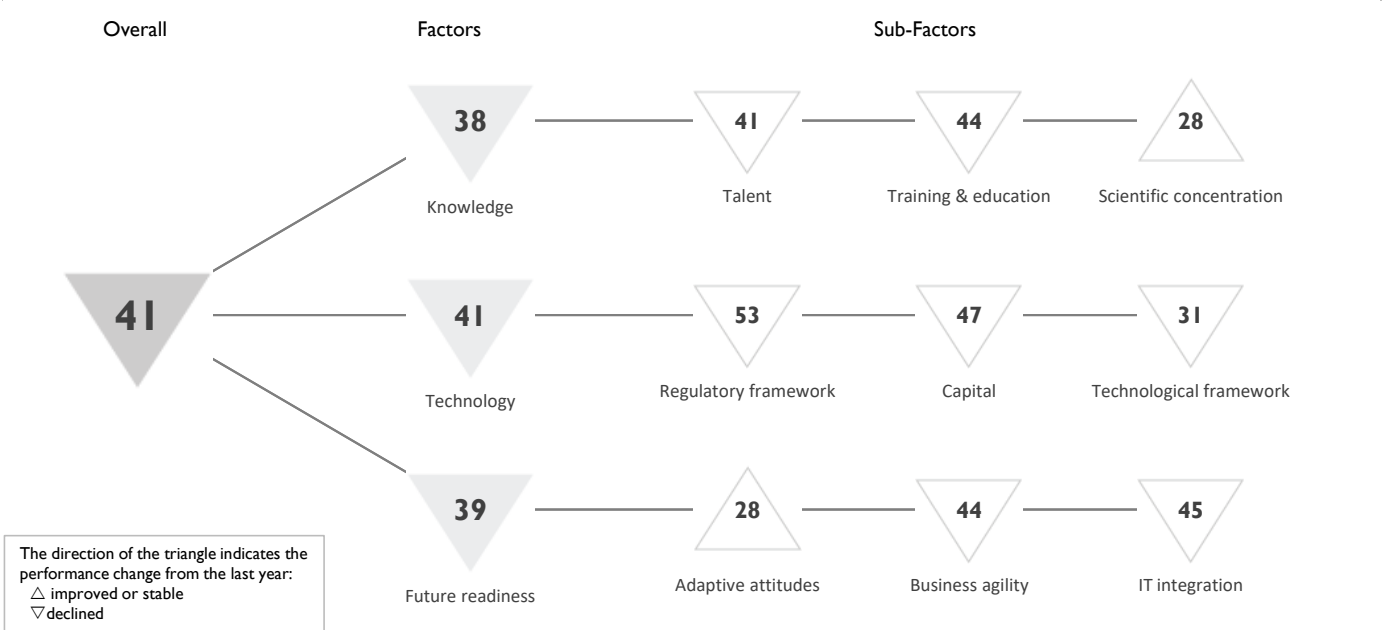
Adaptive attitudes	Rank
E-Participation	45
Internet retailing	58
Tablet possession	56
Smartphone possession	55
Attitudes toward globalization	32

Business agility	Rank
Opportunities and threats	38
World robots distribution	40
Agility of companies	33
Use of big data and analytics	37
Knowledge transfer	46
▶ Entrepreneurial fear of failure	21

IT integration	Rank
E-Government	55
Public-private partnerships	32
Cyber security	50
Software piracy	55

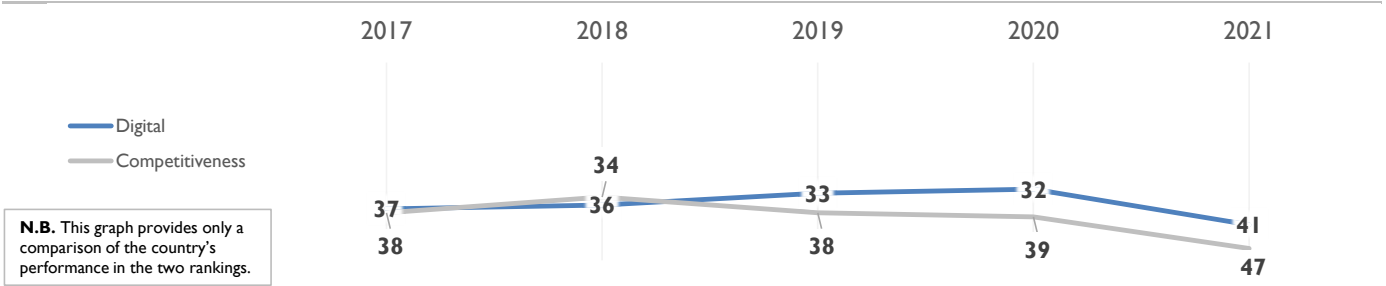
POLAND

OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years	2017	2018	2019	2020	2021
OVERALL	37	36	33	32	41
Knowledge	32	33	33	30	38
Technology	39	37	37	37	41
Future readiness	39	37	33	35	39

COMPETITIVENESS & DIGITAL RANKINGS

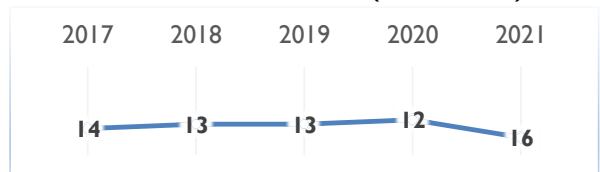


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	28	30	28	29	41
Training & education	23	35	35	32	44
Scientific concentration	40	38	31	28	28

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▶ Educational assessment PISA - Math	9	▷ Employee training	62	Total expenditure on R&D (%)	29						
International experience	50	Total public expenditure on education	23	Total R&D personnel per capita	33						
Foreign highly-skilled personnel	54	Higher education achievement	32	Female researchers	27						
Management of cities	46	Pupil-teacher ratio (tertiary education)	32	R&D productivity by publication	16						
Digital/Technological skills	56	Graduates in Sciences	45	Scientific and technical employment	37						
Net flow of international students	30	Women with degrees	33	High-tech patent grants	40						
				▶ Robots in Education and R&D	15						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	47	46	45	46	53
Capital	32	32	38	36	47
Technological framework	39	37	30	23	31

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	54	IT & media stock market capitalization	27	Communications technology	50						
Enforcing contracts	39	Funding for technological development	50	Mobile Broadband subscribers	35						
Immigration laws	43	Banking and financial services	48	▶ Wireless broadband	3						
▷ Development & application of tech.	58	Country credit rating	36	Internet users	45						
Scientific research legislation	52	Venture capital	47	Internet bandwidth speed	28						
Intellectual property rights	50	Investment in Telecommunications	32	High-tech exports (%)	41						

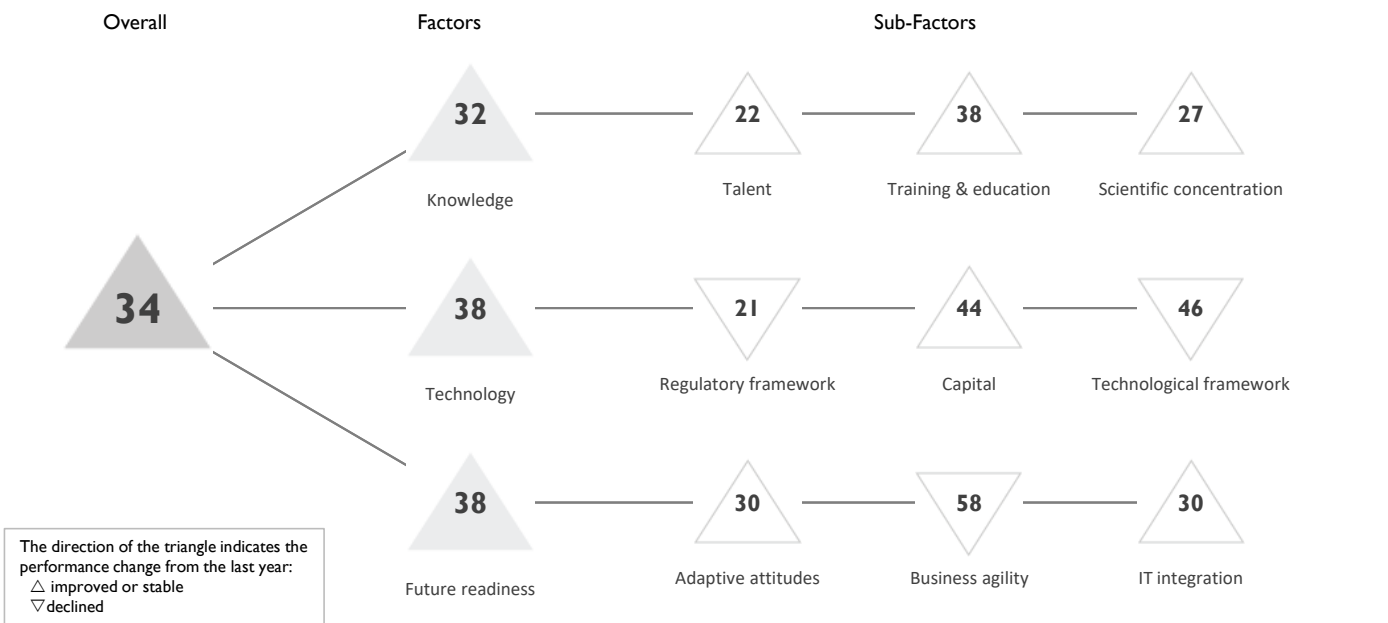
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	38	33	37	29	28
Business agility	45	40	28	33	44
IT integration	41	40	36	38	45

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
▶ E-Participation	9	Opportunities and threats	35	E-Government	23						
Internet retailing	26	World robots distribution	17	▷ Public-private partnerships	59						
▶ Tablet possession	10	Agility of companies	36	Cyber security	52						
Smartphone possession	40	Use of big data and analytics	42	Software piracy	36						
▷ Attitudes toward globalization	58	▷ Knowledge transfer	57								
		Entrepreneurial fear of failure	41								

PORTUGAL

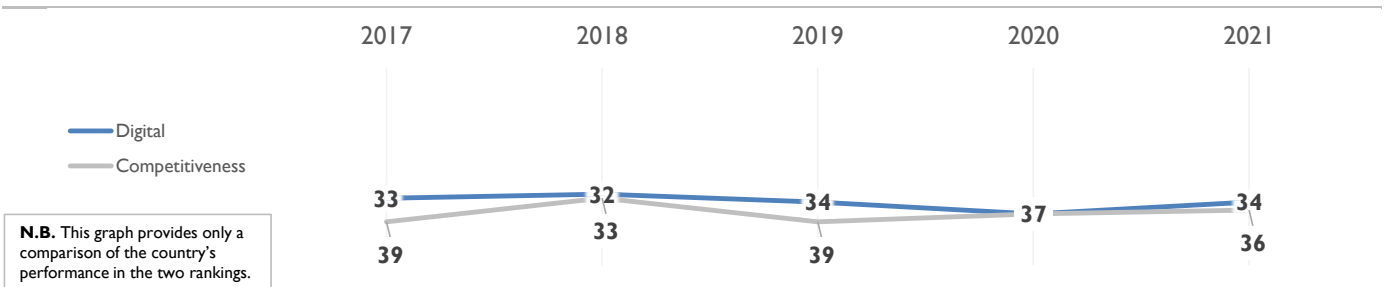
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

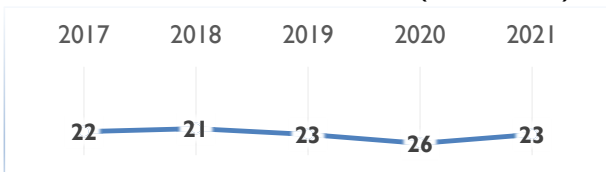
	2017	2018	2019	2020	2021
OVERALL	33	32	34	37	34
Knowledge	31	27	31	33	32
Technology	37	36	38	38	38
Future readiness	35	32	34	41	38

COMPETITIVENESS & DIGITAL RANKINGS

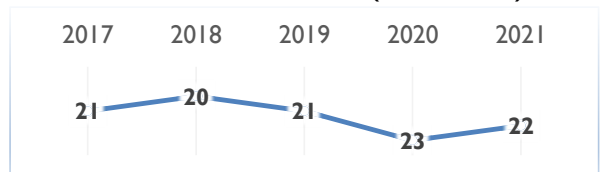


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	30	23	26	24	22
Training & education	18	27	39	38	38
Scientific concentration	36	34	32	30	27

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	27	▷ Employee training	60	Total expenditure on R&D (%)	27
International experience	43	Total public expenditure on education	36	Total R&D personnel per capita	23
Foreign highly-skilled personnel	34	Higher education achievement	40	Female researchers	19
Management of cities	21	▶ Pupil-teacher ratio (tertiary education)	13	R&D productivity by publication	32
▶ Digital/Technological skills	14	▶ Graduates in Sciences	12	Scientific and technical employment	30
Net flow of international students	24	Women with degrees	39	High-tech patent grants	36
				Robots in Education and R&D	34

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	19	19	21	20	21
Capital	50	45	48	44	44
Technological framework	43	39	45	42	46

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	33	IT & media stock market capitalization	41	▶ Communications technology	11
Enforcing contracts	30	Funding for technological development	33	▷ Mobile Broadband subscribers	59
▶ Immigration laws	3	Banking and financial services	39	▷ Wireless broadband	53
Development & application of tech.	27	Country credit rating	37	Internet users	47
Scientific research legislation	32	Venture capital	46	Internet bandwidth speed	23
Intellectual property rights	26	Investment in Telecommunications	43	▷ High-tech exports (%)	51

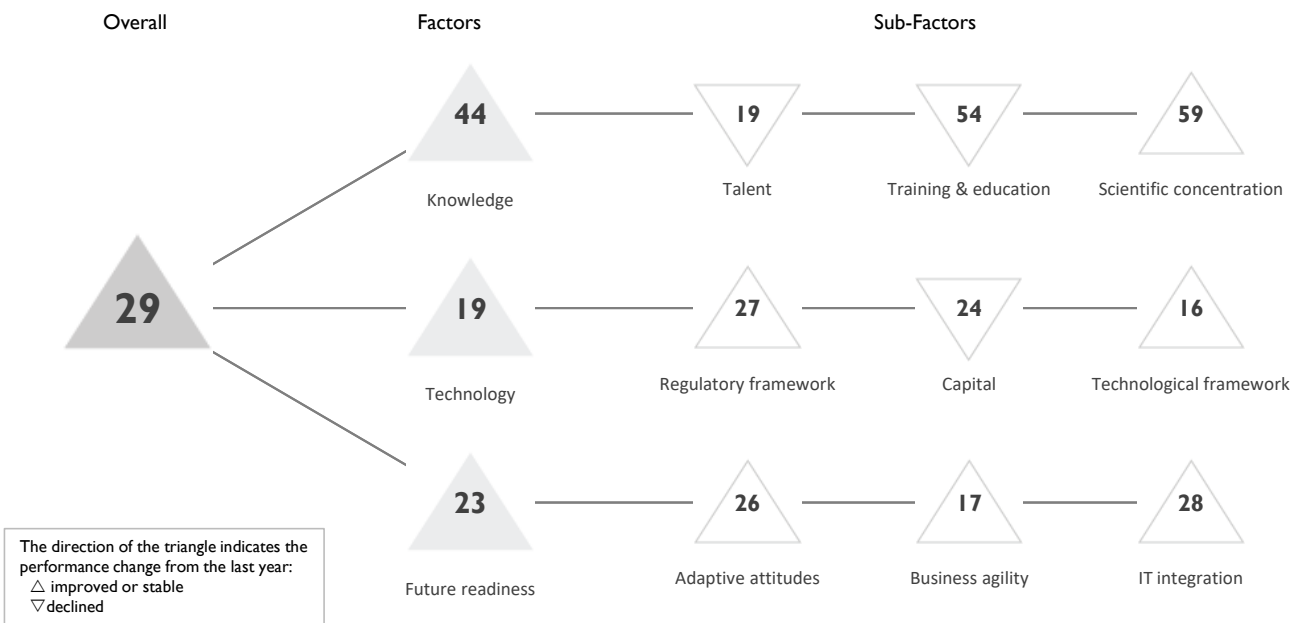
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	34	35	32	31	30
Business agility	40	27	52	57	58
IT integration	32	30	29	34	30

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	35	Opportunities and threats	46	E-Government	32
Internet retailing	32	World robots distribution	32	Public-private partnerships	36
Tablet possession	32	Agility of companies	49	Cyber security	36
Smartphone possession	41	▷ Use of big data and analytics	58	Software piracy	28
Attitudes toward globalization	19	Knowledge transfer	35		
		Entrepreneurial fear of failure	50		

QATAR

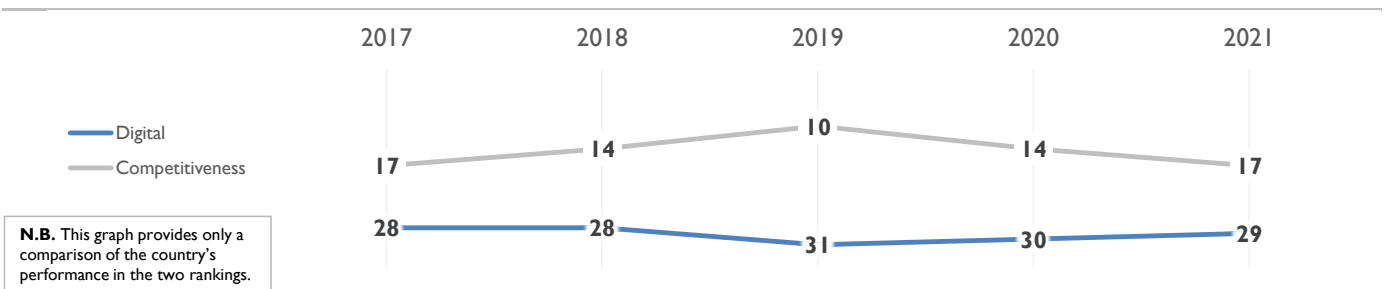
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

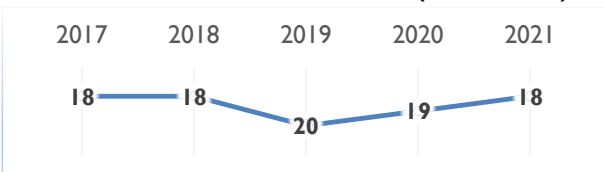
	2017	2018	2019	2020	2021
OVERALL	28	28	31	30	29
Knowledge	35	37	45	45	44
Technology	31	27	33	25	19
Future readiness	19	16	22	24	23

COMPETITIVENESS & DIGITAL RANKINGS

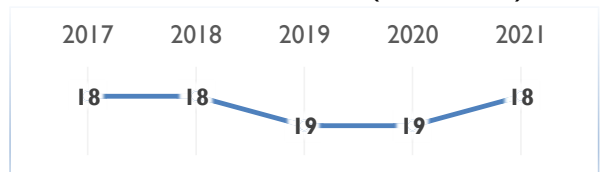


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	19	15	15	15	19
Training & education	24	38	48	53	54
Scientific concentration	55	59	61	60	59

Talent	Rank
Educational assessment PISA - Math	50
International experience	7
Foreign highly-skilled personnel	8
Management of cities	7
Digital/Technological skills	12
Net flow of international students	29

Training & education	Rank
Employee training	19
▷ Total public expenditure on education	61
▷ Higher education achievement	58
Pupil-teacher ratio (tertiary education)	31
Graduates in Sciences	33
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	51
Total R&D personnel per capita	47
Female researchers	36
R&D productivity by publication	51
▷ Scientific and technical employment	59
High-tech patent grants	14
Robots in Education and R&D	53

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	31	32	28	29	27
Capital	17	24	23	19	24
Technological framework	36	30	38	31	16

Regulatory framework	Rank
Starting a business	46
Enforcing contracts	55
Immigration laws	17
Development & application of tech.	12
Scientific research legislation	13
Intellectual property rights	19

Capital	Rank
IT & media stock market capitalization	40
Funding for technological development	10
Banking and financial services	9
Country credit rating	23
Venture capital	14
Investment in Telecommunications	57

Technological framework	Rank
Communications technology	16
▶ Mobile Broadband subscribers	3
Wireless broadband	11
▶ Internet users	1
Internet bandwidth speed	37
▷ High-tech exports (%)	60

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	15	16	18	27	26
Business agility	15	8	12	17	17
IT integration	27	26	27	28	28

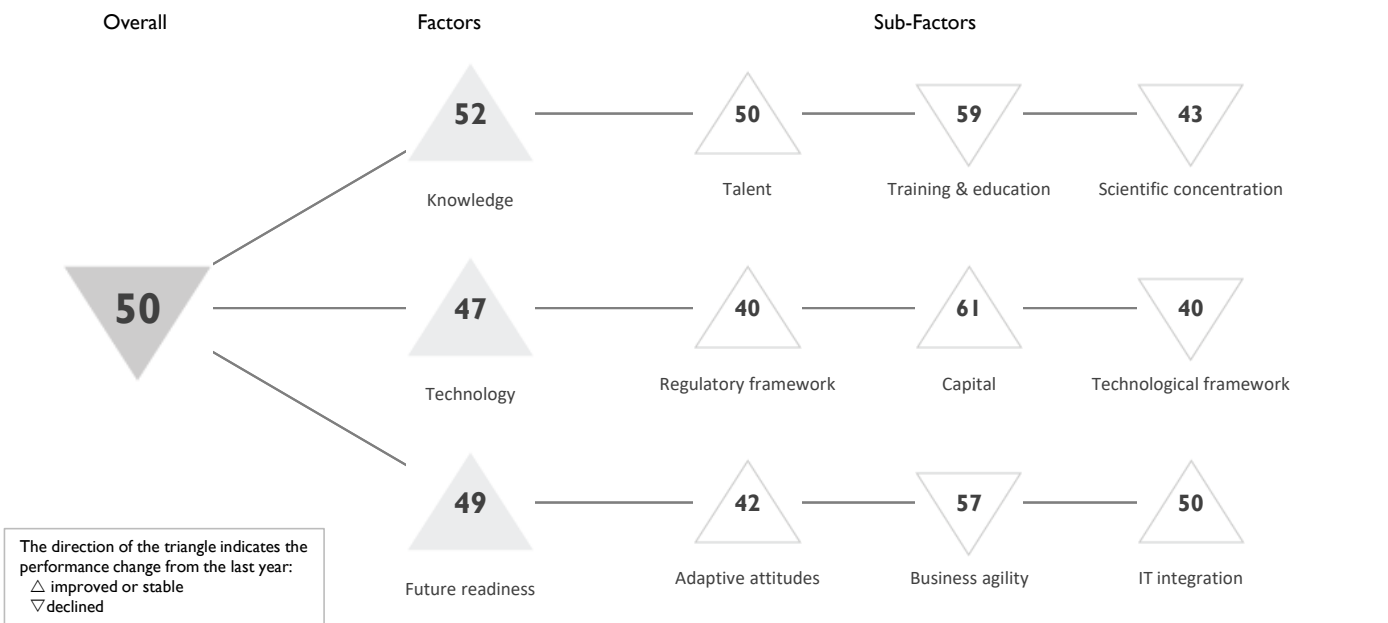
Adaptive attitudes	Rank
E-Participation	56
Internet retailing	53
▶ Tablet possession	5
Smartphone possession	7
Attitudes toward globalization	16

Business agility	Rank
Opportunities and threats	8
▷ World robots distribution	58
Agility of companies	16
▶ Use of big data and analytics	2
Knowledge transfer	15
Entrepreneurial fear of failure	39

IT integration	Rank
E-Government	51
Public-private partnerships	9
▶ Cyber security	4
Software piracy	38

ROMANIA

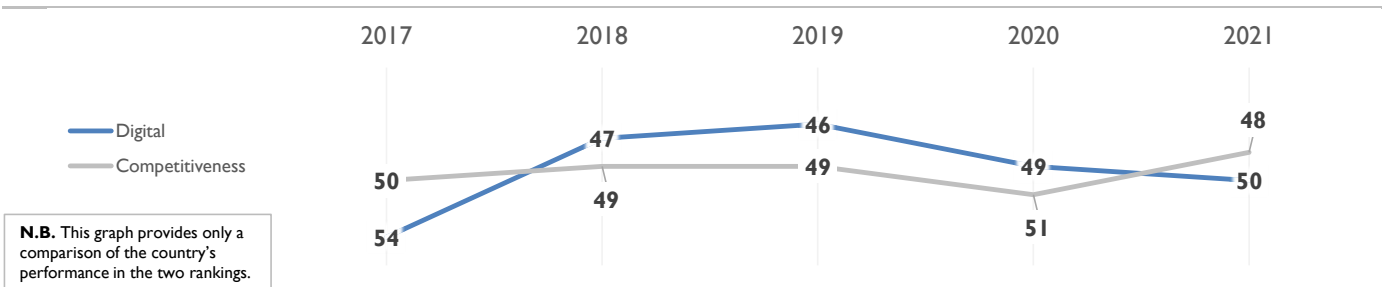
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

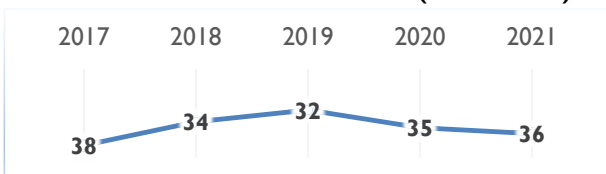
	2017	2018	2019	2020	2021
OVERALL	54	47	46	49	50
Knowledge	47	45	47	53	52
Technology	46	44	45	48	47
Future readiness	59	57	51	49	49

COMPETITIVENESS & DIGITAL RANKINGS

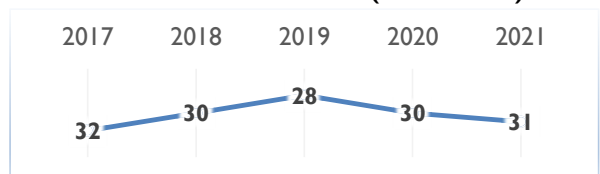


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	45	45	48	51	50
Training & education	52	50	51	54	59
Scientific concentration	41	43	38	39	43

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▶ Educational assessment PISA - Math	46	▶ Employee training	59	Total expenditure on R&D (%)	52						
International experience	42	Total public expenditure on education	50	Total R&D personnel per capita	44						
Foreign highly-skilled personnel	47	Higher education achievement	54	▶ Female researchers	14						
▷ Management of cities	56	Pupil-teacher ratio (tertiary education)	49	▶ R&D productivity by publication	22						
Digital/Technological skills	29	▶ Graduates in Sciences	13	Scientific and technical employment	48						
Net flow of international students	45	Women with degrees	52	High-tech patent grants	34						
				Robots in Education and R&D	35						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	41	39	41	43	40
Capital	60	62	59	61	61
Technological framework	33	31	36	37	40

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	39	IT & media stock market capitalization	52	Communications technology	25						
▶ Enforcing contracts	18	Funding for technological development	52	Mobile Broadband subscribers	55						
Immigration laws	35	▶ Banking and financial services	59	Wireless broadband	40						
Development & application of tech.	50	Country credit rating	52	Internet users	50						
Scientific research legislation	51	Venture capital	54	▶ Internet bandwidth speed	9						
Intellectual property rights	47	Investment in Telecommunications	49	High-tech exports (%)	37						

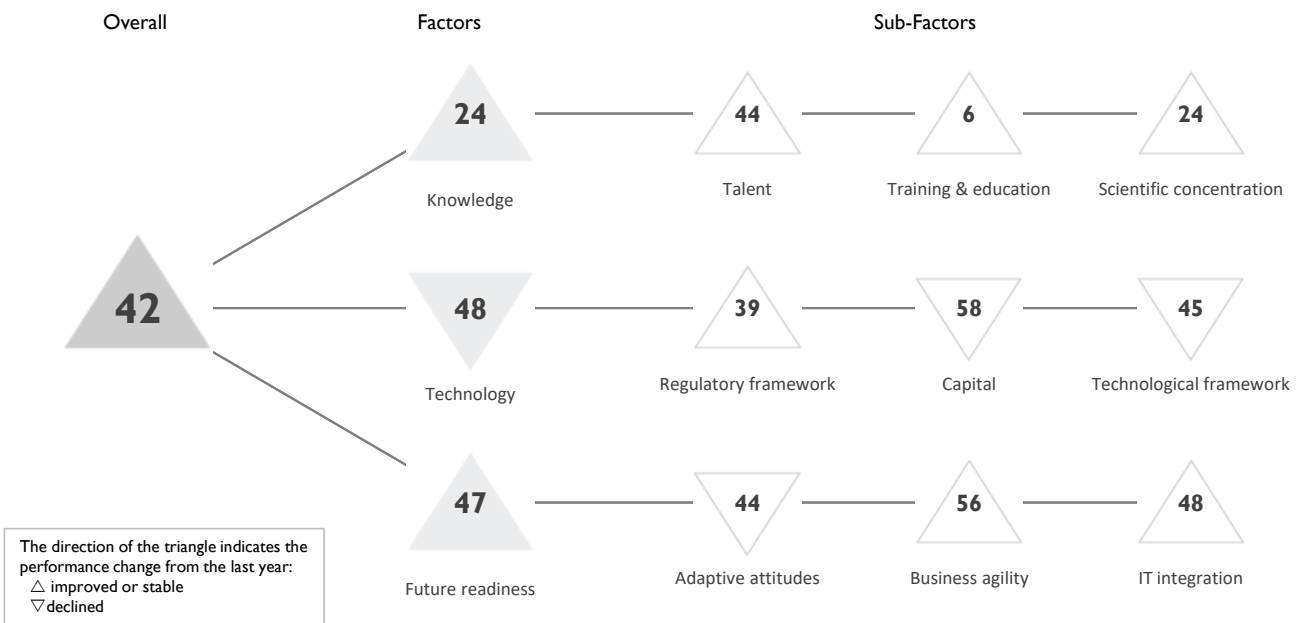
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	60	46	48	45	42
Business agility	60	60	46	53	57
IT integration	58	58	55	54	50

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	39	▶ Opportunities and threats	57	E-Government	48						
Internet retailing	38	World robots distribution	35	▶ Public-private partnerships	58						
Tablet possession	37	Agility of companies	54	Cyber security	34						
Smartphone possession	37	Use of big data and analytics	39	Software piracy	51						
Attitudes toward globalization	55	Knowledge transfer	54								
		Entrepreneurial fear of failure	26								

RUSSIA

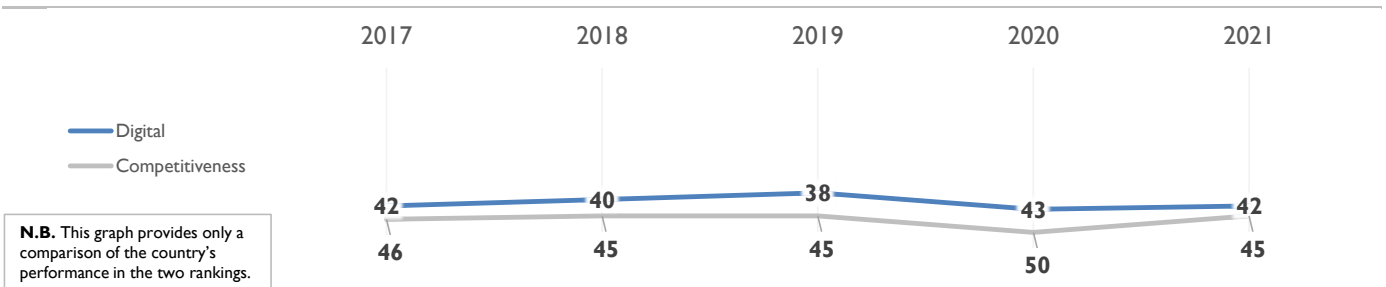
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

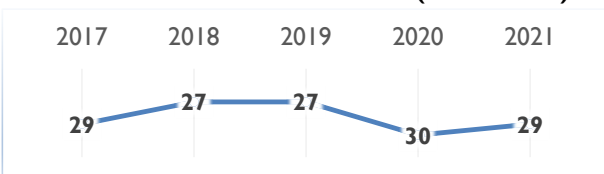
	2017	2018	2019	2020	2021
OVERALL	42	40	38	43	42
Knowledge	24	24	22	26	24
Technology	44	43	43	47	48
Future readiness	52	51	42	53	47

COMPETITIVENESS & DIGITAL RANKINGS

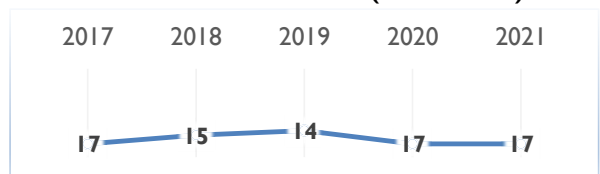


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	35	40	45	47	44
Training & education	14	12	9	13	6
Scientific concentration	25	23	18	24	24

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	29	Employee training	42	Total expenditure on R&D (%)	39
International experience	54	Total public expenditure on education	49	Total R&D personnel per capita	26
Foreign highly-skilled personnel	53	▶ Higher education achievement	7	Female researchers	23
Management of cities	54	Pupil-teacher ratio (tertiary education)	10	▶ R&D productivity by publication	5
Digital/Technological skills	49	▶ Graduates in Sciences	7	Scientific and technical employment	42
Net flow of international students	23	▶ Women with degrees	2	High-tech patent grants	27
				▶ Robots in Education and R&D	7

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	36	38	40	40	39
Capital	57	58	57	57	58
Technological framework	37	38	39	41	45

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	24	IT & media stock market capitalization	47	Communications technology	26
Enforcing contracts	19	Funding for technological development	49	Mobile Broadband subscribers	51
Immigration laws	49	Banking and financial services	53	Wireless broadband	39
Development & application of tech.	52	Country credit rating	49	Internet users	42
Scientific research legislation	46	▷ Venture capital	60	Internet bandwidth speed	44
▷ Intellectual property rights	56	Investment in Telecommunications	38	High-tech exports (%)	30

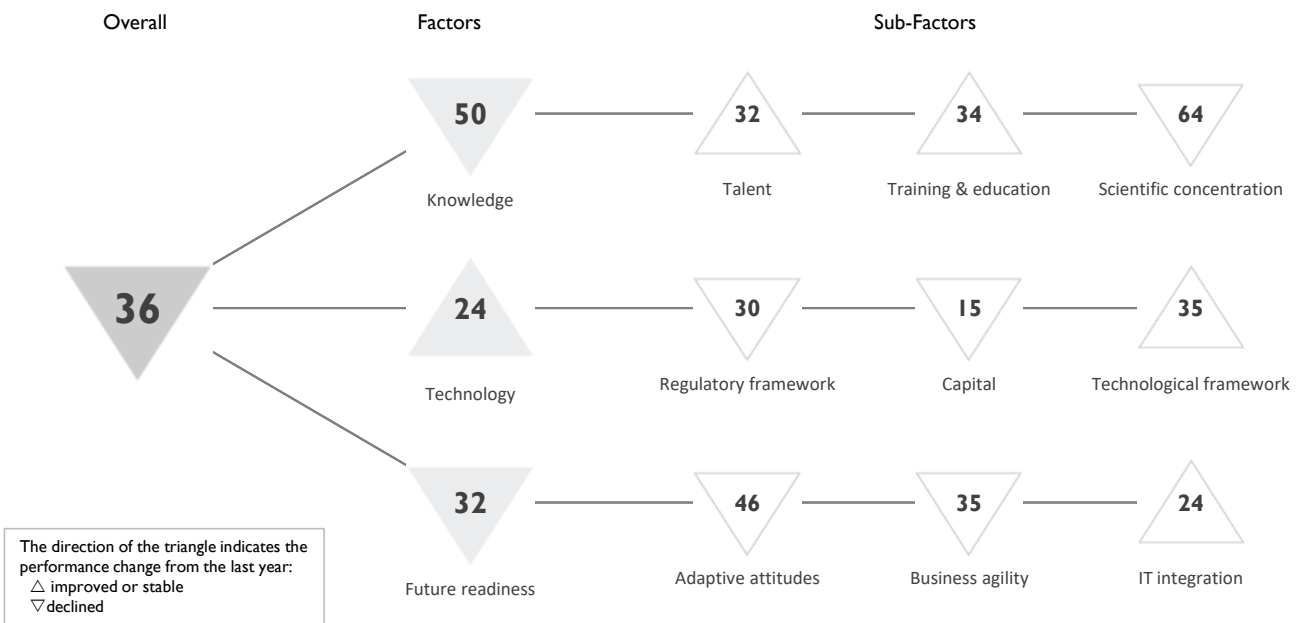
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	44	39	40	43	44
Business agility	59	62	54	60	56
IT integration	43	43	43	51	48

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	26	Opportunities and threats	50	E-Government	33
Internet retailing	37	World robots distribution	31	Public-private partnerships	53
Tablet possession	39	▷ Agility of companies	57	Cyber security	45
Smartphone possession	29	Use of big data and analytics	31	Software piracy	53
▷ Attitudes toward globalization	61	▷ Knowledge transfer	56		
		Entrepreneurial fear of failure	38		

SAUDI ARABIA

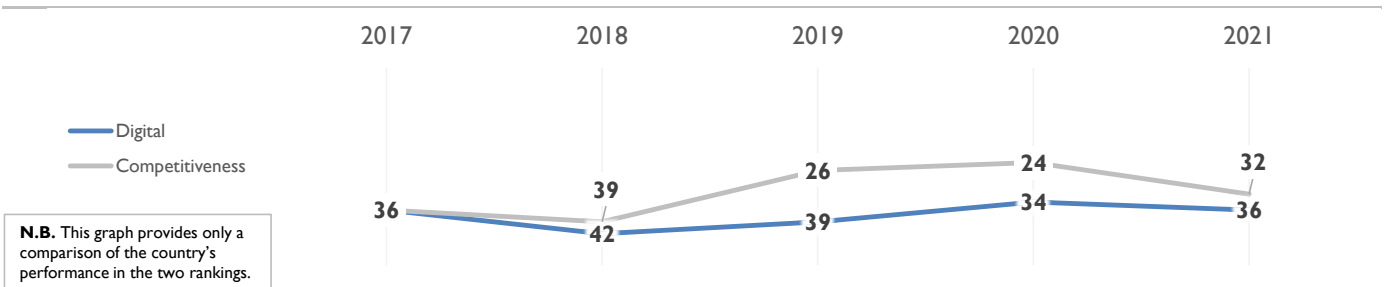
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

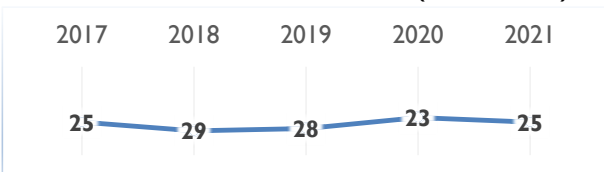
	2017	2018	2019	2020	2021
OVERALL	36	42	39	34	36
Knowledge	39	40	39	46	50
Technology	41	50	40	24	24
Future readiness	32	38	38	28	32

COMPETITIVENESS & DIGITAL RANKINGS

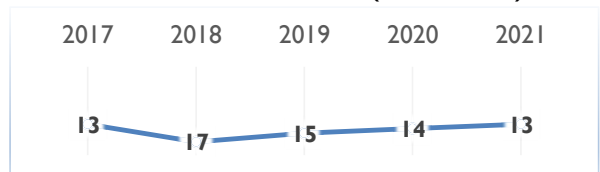


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	22	38	20	34	32
Training & education	16	39	38	34	34
Scientific concentration	61	49	59	62	64

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▷	Educational assessment PISA - Math		58		Employee training		36		Total expenditure on R&D (%)		-
▶	International experience		9	▶	Total public expenditure on education		6		Total R&D personnel per capita		-
	Foreign highly-skilled personnel		15		Higher education achievement		37		Female researchers		-
	Management of cities		22		Pupil-teacher ratio (tertiary education)		45		R&D productivity by publication		-
	Digital/Technological skills		17		Graduates in Sciences		42	▷	Scientific and technical employment		55
	Net flow of international students		39		Women with degrees		37	▷	High-tech patent grants		52
								▷	Robots in Education and R&D		55

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	48	50	39	25	30
Capital	36	31	13	5	15
Technological framework	41	56	54	47	35

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
	Starting a business		22		IT & media stock market capitalization		46		Communications technology		18
	Enforcing contracts		37		Funding for technological development		18		Mobile Broadband subscribers		30
	Immigration laws		34		Banking and financial services		22		Wireless broadband		16
	Development & application of tech.		19		Country credit rating		33	▶	Internet users		11
	Scientific research legislation		23		Venture capital		16		Internet bandwidth speed		47
	Intellectual property rights		30	▶	Investment in Telecommunications		7	▷	High-tech exports (%)		62

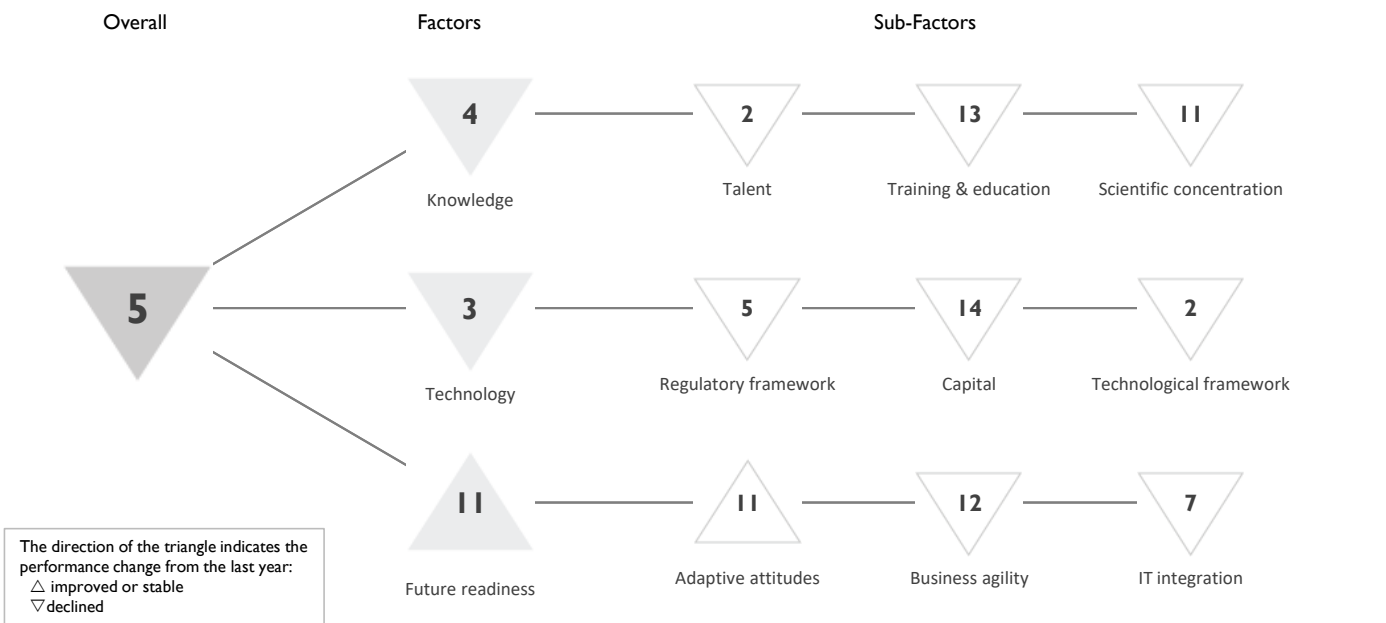
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	29	43	50	37	46
Business agility	38	48	36	28	35
IT integration	31	33	30	24	24

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
	E-Participation		51		Opportunities and threats		40		E-Government		38
	Internet retailing		42		World robots distribution		52		Public-private partnerships		18
	Tablet possession		31		Agility of companies		35	▶	Cyber security		3
	Smartphone possession		36		Use of big data and analytics		28		Software piracy		38
	Attitudes toward globalization		44		Knowledge transfer		33				
					Entrepreneurial fear of failure		29				

SINGAPORE

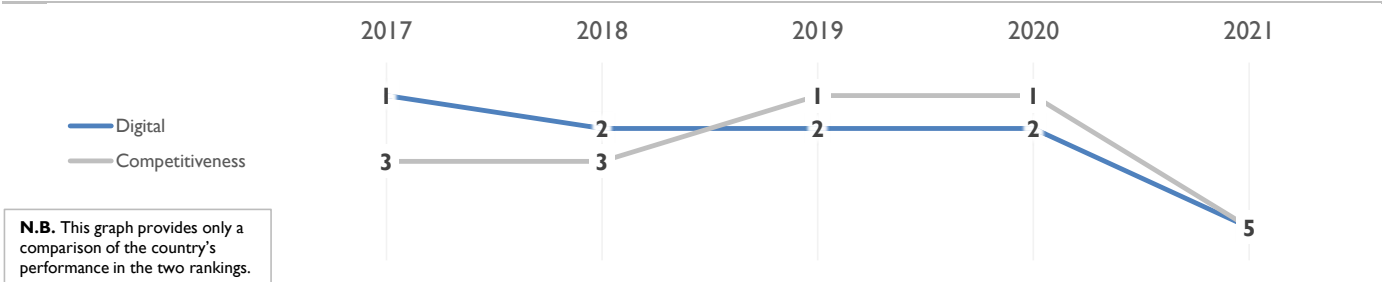
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

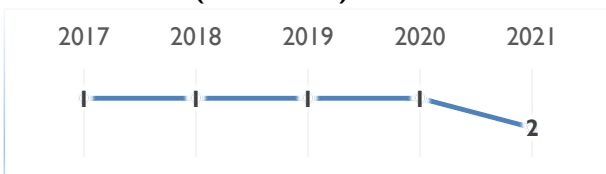
	2017	2018	2019	2020	2021
OVERALL	1	2	2	2	5
Knowledge	1	1	3	2	4
Technology	1	1	1	1	3
Future readiness	6	15	11	12	11

COMPETITIVENESS & DIGITAL RANKINGS

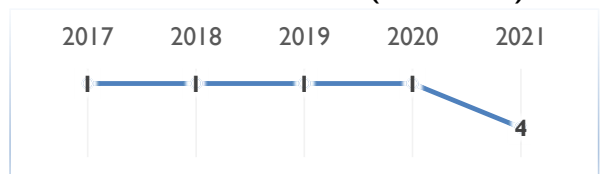


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	1	1	1	1	2
Training & education	9	1	4	7	13
Scientific concentration	8	19	22	10	11

Talent	Rank
Educational assessment PISA - Math	2
International experience	8
Foreign highly-skilled personnel	3
Management of cities	2
Digital/Technological skills	8
Net flow of international students	7

Training & education	Rank
Employee training	23
▶ Total public expenditure on education	63
Higher education achievement	2
▷ Pupil-teacher ratio (tertiary education)	27
Graduates in Sciences	4
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	20
Total R&D personnel per capita	15
▷ Female researchers	43
▷ R&D productivity by publication	39
Scientific and technical employment	27
▶ High-tech patent grants	1
Robots in Education and R&D	30

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	1	2	2	1	5
Capital	14	8	8	11	14
Technological framework	1	1	1	1	2

Regulatory framework	Rank
Starting a business	3
▶ Enforcing contracts	1
▷ Immigration laws	61
▶ Development & application of tech.	1
Scientific research legislation	8
Intellectual property rights	8

Capital	Rank
IT & media stock market capitalization	31
Funding for technological development	4
Banking and financial services	4
▶ Country credit rating	1
Venture capital	10
▷ Investment in Telecommunications	55

Technological framework	Rank
Communications technology	10
Mobile Broadband subscribers	20
Wireless broadband	8
Internet users	24
▶ Internet bandwidth speed	1
High-tech exports (%)	3

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	11	20	19	20	11
Business agility	14	18	6	11	12
IT integration	1	3	4	3	7

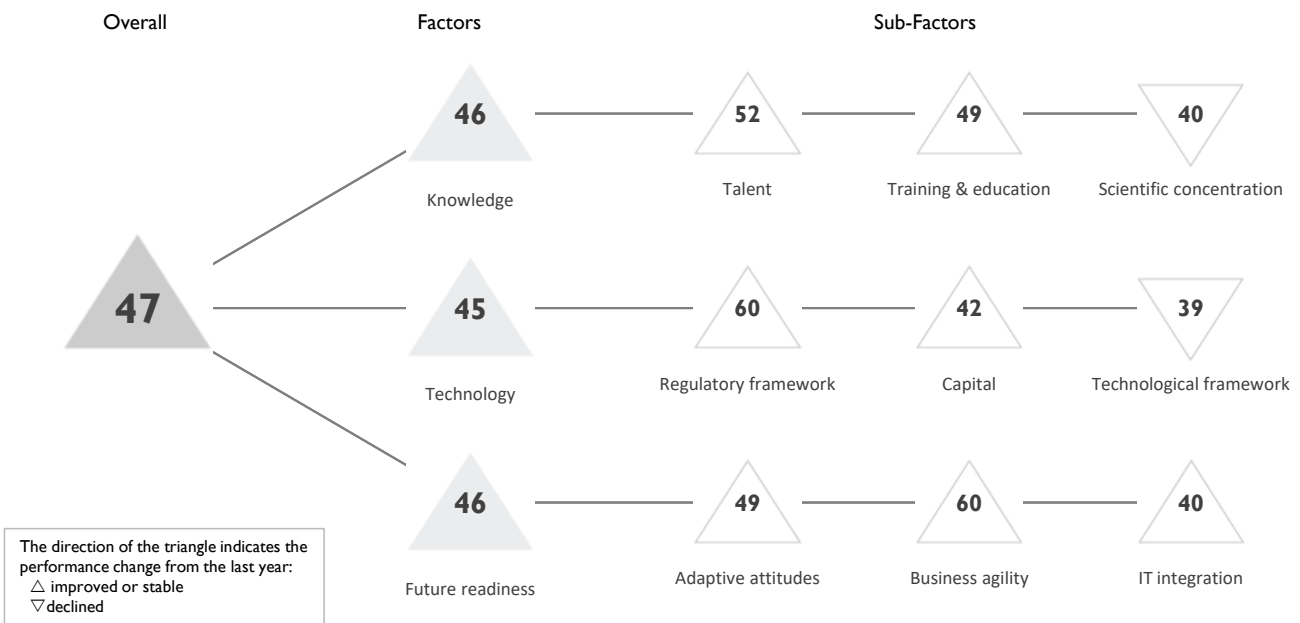
Adaptive attitudes	Rank
E-Participation	6
Internet retailing	24
Tablet possession	15
Smartphone possession	2
Attitudes toward globalization	9

Business agility	Rank
Opportunities and threats	17
World robots distribution	14
Agility of companies	13
Use of big data and analytics	14
Knowledge transfer	8
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	11
Public-private partnerships	3
Cyber security	8
Software piracy	17

SLOVAK REPUBLIC

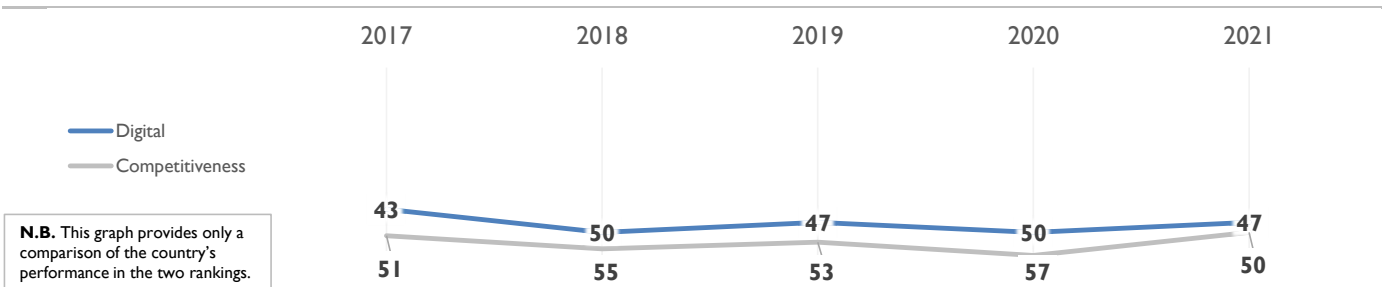
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

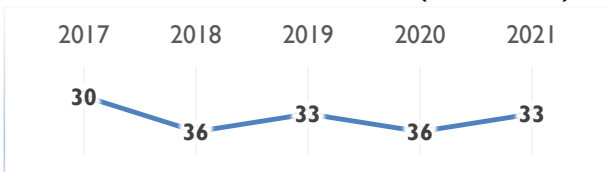
	2017	2018	2019	2020	2021
OVERALL	43	50	47	50	47
Knowledge	43	49	48	51	46
Technology	43	47	44	51	45
Future readiness	46	53	47	51	46

COMPETITIVENESS & DIGITAL RANKINGS

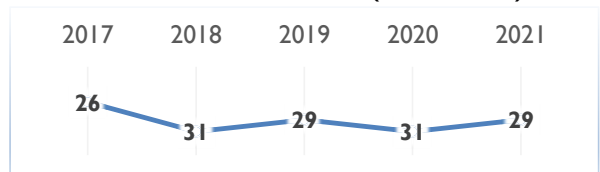


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



SLOVAK REPUBLIC

- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	50	56	54	53	52
Training & education	40	47	52	52	49
Scientific concentration	39	42	36	38	40

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	31	Employee training	54	Total expenditure on R&D (%)	45
International experience	57	Total public expenditure on education	41	Total R&D personnel per capita	34
▷ Foreign highly-skilled personnel	60	Higher education achievement	39	▶ Female researchers	21
Management of cities	51	▶ Pupil-teacher ratio (tertiary education)	26	R&D productivity by publication	38
Digital/Technological skills	37	Graduates in Sciences	41	Scientific and technical employment	46
Net flow of international students	58	Women with degrees	41	High-tech patent grants	30
				Robots in Education and R&D	32

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	55	60	58	61	60
Capital	39	46	43	47	42
Technological framework	38	34	37	38	39

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	49	IT & media stock market capitalization	57	Communications technology	44
Enforcing contracts	35	Funding for technological development	56	Mobile Broadband subscribers	37
Immigration laws	56	Banking and financial services	52	Wireless broadband	37
▷ Development & application of tech.	60	▶ Country credit rating	29	Internet users	36
▷ Scientific research legislation	61	Venture capital	53	Internet bandwidth speed	29
Intellectual property rights	59	▶ Investment in Telecommunications	5	High-tech exports (%)	42

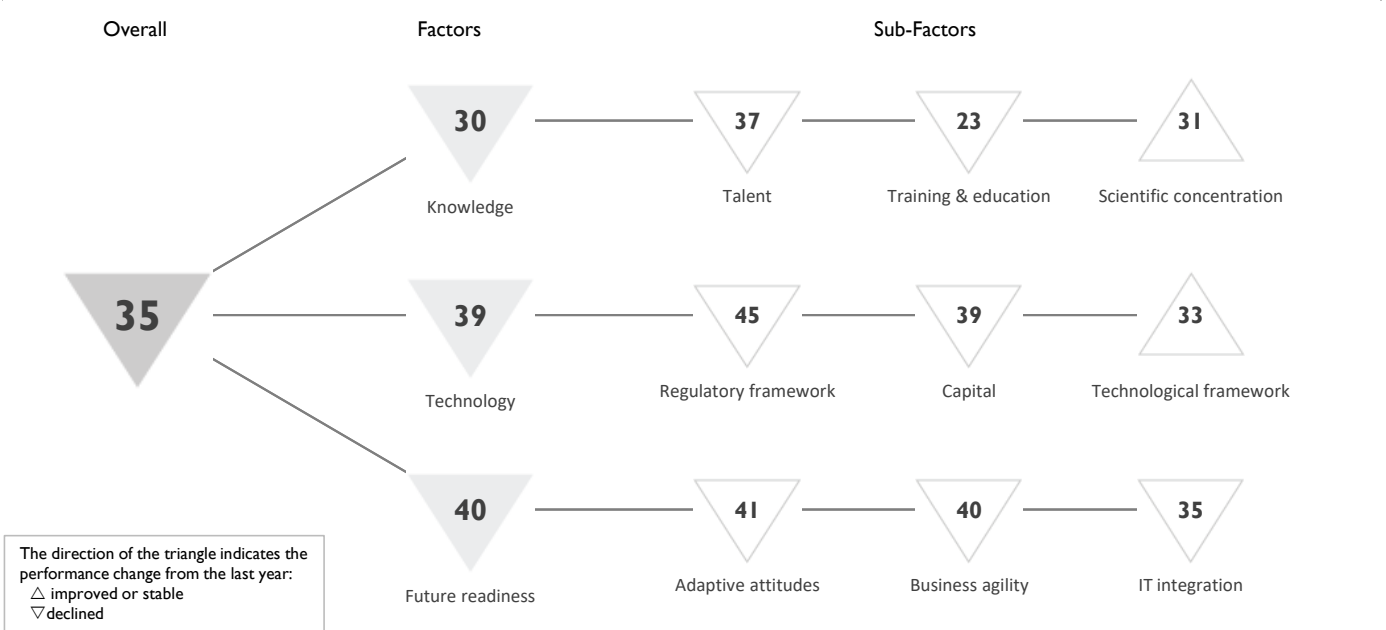
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	52	51	42	50	49
Business agility	52	58	61	62	60
IT integration	37	45	40	44	40

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	53	Opportunities and threats	58	E-Government	42
Internet retailing	31	World robots distribution	28	Public-private partnerships	47
Tablet possession	34	Agility of companies	45	Cyber security	56
Smartphone possession	32	Use of big data and analytics	47	▶ Software piracy	26
▷ Attitudes toward globalization	59	▶ Knowledge transfer	61		
		Entrepreneurial fear of failure	34		

SLOVENIA

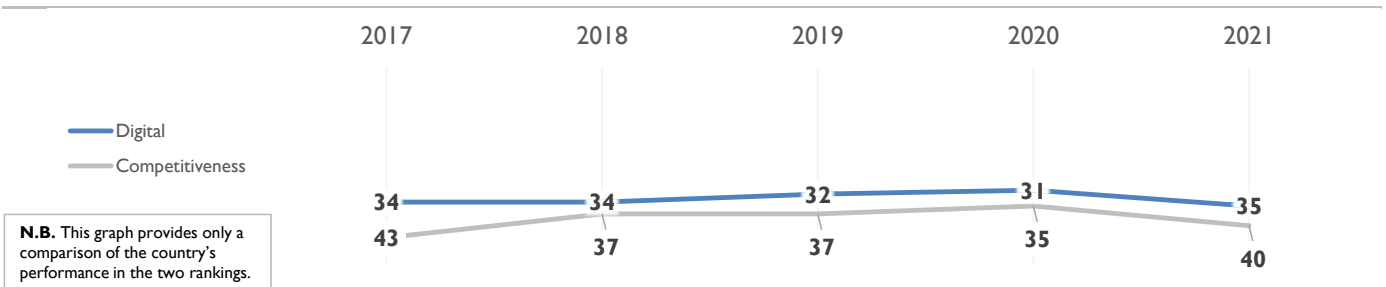
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

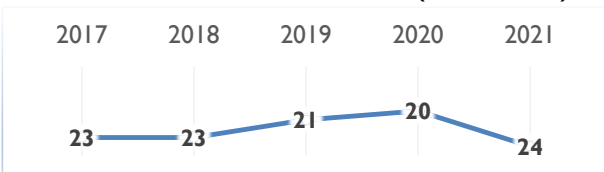
	2017	2018	2019	2020	2021
OVERALL	34	34	32	31	35
Knowledge	26	26	27	29	30
Technology	40	38	35	35	39
Future readiness	36	35	36	37	40

COMPETITIVENESS & DIGITAL RANKINGS

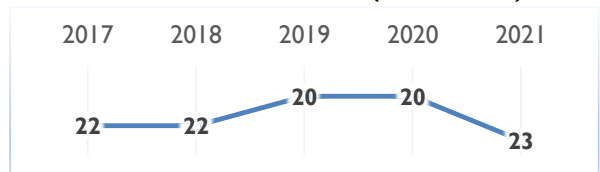


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	37	35	33	35	37
Training & education	17	23	22	22	23
Scientific concentration	24	25	25	33	31

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▶ Educational assessment PISA - Math	13	Employee training	20	Total expenditure on R&D (%)	18						
International experience	39	Total public expenditure on education	25	▶ Total R&D personnel per capita	14						
▷ Foreign highly-skilled personnel	57	Higher education achievement	29	Female researchers	42						
Management of cities	41	▶ Pupil-teacher ratio (tertiary education)	15	▷ R&D productivity by publication	58						
Digital/Technological skills	27	Graduates in Sciences	19	Scientific and technical employment	24						
Net flow of international students	36	Women with degrees	31	High-tech patent grants	20						
				Robots in Education and R&D	33						

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	44	42	37	38	45
Capital	40	29	31	28	39
Technological framework	44	45	33	34	33

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	25	IT & media stock market capitalization	43	Communications technology	31						
▷ Enforcing contracts	54	Funding for technological development	39	▶ Mobile Broadband subscribers	2						
Immigration laws	44	Banking and financial services	44	Wireless broadband	44						
Development & application of tech.	48	Country credit rating	31	Internet users	41						
Scientific research legislation	40	Venture capital	51	Internet bandwidth speed	27						
Intellectual property rights	41	▶ Investment in Telecommunications	13	High-tech exports (%)	50						

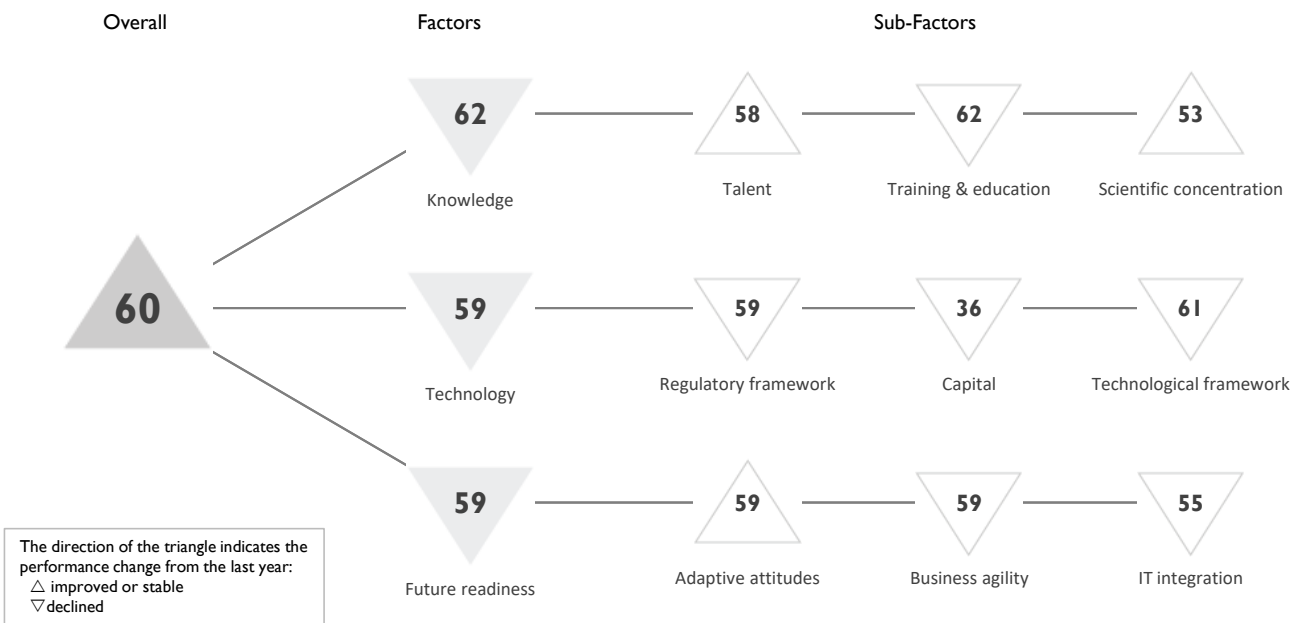
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	37	44	44	38	41
Business agility	43	30	34	31	40
IT integration	30	29	31	31	35

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	28	Opportunities and threats	34	E-Government	22						
Internet retailing	40	World robots distribution	36	Public-private partnerships	51						
Tablet possession	29	Agility of companies	31	Cyber security	31						
▷ Smartphone possession	51	Use of big data and analytics	43	Software piracy	30						
▷ Attitudes toward globalization	53	Knowledge transfer	41								
		Entrepreneurial fear of failure	30								

SOUTH AFRICA

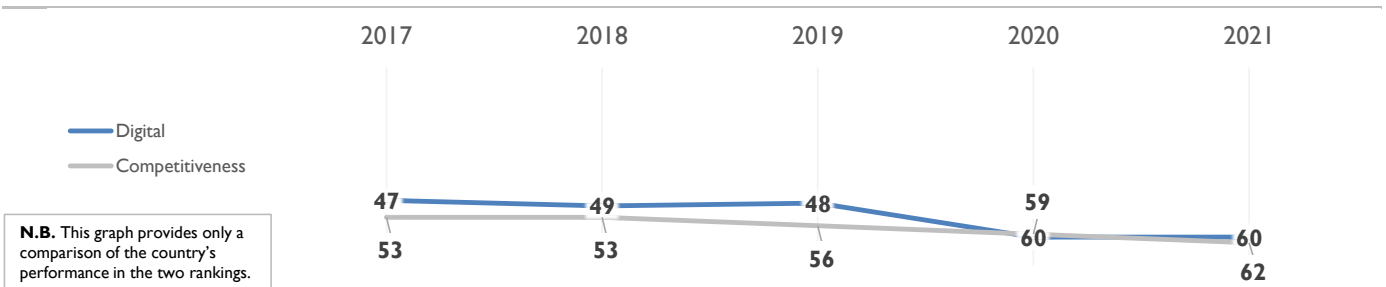
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

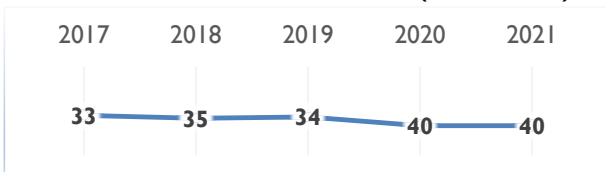
	2017	2018	2019	2020	2021
OVERALL	47	49	48	60	60
Knowledge	49	52	54	60	62
Technology	53	52	51	55	59
Future readiness	42	43	44	57	59

COMPETITIVENESS & DIGITAL RANKINGS

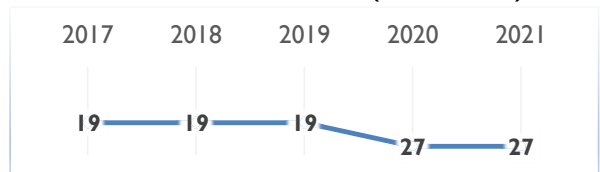


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	52	54	49	59	58
Training & education	37	54	58	60	62
Scientific concentration	49	47	48	53	53

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	-	Employee training	52	Total expenditure on R&D (%)	44
International experience	56	▶ Total public expenditure on education	2	Total R&D personnel per capita	51
Foreign highly-skilled personnel	50	Higher education achievement	60	▶ Female researchers	16
▷ Management of cities	63	Pupil-teacher ratio (tertiary education)	46	R&D productivity by publication	26
Digital/Technological skills	57	Graduates in Sciences	55	Scientific and technical employment	-
Net flow of international students	32	Women with degrees	55	High-tech patent grants	59
				Robots in Education and R&D	39

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	54	53	53	56	59
Capital	35	27	30	32	36
Technological framework	57	58	59	57	61

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	59	▶ IT & media stock market capitalization	8	Communications technology	59
Enforcing contracts	51	Funding for technological development	58	▷ Mobile Broadband subscribers	61
▷ Immigration laws	63	Banking and financial services	43	Wireless broadband	47
Development & application of tech.	53	Country credit rating	56	▷ Internet users	63
Scientific research legislation	44	Venture capital	56	Internet bandwidth speed	56
Intellectual property rights	49	▶ Investment in Telecommunications	4	High-tech exports (%)	55

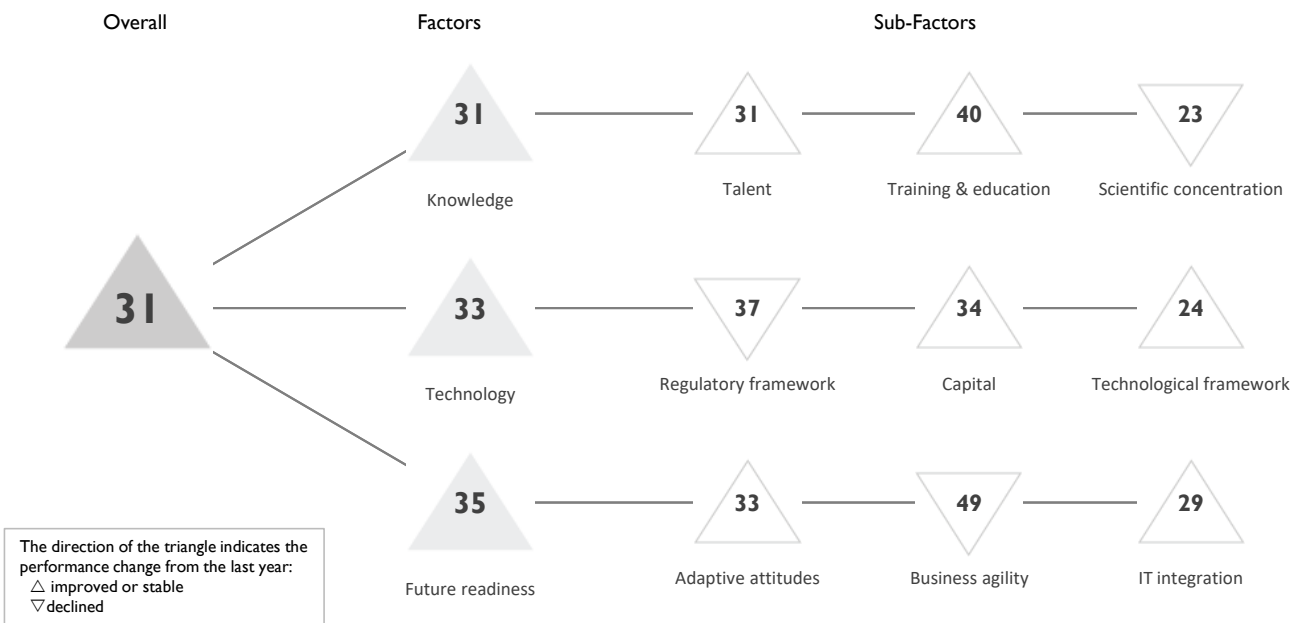
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	54	56	55	59	59
Business agility	37	38	40	58	59
IT integration	42	39	42	50	55

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	45	Opportunities and threats	49	E-Government	56
Internet retailing	59	World robots distribution	33	▷ Public-private partnerships	61
Tablet possession	57	Agility of companies	55	Cyber security	57
Smartphone possession	44	Use of big data and analytics	40	▶ Software piracy	20
Attitudes toward globalization	56	Knowledge transfer	55		
		Entrepreneurial fear of failure	48		

SPAIN

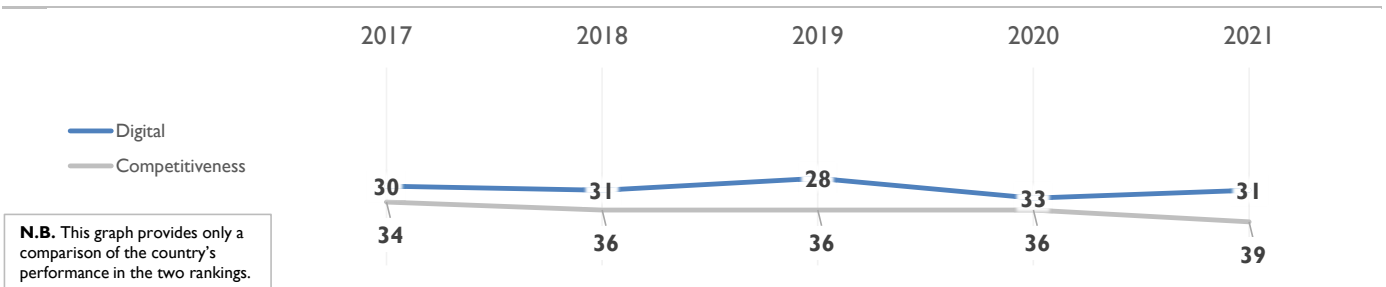
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

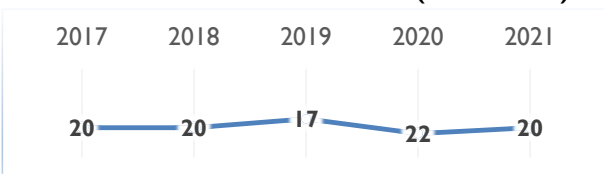
	2017	2018	2019	2020	2021
OVERALL	30	31	28	33	31
Knowledge	33	31	28	32	31
Technology	33	33	29	33	33
Future readiness	29	30	27	40	35

COMPETITIVENESS & DIGITAL RANKINGS

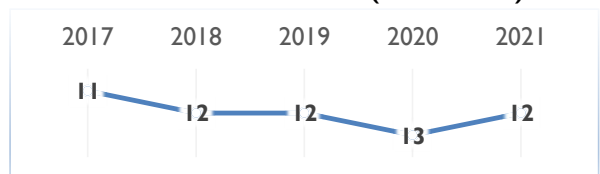


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	32	32	29	32	31
Training & education	42	40	40	42	40
Scientific concentration	29	27	20	20	23

Talent	Rank
Educational assessment PISA - Math	33
International experience	41
Foreign highly-skilled personnel	24
Management of cities	26
Digital/Technological skills	35
Net flow of international students	31

Training & education	Rank
Employee training	48
Total public expenditure on education	43
Higher education achievement	28
Pupil-teacher ratio (tertiary education)	20
Graduates in Sciences	39
Women with degrees	27

Scientific concentration	Rank
Total expenditure on R&D (%)	33
Total R&D personnel per capita	28
Female researchers	22
▶ R&D productivity by publication	10
Scientific and technical employment	25
High-tech patent grants	43
▶ Robots in Education and R&D	9

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	35	36	34	36	37
Capital	34	37	33	34	34
Technological framework	23	29	23	27	24

Regulatory framework	Rank
Starting a business	41
Enforcing contracts	23
Immigration laws	22
Development & application of tech.	37
▷ Scientific research legislation	53
Intellectual property rights	29

Capital	Rank
IT & media stock market capitalization	20
Funding for technological development	42
Banking and financial services	35
Country credit rating	38
Venture capital	29
Investment in Telecommunications	27

Technological framework	Rank
Communications technology	19
Mobile Broadband subscribers	27
Wireless broadband	31
Internet users	19
▶ Internet bandwidth speed	16
▷ High-tech exports (%)	52

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	24	26	25	35	33
Business agility	47	44	38	48	49
IT integration	26	27	25	30	29

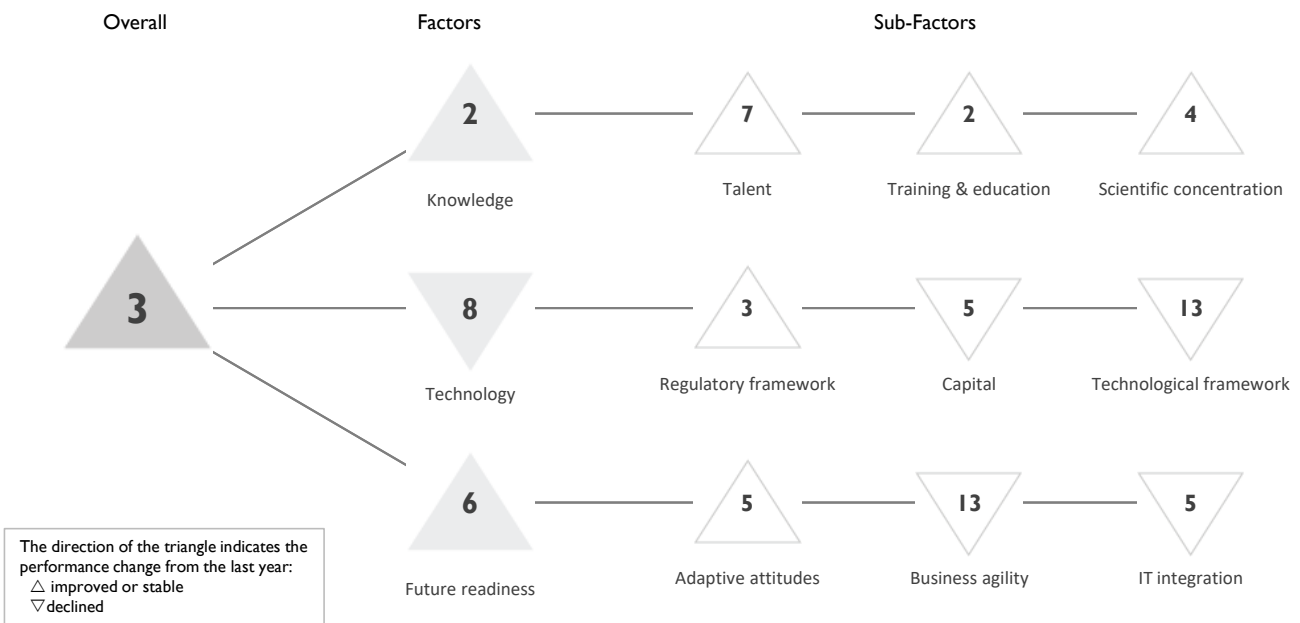
Adaptive attitudes	Rank
E-Participation	34
Internet retailing	29
Tablet possession	26
▷ Smartphone possession	56
Attitudes toward globalization	28

Business agility	Rank
Opportunities and threats	47
▶ World robots distribution	10
Agility of companies	41
▷ Use of big data and analytics	55
▷ Knowledge transfer	48
Entrepreneurial fear of failure	46

IT integration	Rank
▶ E-Government	17
Public-private partnerships	26
Cyber security	40
Software piracy	32

SWEDEN

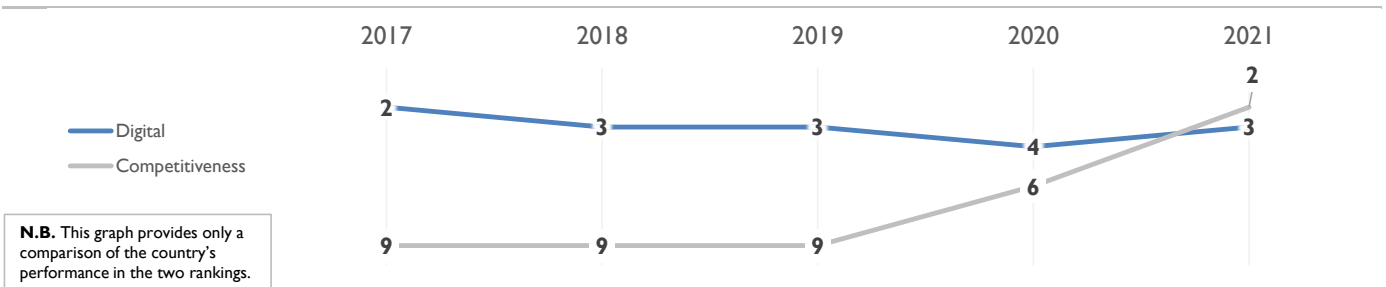
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

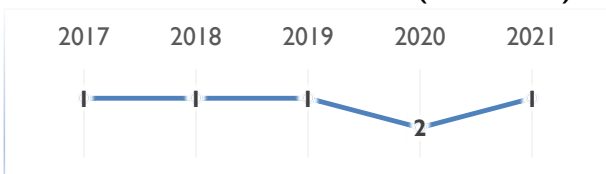
	2017	2018	2019	2020	2021
OVERALL	2	3	3	4	3
Knowledge	2	7	4	4	2
Technology	5	5	7	6	8
Future readiness	5	5	6	7	6

COMPETITIVENESS & DIGITAL RANKINGS

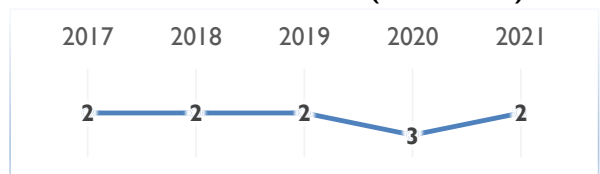


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	11	10	8	9	7
Training & education	1	5	2	2	2
Scientific concentration	5	3	3	6	4

Talent	Rank
Educational assessment PISA - Math	16
International experience	5
Foreign highly-skilled personnel	19
Management of cities	10
Digital/Technological skills	2
Net flow of international students	22

Training & education	Rank
Employee training	3
Total public expenditure on education	5
Higher education achievement	22
Pupil-teacher ratio (tertiary education)	22
Graduates in Sciences	21
Women with degrees	14

Scientific concentration	Rank
Total expenditure on R&D (%)	4
Total R&D personnel per capita	12
▷ Female researchers	41
▷ R&D productivity by publication	40
Scientific and technical employment	3
High-tech patent grants	7
Robots in Education and R&D	22

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	4	12	5	5	3
Capital	13	10	4	4	5
Technological framework	7	7	12	11	13

Regulatory framework	Rank
Starting a business	23
Enforcing contracts	31
Immigration laws	13
Development & application of tech.	2
Scientific research legislation	2
Intellectual property rights	4

Capital	Rank
IT & media stock market capitalization	21
▶ Funding for technological development	1
Banking and financial services	8
▶ Country credit rating	1
▶ Venture capital	2
▷ Investment in Telecommunications	36

Technological framework	Rank
Communications technology	5
Mobile Broadband subscribers	23
Wireless broadband	19
Internet users	8
Internet bandwidth speed	7
▷ High-tech exports (%)	28

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	7	9	8	8	5
Business agility	13	10	13	10	13
IT integration	4	11	12	4	5

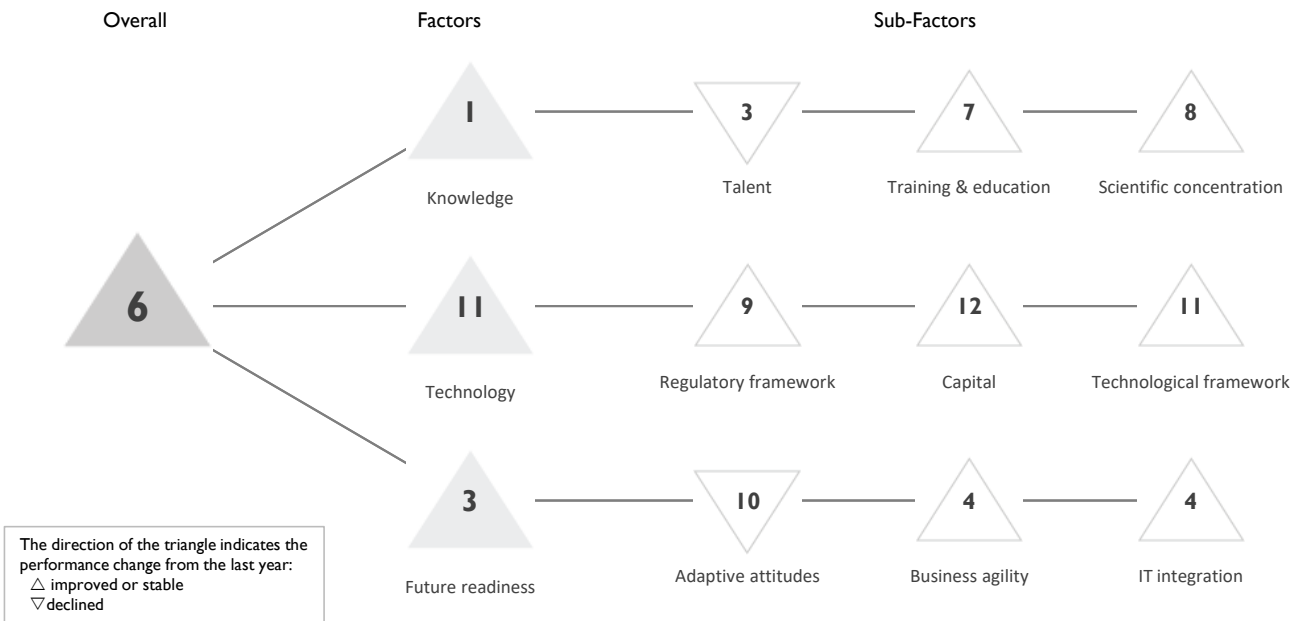
Adaptive attitudes	Rank
E-Participation	35
Internet retailing	14
▶ Tablet possession	2
Smartphone possession	6
▶ Attitudes toward globalization	1

Business agility	Rank
Opportunities and threats	9
World robots distribution	21
Agility of companies	10
Use of big data and analytics	10
Knowledge transfer	4
▷ Entrepreneurial fear of failure	31

IT integration	Rank
E-Government	6
Public-private partnerships	13
Cyber security	19
Software piracy	6

SWITZERLAND

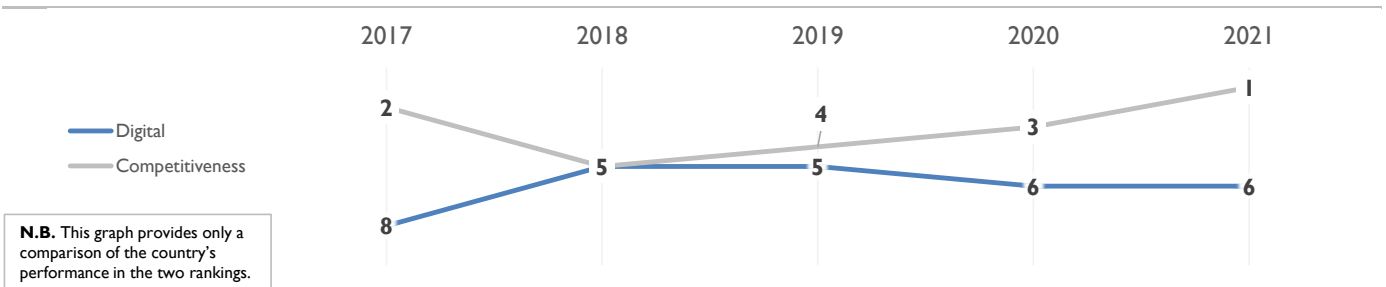
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

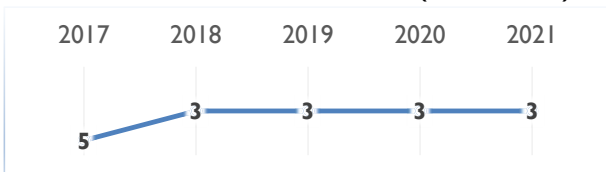
	2017	2018	2019	2020	2021
OVERALL	8	5	5	6	6
Knowledge	4	6	2	3	1
Technology	8	9	10	11	11
Future readiness	13	10	10	5	3

COMPETITIVENESS & DIGITAL RANKINGS

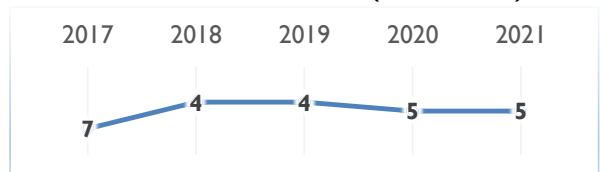


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	2	2	2	2	3
Training & education	25	15	15	14	7
Scientific concentration	13	6	7	9	8

Talent	Rank
Educational assessment PISA - Math	10
▶ International experience	1
▶ Foreign highly-skilled personnel	1
Management of cities	6
Digital/Technological skills	11
Net flow of international students	10

Training & education	Rank
Employee training	4
Total public expenditure on education	17
Higher education achievement	14
Pupil-teacher ratio (tertiary education)	6
Graduates in Sciences	29
Women with degrees	29

Scientific concentration	Rank
Total expenditure on R&D (%)	7
Total R&D personnel per capita	4
▷ Female researchers	33
▷ R&D productivity by publication	37
Scientific and technical employment	4
High-tech patent grants	26
Robots in Education and R&D	14

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	13	15	14	10	9
Capital	11	15	16	14	12
Technological framework	10	8	9	14	11

Regulatory framework	Rank
Starting a business	37
▷ Enforcing contracts	41
Immigration laws	18
Development & application of tech.	6
Scientific research legislation	1
▶ Intellectual property rights	1

Capital	Rank
▷ IT & media stock market capitalization	44
Funding for technological development	9
Banking and financial services	5
▶ Country credit rating	1
Venture capital	11
Investment in Telecommunications	31

Technological framework	Rank
Communications technology	8
Mobile Broadband subscribers	6
▷ Wireless broadband	38
Internet users	13
Internet bandwidth speed	3
High-tech exports (%)	31

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	23	12	11	9	10
Business agility	4	7	14	6	4
IT integration	13	16	7	7	4

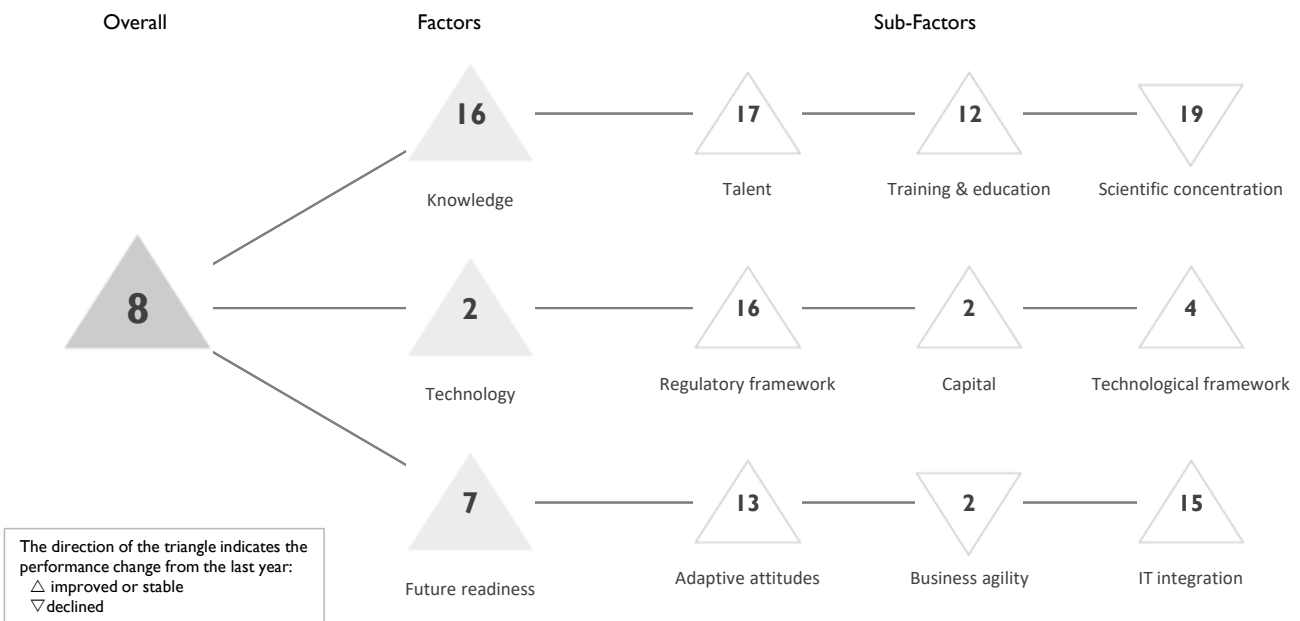
Adaptive attitudes	Rank
E-Participation	18
Internet retailing	8
Tablet possession	9
Smartphone possession	4
Attitudes toward globalization	21

Business agility	Rank
Opportunities and threats	11
World robots distribution	25
Agility of companies	6
Use of big data and analytics	23
▶ Knowledge transfer	1
Entrepreneurial fear of failure	3

IT integration	Rank
E-Government	16
Public-private partnerships	5
Cyber security	7
Software piracy	10

TAIWAN, CHINA

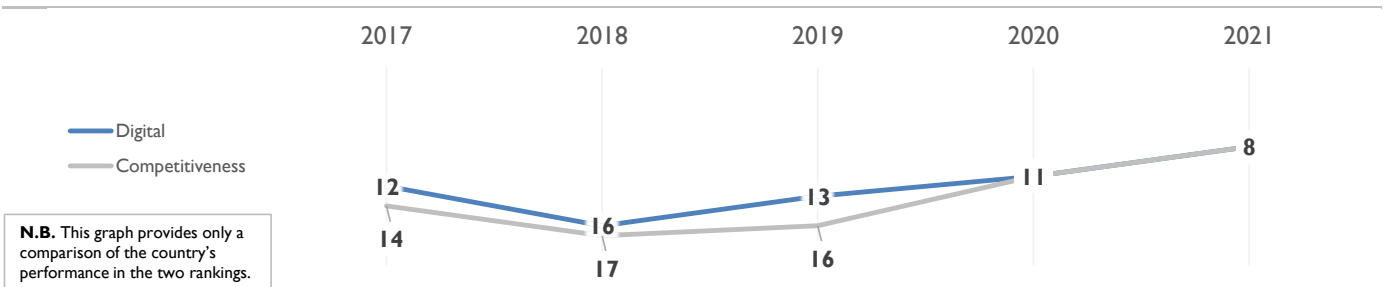
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

	2017	2018	2019	2020	2021
OVERALL	12	16	13	11	8
Knowledge	16	19	17	18	16
Technology	7	11	9	5	2
Future readiness	16	22	12	8	7

COMPETITIVENESS & DIGITAL RANKINGS

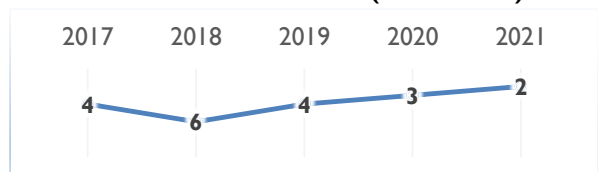


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	18	25	21	18	17
Training & education	28	25	20	21	12
Scientific concentration	17	13	15	18	19

Talent	Rank
Educational assessment PISA - Math	4
International experience	27
Foreign highly-skilled personnel	38
Management of cities	19
Digital/Technological skills	25
Net flow of international students	11

Training & education	Rank
Employee training	5
▷ Total public expenditure on education	51
▶ Higher education achievement	3
▷ Pupil-teacher ratio (tertiary education)	53
Graduates in Sciences	5
Women with degrees	18

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	3
▶ Total R&D personnel per capita	1
▷ Female researchers	52
R&D productivity by publication	36
▷ Scientific and technical employment	44
High-tech patent grants	17
Robots in Education and R&D	20

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	24	21	23	16	16
Capital	8	13	12	8	2
Technological framework	4	10	4	4	4

Regulatory framework	Rank
Starting a business	10
Enforcing contracts	11
Immigration laws	29
Development & application of tech.	20
Scientific research legislation	16
Intellectual property rights	21

Capital	Rank
▶ IT & media stock market capitalization	1
Funding for technological development	17
Banking and financial services	13
Country credit rating	21
Venture capital	12
▷ Investment in Telecommunications	47

Technological framework	Rank
Communications technology	24
▶ Mobile Broadband subscribers	1
Wireless broadband	13
Internet users	20
Internet bandwidth speed	19
High-tech exports (%)	5

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	19	28	14	14	13
Business agility	6	13	3	1	2
IT integration	22	23	24	17	15

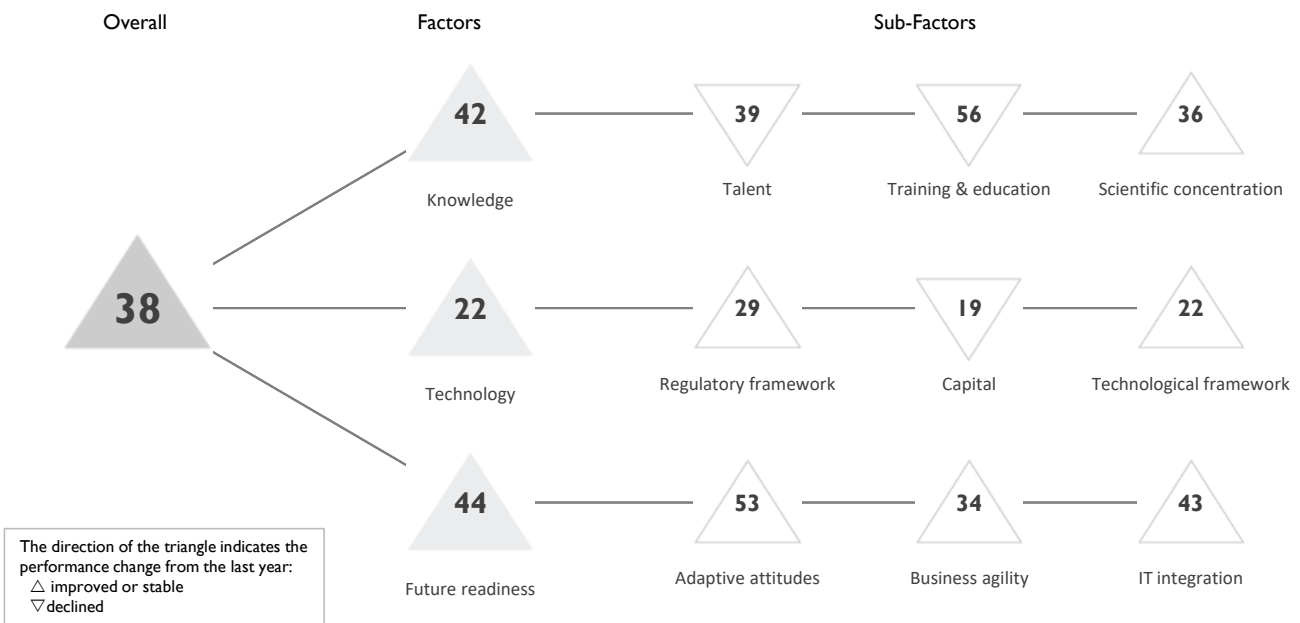
Adaptive attitudes	Rank
E-Participation	-
Internet retailing	23
Tablet possession	25
Smartphone possession	3
Attitudes toward globalization	4

Business agility	Rank
Opportunities and threats	5
World robots distribution	7
Agility of companies	3
Use of big data and analytics	4
Knowledge transfer	11
Entrepreneurial fear of failure	11

IT integration	Rank
E-Government	-
Public-private partnerships	15
Cyber security	10
Software piracy	25

THAILAND

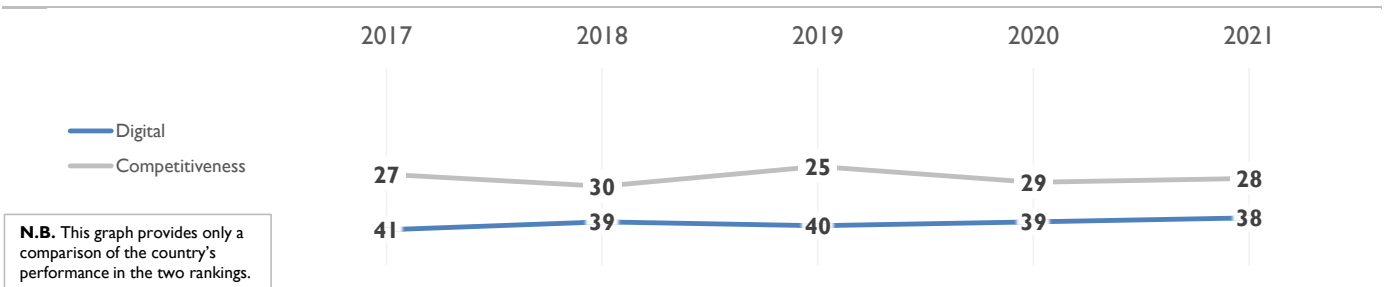
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

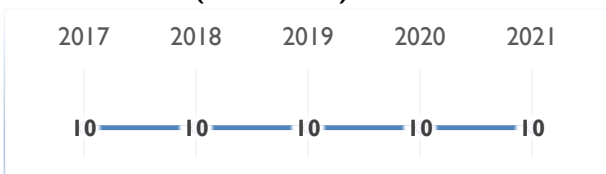
	2017	2018	2019	2020	2021
OVERALL	41	39	40	39	38
Knowledge	44	44	43	43	42
Technology	30	28	27	22	22
Future readiness	45	49	50	45	44

COMPETITIVENESS & DIGITAL RANKINGS

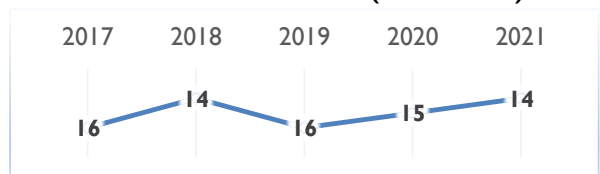


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	42	42	40	36	39
Training & education	47	44	50	55	56
Scientific concentration	43	45	35	37	36

Talent	Rank
Educational assessment PISA - Math	48
International experience	25
Foreign highly-skilled personnel	22
Management of cities	28
Digital/Technological skills	42
Net flow of international students	37

Training & education	Rank
Employee training	20
▷ Total public expenditure on education	59
Higher education achievement	49
▷ Pupil-teacher ratio (tertiary education)	56
Graduates in Sciences	17
Women with degrees	47

Scientific concentration	Rank
Total expenditure on R&D (%)	36
Total R&D personnel per capita	40
▶ Female researchers	6
R&D productivity by publication	31
▷ Scientific and technical employment	58
High-tech patent grants	42
Robots in Education and R&D	17

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	38	34	33	31	29
Capital	21	28	21	17	19
Technological framework	30	23	29	25	22

Regulatory framework	Rank
Starting a business	27
Enforcing contracts	29
Immigration laws	20
Development & application of tech.	30
Scientific research legislation	31
Intellectual property rights	37

Capital	Rank
IT & media stock market capitalization	16
Funding for technological development	26
Banking and financial services	16
Country credit rating	42
Venture capital	26
▶ Investment in Telecommunications	10

Technological framework	Rank
Communications technology	22
Mobile Broadband subscribers	21
Wireless broadband	24
Internet users	49
Internet bandwidth speed	20
▶ High-tech exports (%)	12

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	51	55	58	53	53
Business agility	32	34	30	44	34
IT integration	53	55	51	43	43

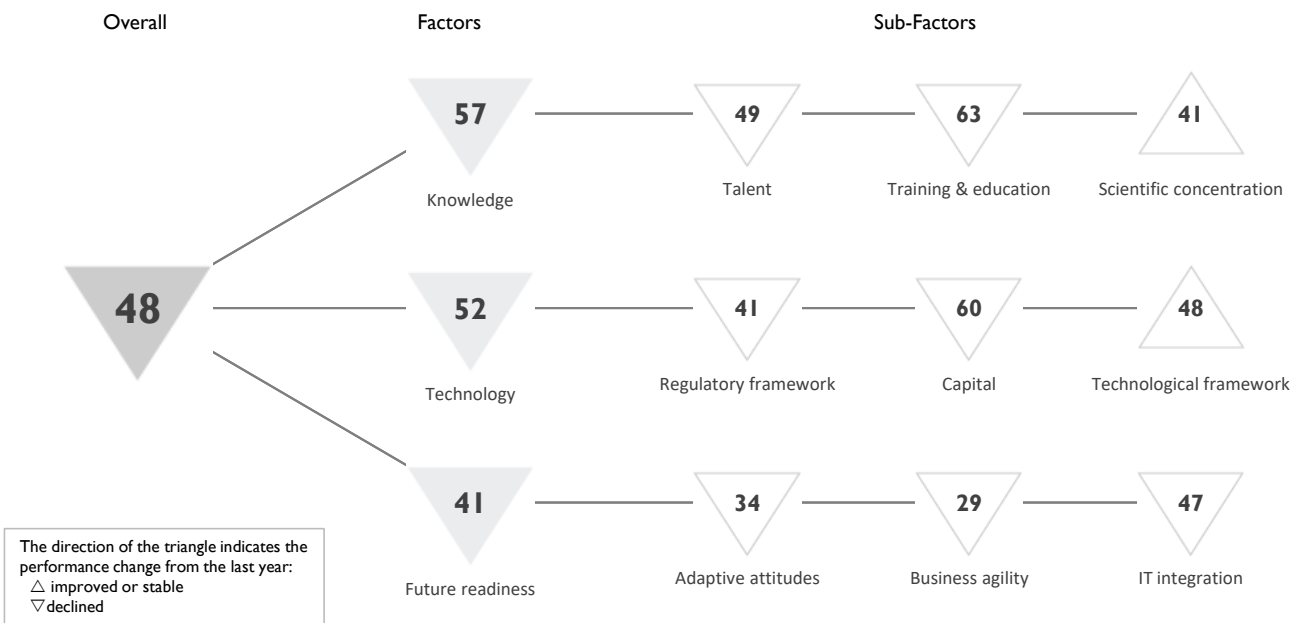
Adaptive attitudes	Rank
E-Participation	42
Internet retailing	46
▷ Tablet possession	58
Smartphone possession	46
▶ Attitudes toward globalization	12

Business agility	Rank
Opportunities and threats	25
▶ World robots distribution	11
Agility of companies	29
Use of big data and analytics	29
Knowledge transfer	24
Entrepreneurial fear of failure	54

IT integration	Rank
E-Government	49
Public-private partnerships	22
Cyber security	29
▷ Software piracy	56

TURKEY

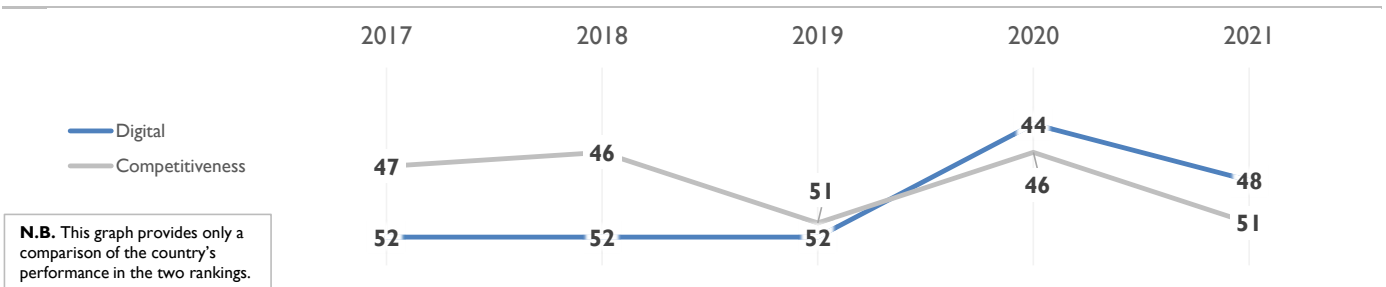
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

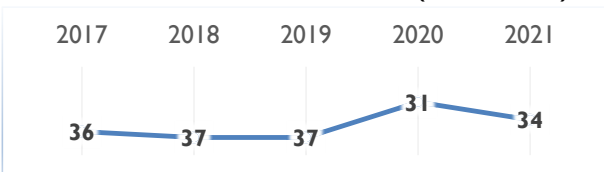
	2017	2018	2019	2020	2021
OVERALL	52	52	52	44	48
Knowledge	60	59	60	56	57
Technology	49	45	48	42	52
Future readiness	40	42	41	34	41

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	49	49	52	38	49
Training & education	63	62	63	62	63
Scientific concentration	48	48	43	45	41

Talent		Training & education		Scientific concentration	
	Rank		Rank		Rank
Educational assessment PISA - Math	39	Employee training	50	Total expenditure on R&D (%)	38
▷ International experience	59	Total public expenditure on education	34	Total R&D personnel per capita	41
Foreign highly-skilled personnel	55	Higher education achievement	44	Female researchers	30
Management of cities	42	▷ Pupil-teacher ratio (tertiary education)	60	▶ R&D productivity by publication	13
Digital/Technological skills	39	Graduates in Sciences	49	Scientific and technical employment	45
Net flow of international students	28	Women with degrees	50	High-tech patent grants	54
				Robots in Education and R&D	28

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	40	37	38	34	41
Capital	47	41	56	51	60
Technological framework	51	51	50	51	48

Regulatory framework		Capital		Technological framework	
	Rank		Rank		Rank
Starting a business	36	IT & media stock market capitalization	30	Communications technology	49
▶ Enforcing contracts	21	Funding for technological development	45	▶ Mobile Broadband subscribers	4
Immigration laws	38	Banking and financial services	37	Wireless broadband	55
Development & application of tech.	47	▷ Country credit rating	60	Internet users	44
Scientific research legislation	45	Venture capital	55	▷ Internet bandwidth speed	59
Intellectual property rights	58	Investment in Telecommunications	52	▷ High-tech exports (%)	59

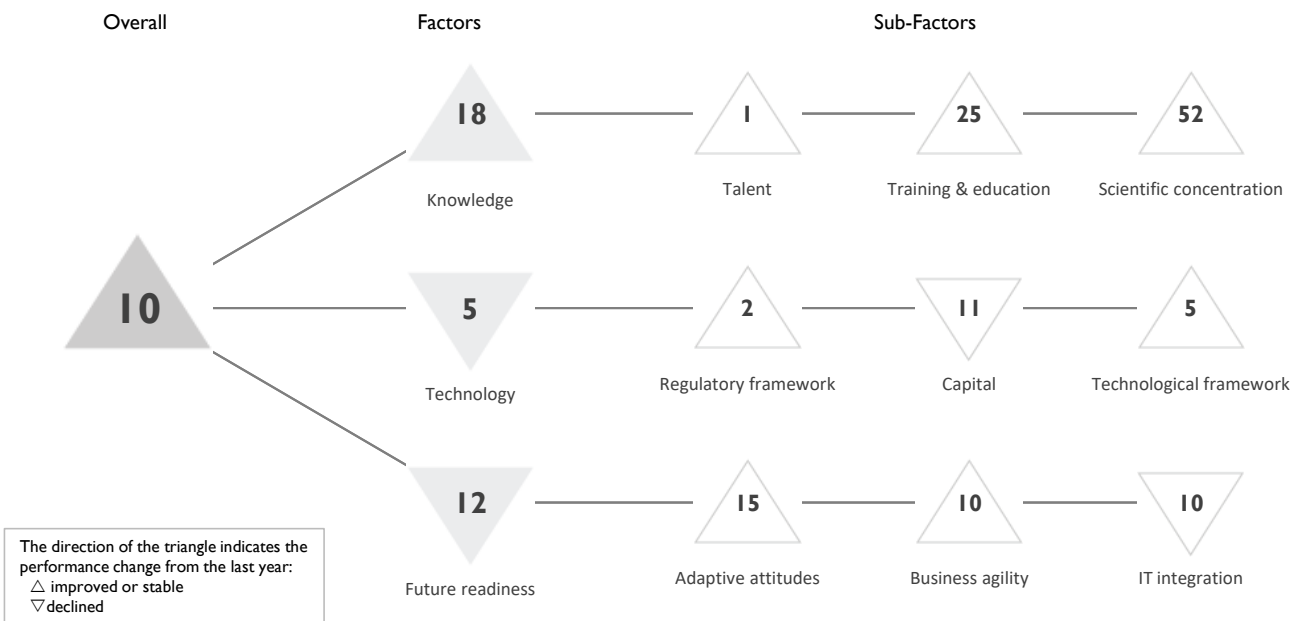
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	36	42	38	32	34
Business agility	39	42	44	20	29
IT integration	51	50	48	42	47

Adaptive attitudes		Business agility		IT integration	
	Rank		Rank		Rank
E-Participation	22	▶ Opportunities and threats	18	E-Government	46
Internet retailing	41	World robots distribution	19	Public-private partnerships	44
Tablet possession	44	Agility of companies	32	Cyber security	46
Smartphone possession	38	Use of big data and analytics	54	Software piracy	48
Attitudes toward globalization	40	Knowledge transfer	53		
		▶ Entrepreneurial fear of failure	6		

UAE

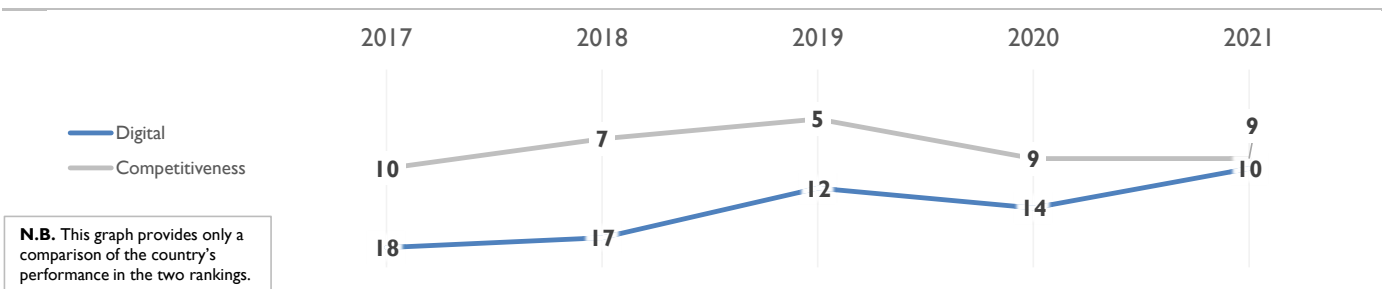
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

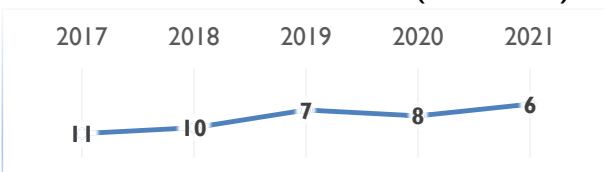
	2017	2018	2019	2020	2021
OVERALL	18	17	12	14	10
Knowledge	38	36	35	31	18
Technology	14	7	2	4	5
Future readiness	7	12	9	11	12

COMPETITIVENESS & DIGITAL RANKINGS

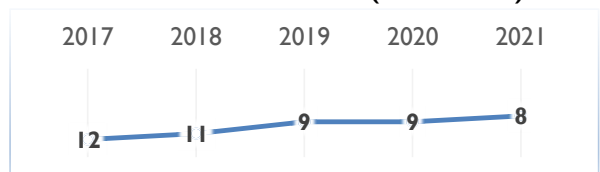


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (35 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	5	4	5	5	1
Training & education	56	53	41	44	25
Scientific concentration	52	56	56	52	52

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
▷	Educational assessment PISA - Math		45		Employee training		8		Total expenditure on R&D (%)		30
▶	International experience		2	▷	Total public expenditure on education		55		Total R&D personnel per capita		32
	Foreign highly-skilled personnel		2		Higher education achievement		16		Female researchers		39
	Management of cities		3	▷	Pupil-teacher ratio (tertiary education)		44	▷	R&D productivity by publication		53
	Digital/Technological skills		10		Graduates in Sciences		9		Scientific and technical employment		32
▶	Net flow of international students		1		Women with degrees		10		High-tech patent grants		31
									Robots in Education and R&D		43

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	5	3	1	3	2
Capital	12	11	2	10	11
Technological framework	29	16	5	8	5

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
	Starting a business		8		IT & media stock market capitalization		13		Communications technology		23
	Enforcing contracts		9		Funding for technological development		8		Mobile Broadband subscribers		12
▶	Immigration laws		1		Banking and financial services		10	▶	Wireless broadband		1
	Development & application of tech.		9		Country credit rating		16		Internet users		4
	Scientific research legislation		7		Venture capital		9		Internet bandwidth speed		31
	Intellectual property rights		22		Investment in Telecommunications		40		High-tech exports (%)		39

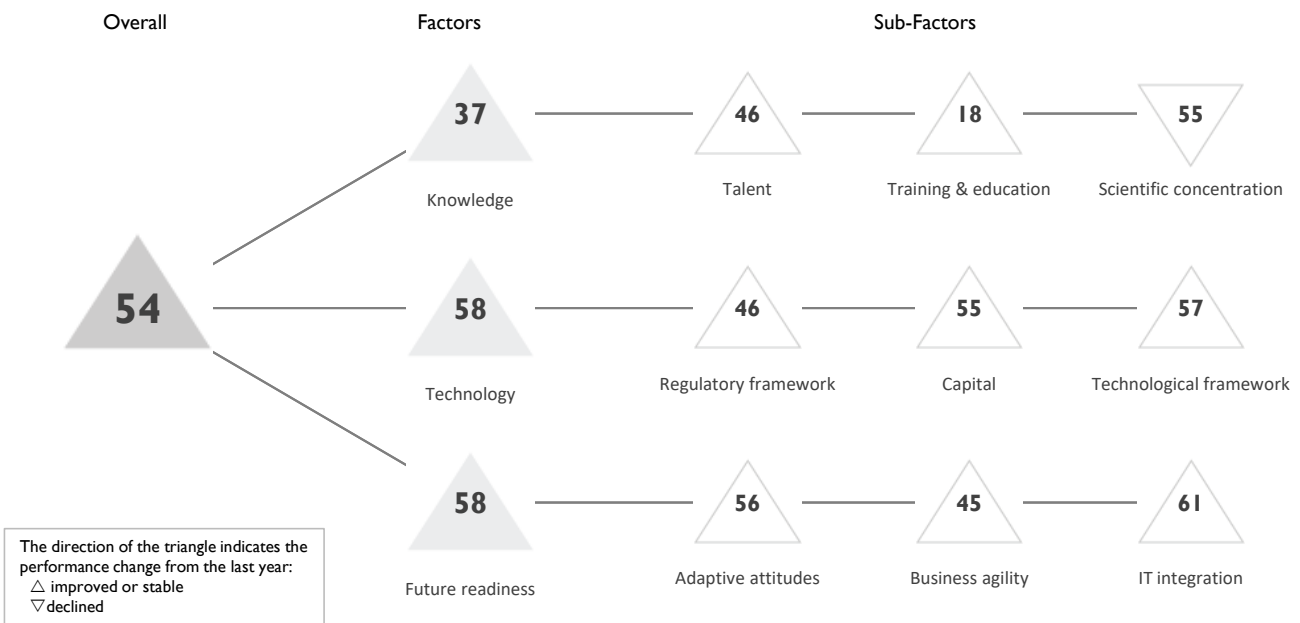
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	17	21	20	15	15
Business agility	1	1	4	12	10
IT integration	8	14	8	8	10

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
	E-Participation		16		Opportunities and threats		3		E-Government		21
	Internet retailing		27	▷	World robots distribution		53		Public-private partnerships		10
	Tablet possession		12		Agility of companies		4	▶	Cyber security		1
	Smartphone possession		18		Use of big data and analytics		3		Software piracy		20
	Attitudes toward globalization		2		Knowledge transfer		9				
					Entrepreneurial fear of failure		28				

UKRAINE

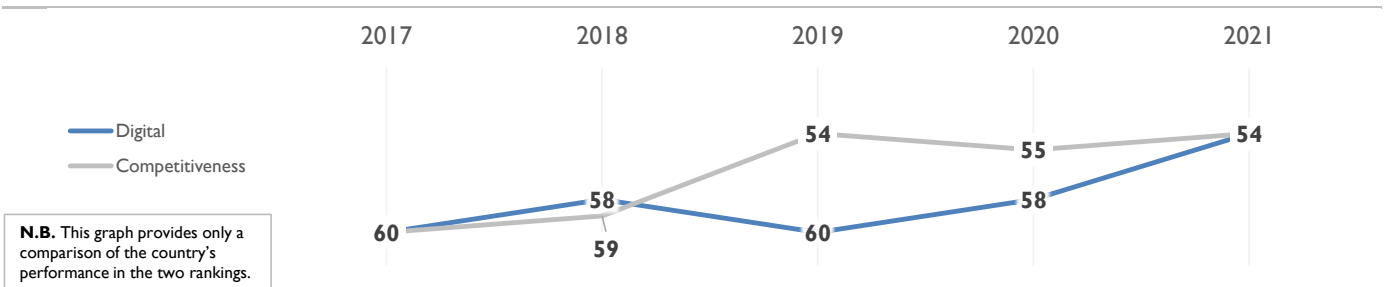
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

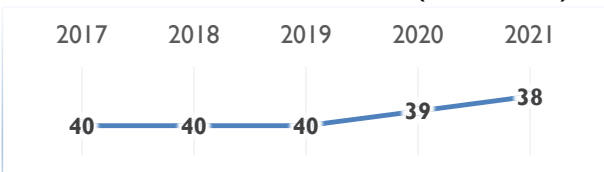
	2017	2018	2019	2020	2021
OVERALL	60	58	60	58	54
Knowledge	45	39	40	38	37
Technology	62	61	61	59	58
Future readiness	61	61	62	61	58

COMPETITIVENESS & DIGITAL RANKINGS

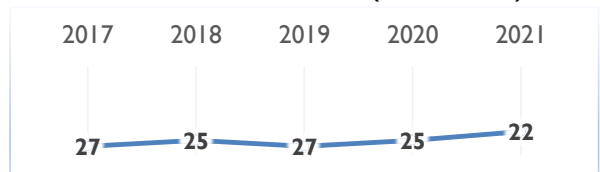


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	57	55	57	52	46
Training & education	26	22	21	19	18
Scientific concentration	45	40	49	50	55

Talent	Rank
Educational assessment PISA - Math	40
International experience	49
Foreign highly-skilled personnel	58
Management of cities	50
Digital/Technological skills	26
Net flow of international students	47

Training & education	Rank
Employee training	37
▶ Total public expenditure on education	11
Higher education achievement	-
▶ Pupil-teacher ratio (tertiary education)	11
Graduates in Sciences	30
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	53
Total R&D personnel per capita	45
▶ Female researchers	17
R&D productivity by publication	20
Scientific and technical employment	53
High-tech patent grants	44
Robots in Education and R&D	45

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	56	54	54	54	46
Capital	62	61	62	59	55
Technological framework	60	57	60	58	57

Regulatory framework	Rank
Starting a business	32
Enforcing contracts	43
Immigration laws	32
Development & application of tech.	55
Scientific research legislation	55
▷ Intellectual property rights	61

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	57
Banking and financial services	57
▷ Country credit rating	62
▷ Venture capital	61
▶ Investment in Telecommunications	2

Technological framework	Rank
Communications technology	38
▷ Mobile Broadband subscribers	64
▷ Wireless broadband	61
Internet users	46
Internet bandwidth speed	48
High-tech exports (%)	54

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	58	53	59	56	56
Business agility	56	53	45	51	45
IT integration	60	61	61	62	61

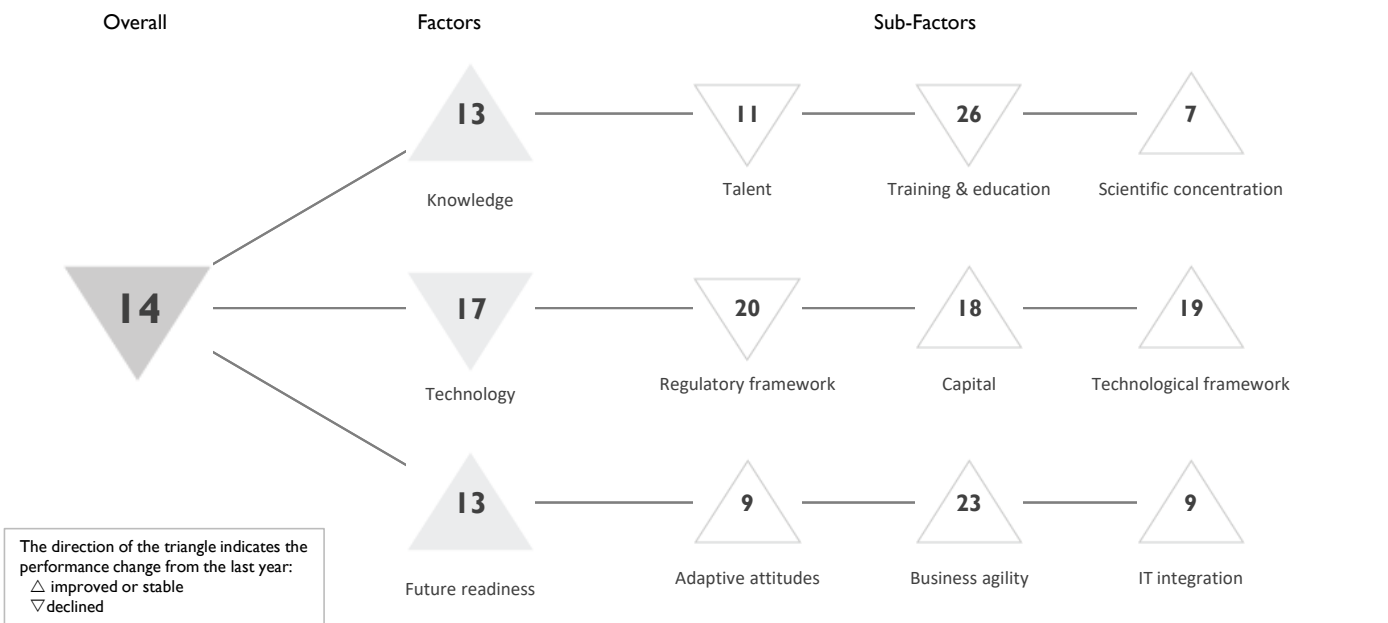
Adaptive attitudes	Rank
E-Participation	39
Internet retailing	50
Tablet possession	55
Smartphone possession	48
Attitudes toward globalization	47

Business agility	Rank
Opportunities and threats	45
World robots distribution	51
Agility of companies	46
▶ Use of big data and analytics	19
Knowledge transfer	59
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	53
Public-private partnerships	57
Cyber security	53
Software piracy	60

UNITED KINGDOM

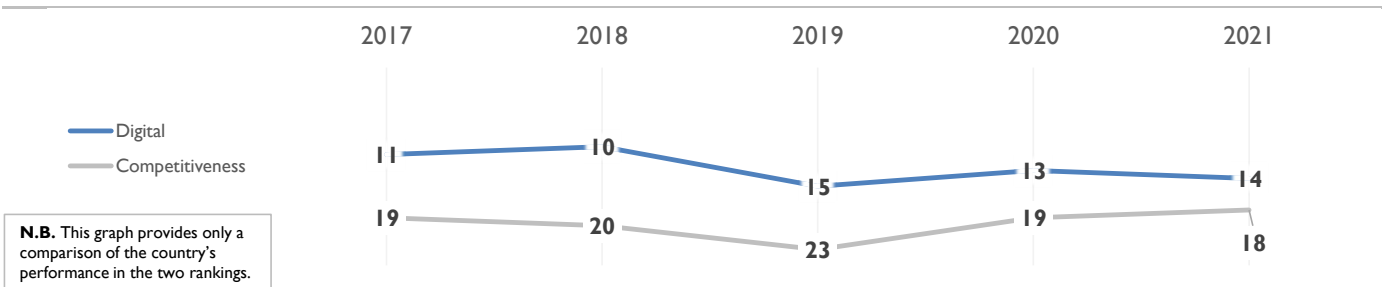
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

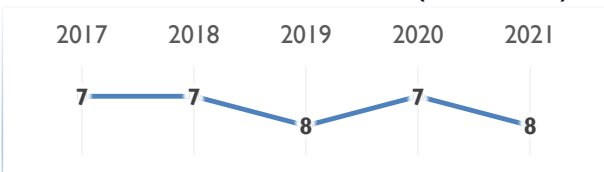
	2017	2018	2019	2020	2021
OVERALL	11	10	15	13	14
Knowledge	10	10	14	13	13
Technology	16	13	18	16	17
Future readiness	9	3	13	13	13

COMPETITIVENESS & DIGITAL RANKINGS

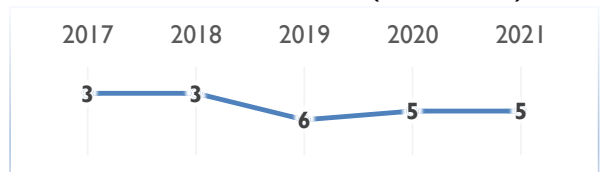


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (29 countries)



UNITED KINGDOM

- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	7	9	17	10	11
Training & education	19	20	23	25	26
Scientific concentration	11	8	8	8	7

Talent		Rank		Training & education		Rank		Scientific concentration		Rank	
Educational assessment PISA - Math	17	▷ Employee training	38	Total expenditure on R&D (%)	22	International experience	23	Total R&D personnel per capita	19	Female researchers	25
Foreign highly-skilled personnel	20	Total public expenditure on education	27	R&D productivity by publication	6	Management of cities	16	Scientific and technical employment	8	High-tech patent grants	19
Digital/Technological skills	19	Higher education achievement	18	▷ Robots in Education and R&D	6	▷ Net flow of international students	4	Pupil-teacher ratio (tertiary education)	36		
		Graduates in Sciences	24								
		Women with degrees	20								

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	12	7	18	17	20
Capital	24	17	22	22	18
Technological framework	16	17	18	22	19

Regulatory framework		Rank		Capital		Rank		Technological framework		Rank	
Starting a business	9	IT & media stock market capitalization	32	Communications technology	27	Immigration laws	51	Funding for technological development	12	Mobile Broadband subscribers	18
Development & application of tech.	17	Banking and financial services	14	Wireless broadband	26	Development & application of tech.	17	Country credit rating	19	Internet users	10
Scientific research legislation	15	▷ Venture capital	3	▷ Internet bandwidth speed	39	Scientific research legislation	15	Investment in Telecommunications	48	High-tech exports (%)	13
Intellectual property rights	14	▷ Investment in Telecommunications	48			Intellectual property rights	14				

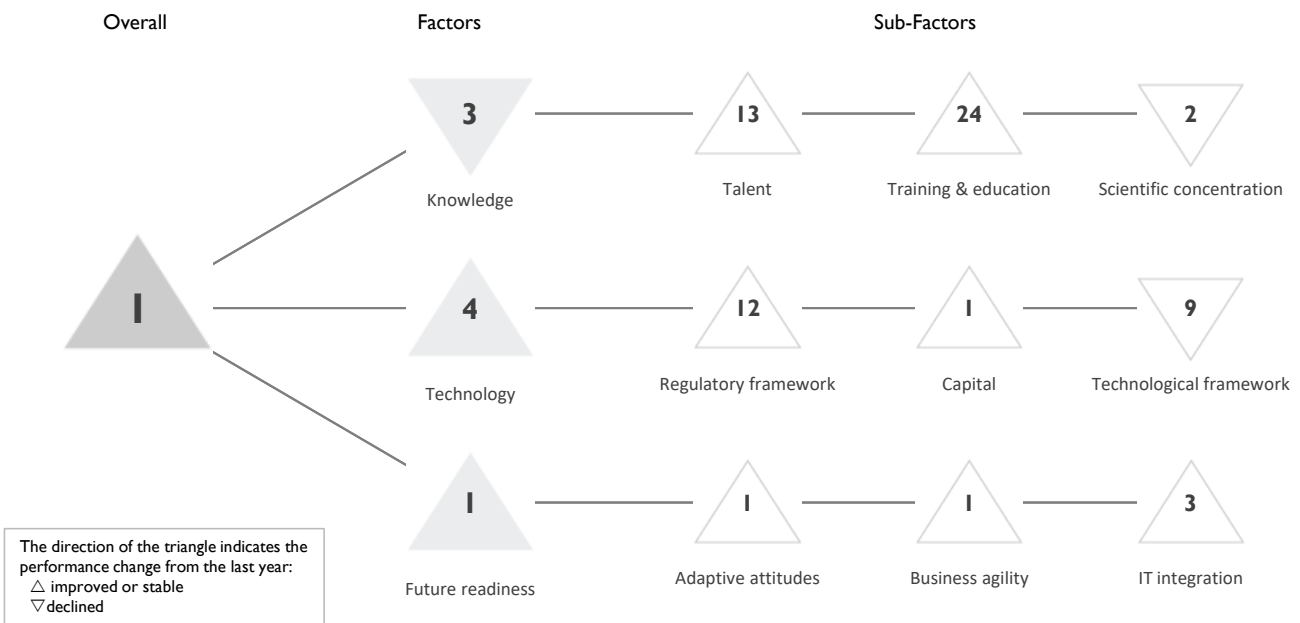
FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	6	4	10	11	9
Business agility	22	16	26	25	23
IT integration	6	2	14	11	9

Adaptive attitudes		Rank		Business agility		Rank		IT integration		Rank	
E-Participation	6	Opportunities and threats	28	E-Government	7	Internet retailing	3	World robots distribution	15	Public-private partnerships	19
Tablet possession	18	Agility of companies	20	Cyber security	17	Tablet possession	18	Use of big data and analytics	18	Software piracy	10
Smartphone possession	22	Knowledge transfer	13			Smartphone possession	22	Entrepreneurial fear of failure	35		
▷ Attitudes toward globalization	37					▷ Attitudes toward globalization	37				

USA

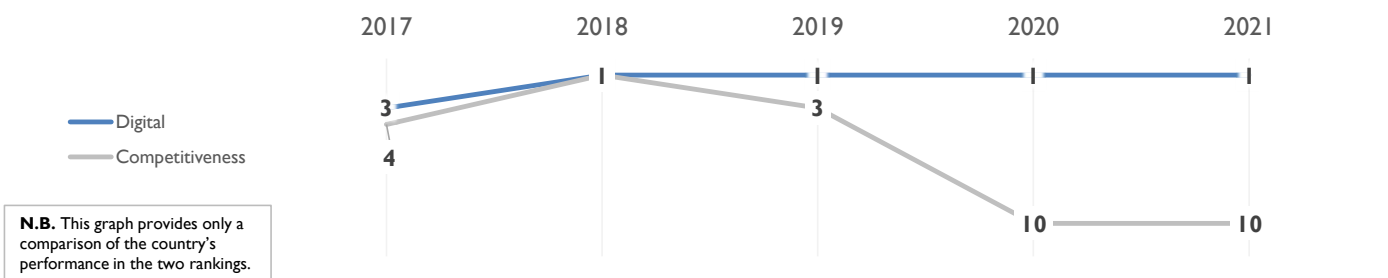
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

	2017	2018	2019	2020	2021
OVERALL	3	1	1	1	1
Knowledge	5	4	1	1	3
Technology	6	3	5	7	4
Future readiness	2	2	1	2	1

COMPETITIVENESS & DIGITAL RANKINGS

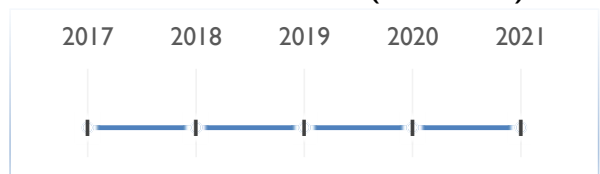


PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	13	11	14	14	13
Training & education	33	21	25	24	24
Scientific concentration	1	1	1	1	2

Talent	Rank
Educational assessment PISA - Math	36
International experience	26
Foreign highly-skilled personnel	6
Management of cities	27
Digital/Technological skills	9
Net flow of international students	14

Training & education	Rank
Employee training	29
Total public expenditure on education	10
Higher education achievement	19
Pupil-teacher ratio (tertiary education)	19
▶ Graduates in Sciences	56
Women with degrees	13

Scientific concentration	Rank
Total expenditure on R&D (%)	9
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	3
Scientific and technical employment	18
High-tech patent grants	4
Robots in Education and R&D	3

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	17	16	19	22	12
Capital	2	1	1	1	1
Technological framework	12	9	11	7	9

Regulatory framework	Rank
Starting a business	30
Enforcing contracts	16
▷ Immigration laws	37
Development & application of tech.	7
Scientific research legislation	5
Intellectual property rights	17

Capital	Rank
IT & media stock market capitalization	7
Funding for technological development	3
Banking and financial services	1
Country credit rating	10
▶ Venture capital	1
Investment in Telecommunications	19

Technological framework	Rank
Communications technology	15
Mobile Broadband subscribers	13
Wireless broadband	7
Internet users	23
Internet bandwidth speed	11
High-tech exports (%)	21

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	2	1	2	3	1
Business agility	3	9	2	2	1
IT integration	12	8	5	10	3

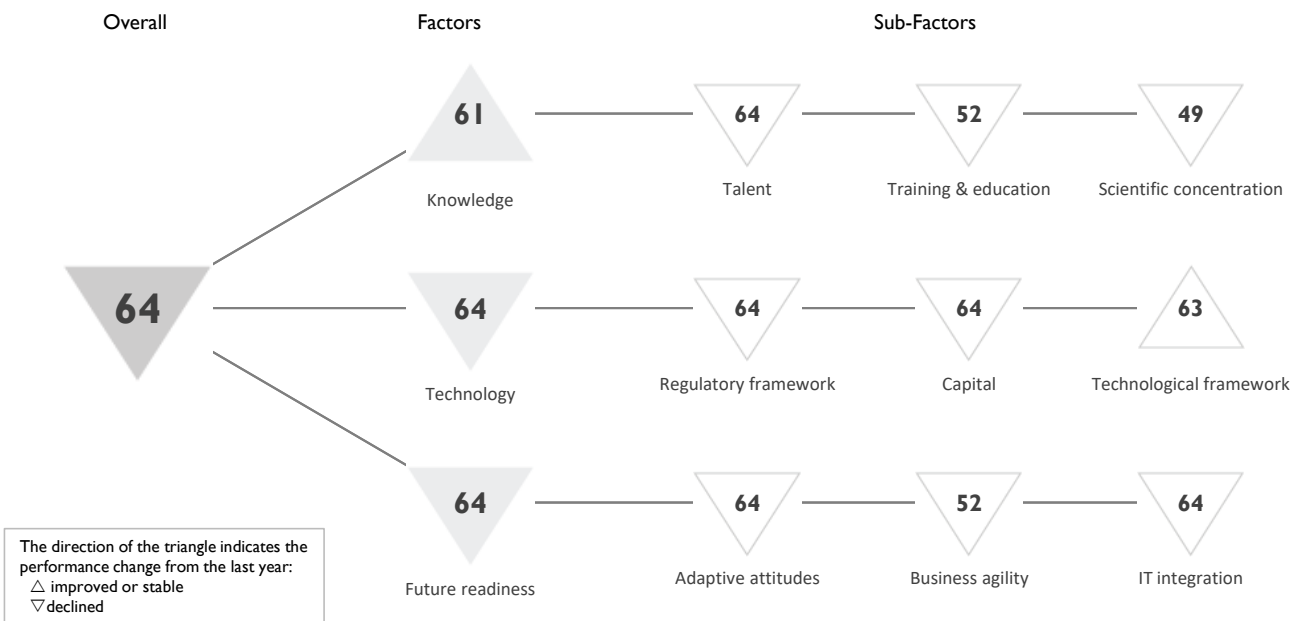
Adaptive attitudes	Rank
▶ E-Participation	1
▶ Internet retailing	1
▶ Tablet possession	1
Smartphone possession	14
▷ Attitudes toward globalization	38

Business agility	Rank
Opportunities and threats	7
World robots distribution	4
Agility of companies	7
Use of big data and analytics	5
Knowledge transfer	6
Entrepreneurial fear of failure	18

IT integration	Rank
E-Government	9
Public-private partnerships	11
Cyber security	22
▶ Software piracy	1

VENEZUELA

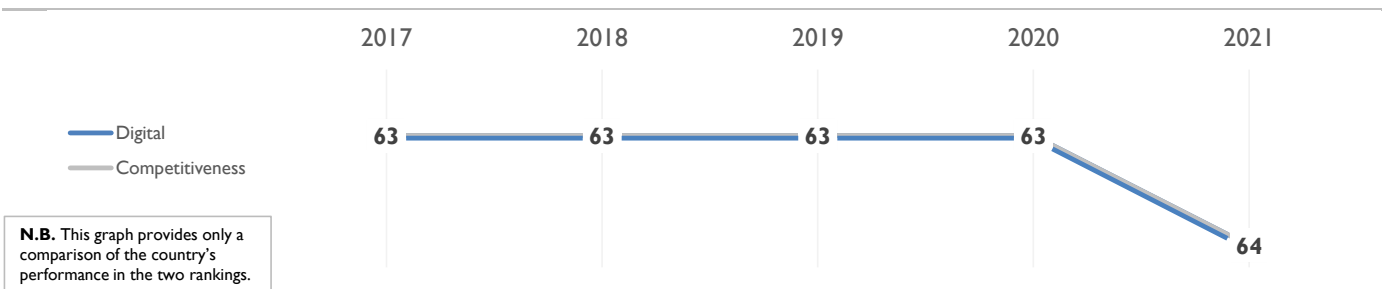
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

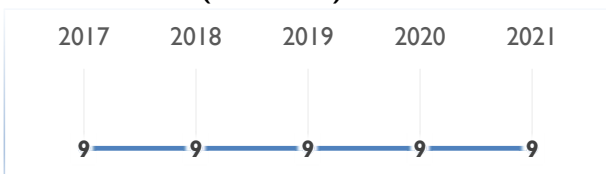
	2017	2018	2019	2020	2021
OVERALL	63	63	63	63	64
Knowledge	63	63	63	61	61
Technology	63	63	63	63	64
Future readiness	63	63	63	63	64

COMPETITIVENESS & DIGITAL RANKINGS

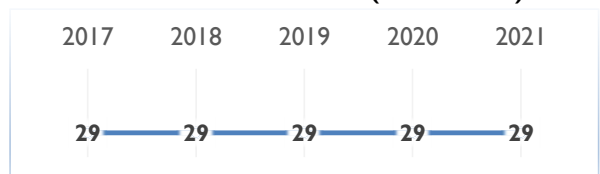


PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (29 countries)



- ▶ Overall top strengths
- ▷ Overall top weaknesses

KNOWLEDGE

Subfactors	2017	2018	2019	2020	2021
Talent	63	63	63	63	64
Training & education	62	60	56	47	52
Scientific concentration	50	22	51	48	49

Talent	Rank
Educational assessment PISA - Math	-
International experience	60
Foreign highly-skilled personnel	64
Management of cities	64
Digital/Technological skills	64
Net flow of international students	-

Training & education	Rank
Employee training	55
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 (%)	62
Total R&D personnel per capita	-
▶ Female researchers	1
R&D productivity by publication	34
Scientific and technical employment	-
High-tech patent grants	56
Robots in Education and R&D	55

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	63	63	63	63	64
Capital	63	63	63	63	64
Technological framework	62	63	63	63	63

Regulatory framework	Rank
▷ Starting a business	64
Enforcing contracts	61
Immigration laws	53
Development & application of tech.	63
Scientific research legislation	64
Intellectual property rights	64

Capital	Rank
IT & media stock market capitalization	55
Funding for technological development	64
Banking and financial services	64
▷ Country credit rating	64
Venture capital	64
▷ Investment in Telecommunications	64

Technological framework	Rank
Communications technology	64
Mobile Broadband subscribers	46
▷ Wireless broadband	64
Internet users	51
▷ Internet bandwidth speed	64
High-tech exports (%)	-

FUTURE READINESS

Subfactors	2017	2018	2019	2020	2021
Adaptive attitudes	62	63	63	63	64
Business agility	49	51	49	49	52
IT integration	63	63	63	63	64

Adaptive attitudes	Rank
E-Participation	62
Internet retailing	56
Tablet possession	50
Smartphone possession	60
Attitudes toward globalization	36

Business agility	Rank
▶ Opportunities and threats	32
World robots distribution	57
Agility of companies	52
Use of big data and analytics	44
Knowledge transfer	63
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	62
Public-private partnerships	64
Cyber security	64
Software piracy	63

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]	Exchange Rate	National currency per US\$ (average)
0.0.2 [B]	Population - market size	Estimates in millions
0.0.3 [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	4G & 5G 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
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
3.2.6	Entrepreneurial fear of failure	% indicating that fear of failure would prevent them from setting up a business

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

The source of the survey criteria is always :
IMD World Competitiveness Center's Executive Opinion Survey 2021.
Which was conducted from mid-February to early May 2021, with a total number of 5'776 respondents.

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 February 2021 (IMF) and national sources.
Per capita	For all information presented "per capita" the sources for the population are the World Economic Outlook April 2021 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 2021 and national sources.

[B] Exchange Rate (National currency per US\$ (average))

International Financial Statistics Online February 2021 (IMF)
National sources

Period average.

[B] Population - market size (Estimates in millions)

World Economic Outlook April 2021
National sources

Mid-year estimates. Croatia: new census in 2011 with a new methodology. India: break in series in 2011. Iceland, Romania as of January 1. Jordan: series have been revised according to the the new Population and Housing Census published in 2016. End of year population for 2019 and 2020. Lithuania: break in series 2011 - census revised population figure downwards by 10% (emigration to EU over past decade). Philippines: Projected population (medium assumption) excluding for 2015, which is based on the 2015 Census. 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).

[B] GDP per capita (US\$ per capita)

OECD (2021), Main Economic Indicators - complete database
National sources

Provisional data or estimates for most recent year. Malaysia: Data 2018 & 2019: Preliminary; Data 2020 is sum of 4 quarters.

Factor 1: Knowledge

1.1 Talent

1.1.1 Educational assessment PISA - Math (PISA survey of 15-year olds)

PISA 2018 (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. PISA selects a sample of students that represents the full population of 15-year-old students in each participating country or education system, in both public and private schools. 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. Hong Kong (China), Netherlands, Portugal and United States: Data did not meet the PISA technical standards but were accepted as largely comparable. China: limited regions (B-S-J-Z); the municipalities of Beijing and Shanghai and the provinces of Jiangsu and Zhejiang participated.

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 October 2020

National sources

Total general (local, regional and central) government expenditure in educational institutions (current and capital). It excludes transfers to private entities such as subsidies to households and students, but includes expenditure funded by transfers from international sources to government. It includes pre-primary, primary, secondary all levels and tertiary public institutions. 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 2020

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).

1.2.4 Pupil-teacher ratio (tertiary education) (Number of pupils per teacher)

UNESCO <http://stats.uis.unesco.org>

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 2017-2018 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)

UNESCO

National sources

Share of graduates in Natural Sciences; Mathematics and Statistics; Information and Communication technologies; Engineering, manufacturing and construction. In tertiary education (ISCED2011 levels 5 to 8), both sexes (%). Japan: Data on information and communication technologies are included in other fields. Philippines: includes Medical and Allied Disciplines Graduates. Taiwan, China: The data include graduates in "natural sciences, mathematics and statistics," "information and communication technologies" and "Engineering, manufacturing and construction" fields.

1.2.6 Women with degrees (Share of women who have a degree in the population 25-65)

OECD Education at a Glance 2020

Educational attainment in tertiary education of 25-64 year-old females expressed as a percentage of the female population 25-64. In most countries data refer to ISCED 2011 (codes 5/6/7/8). Japan: includes data from another category. Kazakhstan: Proportion of women aged 24-44 who have received tertiary education.

Scientific concentration

1.3.1 Total expenditure on R&D (%) (Percentage of GDP)

OECD Main Science and Technology Indicators
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
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
OECD (2021), "Main Science and Technology Indicators", OECD Science, Technology and R&D Statistics (database)

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 2020
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 consider 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)

Eurostat
OECD (2021), "Labour Force Statistics: Employment by activities and status", OECD Employment and Labour Market Statistics
ILOSTAT
National sources

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). Philippines: 2020 data are preliminary figures for October 2020.

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).

1.3.7 Robots in Education and R&D (number of robots)

World Robotics 2020
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.

Factor 2: Technology

2.1 Regulatory framework

2.1.1 Starting a business (Distance to Frontier)

Doing Business 2020 - 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.

2.1.2 Enforcing contracts (Distance to Frontier)

Doing Business 2020 - 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.

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.

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.

2.2.6 Investment in Telecommunications (Percentage of GDP)

Passport GMID
Source: © Euromonitor International 2021
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.

2.3 Technological framework

2.3.2 Mobile Broadband subscribers (4G & 5G market, % of mobile market)

Business Monitor International

Total active mobile 4G and 5G subscriptions, excluding broadband connections on dedicated data SIM cards or USB dongles. Data given as a percentage of the total mobile market.

2.3.3 Wireless broadband (Penetration rate (per 100 people))

Passport GMID

Source: © Euromonitor International 2021

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.

2.3.4 Internet users (Number of internet users per 1000 people)

ITU via World Bank

Internet World Stats www.internetworldstats.com

National sources

Average of available sources

2.3.5 Internet bandwidth speed (Average speed)

M-Labs / cable.co.uk

Ookla

OpenSignal

Average connection speed in Mbps: data transfer rates for Internet access by end-users.

Values presented are an average compiled from three different sources: M-Labs / cable.co.uk; Akamai; and OpenSignal.

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.

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").

3.1.2 Internet retailing (US\$ Per '000 People)

Passport GMID

Source: © Euromonitor International 2021

Retail Value excluding sales tax. Iceland Based on data from Centre for Retail Studies Iceland. Total turnover in online retail with Icelandic cards.

3.1.3 Tablet possession (% households)

Passport GMID

Source: © Euromonitor International 2021

Percentage of households having at least one item. Portable, usually battery-powered, and very thin personal computer contained with a touchscreen panel.

3.1.4 Smartphone possession (% households)

Passport GMID

Source: © Euromonitor International 2021

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.

Business agility

3.2.2 World robots distribution (Percentage share of world robots)

World Robotics 2020

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.

3.2.6 Entrepreneurial fear of failure

Global Entrepreneurship Monitor <https://www.gemconsortium.org/data>

Percentage of 18-64 population perceiving good opportunities to start a business who indicate that fear of failure would prevent them from setting up a business.

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.

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.

Index to Criteria

The first number indicates the Competitiveness Factor, the second number indicates the sub-factor and the third number indicates the criterion number.

A	
Agility of companies	3.2.1-3.2.3
Attitudes toward globalization	3.1.5
B	
Banking and financial services	2.2.3
Big data	3.2.4
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