
IMD WORLD DIGITAL COMPETITIVENESS RANKING 2022



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Preface

We are proud and happy to present the sixth edition of the *IMD World Digital Competitiveness Ranking (WDCR)* for 2022.

Each year, the Ranking quantifies the capacity of an economy to adopt and explore new digital technologies to transform government practices, business models and society in general.

The total number of economies that this year's Ranking assesses is 63, two economies fewer than expected. The reliability of the data collected for Russia and Ukraine was limited, and therefore these two countries are not included in this year's edition. However, for the first time, we are pleased to announce the inclusion of Bahrain.

The pandemic that started almost three years ago forced economies to cope with a health crisis, a subsequent economic crisis, and the comeback of geopolitical risk. To manage the complexity of these challenges, some services and tasks have had to increase their availability in the virtual space to those in the physical space, where many previously operated exclusively. This, however, has increased the number of risks associated with digital crimes such as fraud, as well as business and personal data thefts.

To capture the ability of an economy to safeguard the security and integrity of its digital domain, this year we introduce two new criteria, namely government cybersecurity capacity and privacy protection by law.

Our analysis highlights that both governments and the private sector need to boost the security of their digital infrastructure so as to minimize potential data theft and damage. One way to accomplish this is to increase the effectiveness of the regulatory framework as it applies to business creation as well as technology and scientific development. Finally, a robust knowledge foundation is also highly important.

We are grateful to enjoy the support of a large group of dedicated stakeholders; our Partner Institutes, the IMD Alumni community, and our Panel of Experts offer data and insights that are the backbone of all the rankings we produce. Collectively, they are the reason this publication has been produced. We are most appreciative!



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Table of Contents

Preface	3
The IMD World Competitiveness Center	7
Partner Institutes	8
User's Guide to the IMD World Digital Competitiveness Ranking.....	14
Overall and Breakdown Digital Rankings.....	14
Digital Competitiveness Country Profiles.....	15
Securing Digitalization.....	18
The 2022 IMD World Digital Competitiveness Ranking.....	28
Methodology in a Nutshell.....	30
What is the IMD World Competitiveness Ranking?.....	31
The 2022 IMD World Digital Competitiveness Rankings.....	32
Populations greater than 20 million	32
Populations less than 20 million	32
GDP per capita greater than \$20,000	33
GDP per capita less than \$20,000.....	33
Europe- Middle East - Africa.....	34
Asia - Pacific	35
The Americas.....	35
Knowledge	36
Technology	37
Future Readiness	38
Factor Rankings - 5 years overview.....	40
Sub-factor Rankings	42
IMD World Digital Competitiveness Country Profiles	43
Appendices and Sources	170
Notes and Sources by Criteria.....	174
Factor I: Knowledge.....	175
Factor II: Technology	178
Factor III: Future Readiness.....	180
Index to Criteria.....	182

Competitiveness Country Profiles

Argentina	44	Korea Rep	108
Australia.....	46	Latvia.....	110
Austria.....	48	Lithuania.....	112
Bahrain	50	Luxembourg.....	114
Belgium.....	52	Malaysia.....	116
Botswana	54	Mexico	118
Brazil.....	56	Mongolia	120
Bulgaria	58	Netherlands.....	122
Canada	60	New Zealand.....	124
Chile	62	Norway.....	126
China	64	Peru.....	128
Colombia.....	66	Philippines	130
Croatia.....	68	Poland	132
Cyprus.....	70	Portugal	134
Czech Republic.....	72	Qatar	136
Denmark	74	Romania.....	138
Estonia	76	Saudi Arabia.....	140
Finland	78	Singapore	142
France	80	Slovak Republic	144
Germany	82	Slovenia.....	146
Greece	84	South Africa	148
Hong Kong SAR	86	Spain	150
Hungary	88	Sweden.....	152
Iceland	90	Switzerland	154
India	92	Taiwan, China.....	156
Indonesia	94	Thailand	158
Ireland.....	96	Turkey	160
Israel	98	UAE	162
Italy.....	100	United Kingdom.....	164
Japan.....	102	USA	166
Jordan	104	Venezuela.....	168
Kazakhstan	106		

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 56 Partner Institutes worldwide to provide the government, business and academic communities with the following services:

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

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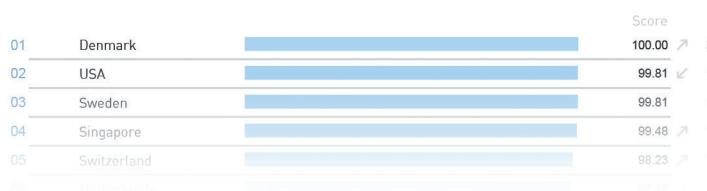
User's Guide to the IMD World Digital Competitiveness Ranking

Overall and Breakdown Digital Rankings

The IMD World Digital Competitiveness Ranking

The IMD World Digital Competitiveness Ranking presents the 2022 overall rankings for the 63 economies covered by the WCY. The rankings are calculated on the basis of the 54 ranked criteria: 34 Hard and 20 Survey data. The countries are ranked from the most to the least digital competitive. The final column shows the improvement or decline from the previous year. The index value or “score” is also indicated for each country.

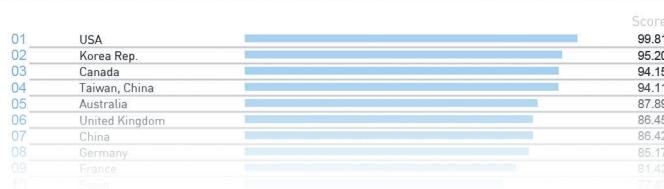
2022 COMPETITIVENESS RANKING



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).

Populations greater than 20 million



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 (2021) 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.

KNOWLEDGE

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



Overall Ranking and Digital Competitiveness Factors

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

	OVERALL					KNOWLEDGE					TECHNOLOGY				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Argentina	55	59	59	61	59	58	58	50	55	58	54	56	62	62	62
Australia	13	14	15	20	14	15	15	17	19	14	14	14	14	18	15
Austria	15	20	17	16	18	13	10	11	10	13	26	32	28	32	36
Bahrain	-	-	-	-	32	-	-	-	-	34	-	-	-	-	23
Belgium	23	25	25	26	23	25	23	21	21	21	24	21	19	23	24
Botswana	-	-	-	63	61	-	-	-	64	55	-	-	-	63	59
Brazil	57	57	51	51	52	82	59	57	51	51	55	57	57	55	55
China	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Denmark	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Finland	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Iceland	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Malta	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Norway	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Singapore	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Sweden	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Switzerland	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
United Kingdom	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
United States	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Digital Sub-factor Rankings

A summary of the rankings for all nine sub-factors is presented for the 63 economies for 2022. It is possible, at a glance, to determine in what areas of digital competitiveness an economy excels or has particular weaknesses and to make comparisons between countries. These rankings provide a more detailed examination of specific aspects of the digital transformation and can be used to, for example, evaluate the technological framework of a country or support international investment decisions.

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

	KNOWLEDGE			TECHNOLOGY			FUTURE READINESS			Argentina	Australia	Austria	Bahrain	Belgium	Botswana
	Talent	Training & education	Scientific concentration	Regulatory framework	Capital	Technological framework	Adaptive attitudes	Business agility	IT integration						
Argentina	61	49	48	61	62	55	49	37	53	Argentina					
Australia	07	29	16	10	13	26	08	40	15	Australia					
Austria	16	12	15	29	36	37	19	21	11	Austria					
Bahrain	13	48	31	32	34	17	23	29	46	Bahrain					
Belgium	17	30	19	17	23	39	28	27	22	Belgium					
Botswana	42	39	63	54	47	62	59	51	61	Botswana					
Brazil	62	51	25	55	57	51	43	52	43	Brazil					
Bulgaria	58	63	40	82	63	46	58	60	48	Bulgaria					
Canada	58	52	51	72	65	51	58	55	52	Canada					
China	58	58	58	81	80	79	58	63	58	China					

Digital Competitiveness Country Profiles

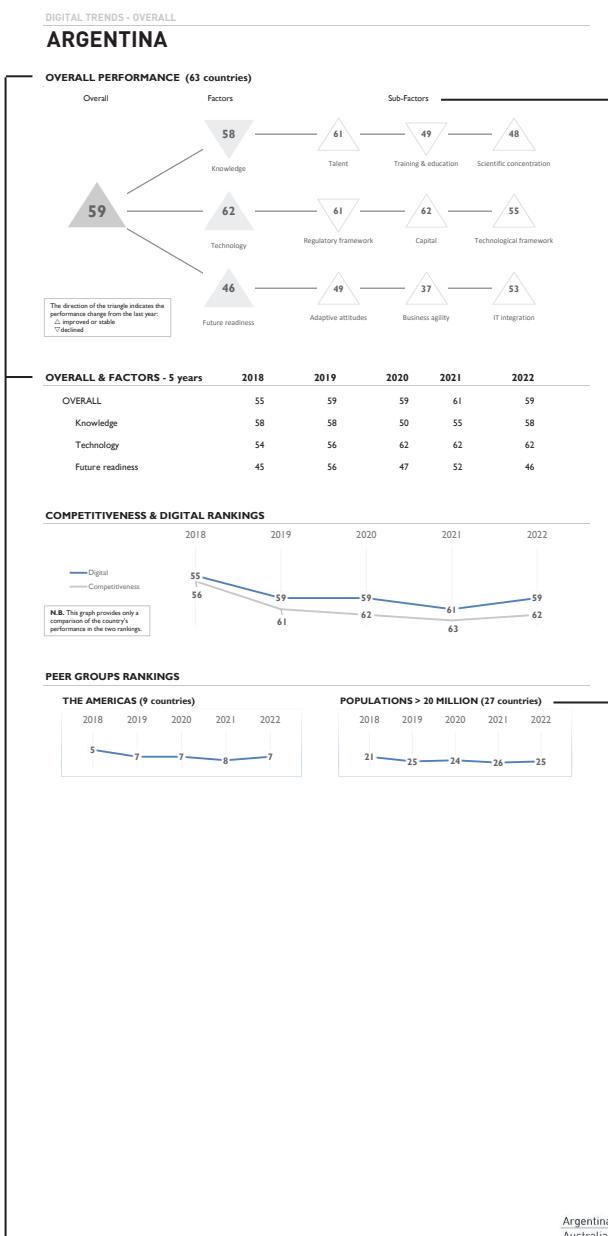
Each two page profile analyses the performance of one of the 63 economies that are included in the IMD World Digital Competitiveness Ranking. The economies are presented in alphabetical order. The term economy signifies an economic entity and does not imply any political independence.

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

User's Guide to the IMD World Digital Competitiveness Ranking

Page 1: Digital Competitiveness – Overall and factors trends

This page shows the overall, factors and sub-factors ranking performances of the country in 2022, their 5-years trends and a comparison of between competitiveness and digital competitiveness rankings. The following indicators are presented:



1. Overall Performance

Overall, factors and sub-factors digital ranking performances of the country in 2022. The direction of the triangles indicates whether there has been an improvement or a decline with respect to the previous year.

2. Overall & Factors – 5 years

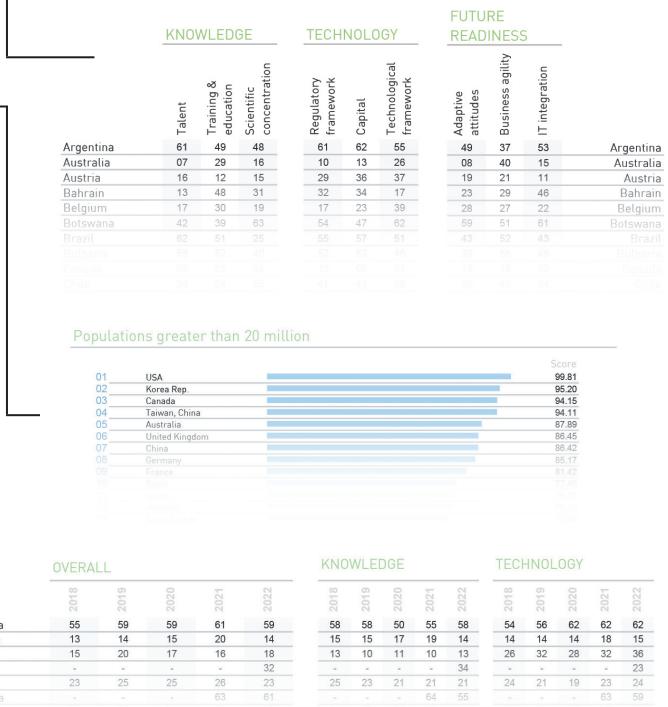
The evolution of the overall and factors digital rankings in the past 5 years.

3. Competitiveness and Digital Rankings

Comparison of the country' performances in the World Competitiveness Ranking and World Digital Competitiveness Ranking in the last 5 years.

4. Peer Group Rankings

Based on geographical region and population size.



Page 2: Factors breakdown & Strengths and Weaknesses

This page shows the country's performance over time for each of the nine sub-factors composing the three Digital Competitiveness Factors (Knowledge, Technology and Future Readiness) and their 54 criteria rankings for 2022.

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1. Factors Breakdown

Shows the 5-years evolution of the sub-factors rankings composing the three factors of Knowledge, Technology and Future Readiness and

2. 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 54 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.

Securing Digitalization

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1. Introduction

The IMD World Digital Competitiveness Ranking each year quantifies the capacity of an economy to adopt and explore new digital technologies able to transform government practices, business models and society in general.

Since the pandemic started almost three years ago, economies have had to adjust to a health crisis, a subsequent economic crisis and the implications of high levels of geopolitical risk. To perform such an adjustment, some services and tasks have had to increase their availability, and to add operations in the virtual space to those in the physical space where many previously operated exclusively.

Those economies that were able to adjust faster were those with the strongest presence in the 2022 IMD World Digital Competitiveness Ranking. One reason for this correlation is the criteria we use to quantify the economies and it is organized into three factors:

1. The *Knowledge* factor refers to intangible infrastructure that enables the discovery, understanding and learning of new technologies, in turn leading to digital transformation. These aspects are captured by indicators that measure the quality of human capital available in a country, as well as the level of investments in education and research and their outcomes (e.g., registered patent grants in high-tech fields and employment in the scientific and technological sectors)
2. The *Technology* factor assesses the overall context facilitating the development of digital technologies. This includes criteria that assess the impact of regulation in encouraging innovation in the private sector, the availability of capital for investments and the quality of the technological infrastructure.
3. The *Future Readiness* factor examines the degree to which technology is adopted by governments, business and society at large. This factor includes indicators such as the diffusion of e-commerce, of industrial robots and of data analytics tools in the private sector as well as the strength of those cyber-security measures in place.

We are delighted to announce the inclusion of Bahrain in this year's edition of the Ranking. The total number of economies that the Ranking assesses is 63; two economies fewer than expected (last year we ranked 64). Due to the limited reliability of the data collected, Russia and Ukraine are not included in this year's edition; we were compelled to exclude them to safeguard the quality and robustness of our results.

Discussions continue on the future of globalization. And yet it doesn't seem to be going anywhere for now; we see an increased interconnectedness of economies, fueled by the transformation of the digital technologies field (e.g. a greater use of cloud services) and the global pandemic. In parallel, these trends have shifted even more parts of our business and personal interactions to the internet, from digital payments to hybrid and remote working, and from social media to e-commerce and streaming services. This situation has vastly increased the number of risks associated with digital crimes such as fraud, and business and personal data thefts. Cyber attacks, if not persistent breach campaigns, continuously loom on the horizon.

In such a context, the sustainability of countries' digital competitiveness depends on two interrelated factors. First, the government, the public sector and the private sector alike need to increase not just the provision but also the quality of online services they provide to individuals. Second, those individuals must feel comfortable with regard to their privacy protection such that they are willing to use the available services.

Focusing on these two factors "secures" digitalization as doing so betters the security of digital systems. If the latter are robust, individuals are credibly reassured about the access to and the use of their data, especially their personal information. Cybersecurity capabilities and strength at company and governmental levels have, therefore, become of paramount importance. For this reason, this year we introduce two new criteria, namely, "Government cybersecurity capacity," and "Privacy protection by law."

Figure 1: Correlation between “Government cybersecurity capacity” index and Knowledge factor (IMD, 2022)

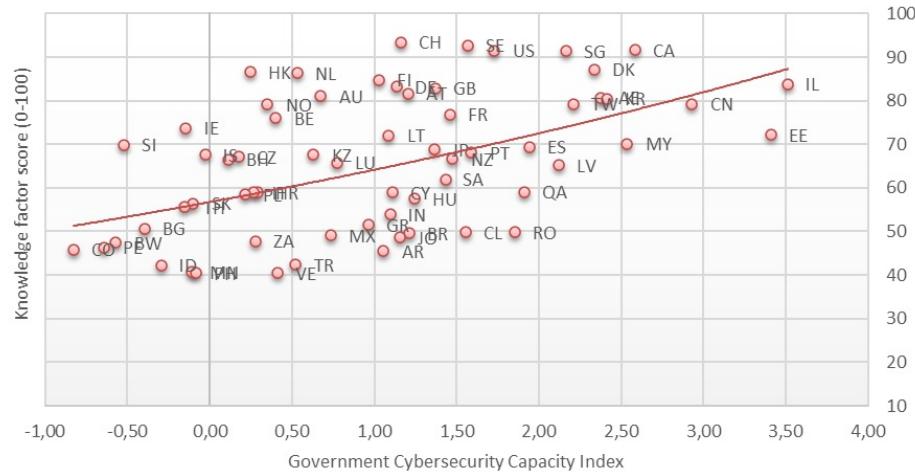
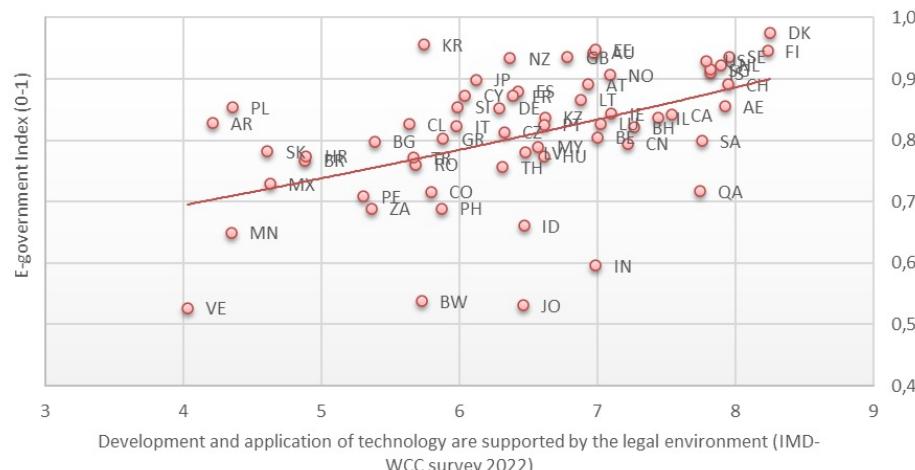


Figure 2: Correlation between “Development and application of technology are supported by the legal environment” and E-Government index. (IMD, 2022)



In the following section, we explore the factors that support the strengthening of cybersecurity capacities, highlighting their various roles in the adoption and diffusion of digital technologies. Section 3 assesses the regional trends in this year’s Ranking and is followed by a discussion about

changes in the Ranking concerning the top 10 countries, including this year’s largest shifts. We conclude with some reflections on the importance of securing digitalization.

2. Cyber safety as a key driver for digitalization

As mentioned, the conjoint impact of globalization, advancements in the digital technologies field and the global pandemic have made economies more interconnected and have shifted even more parts of our business and personal interactions to the internet. This situation has vastly increased those risks associated with digital crimes such as fraud, and business and personal data thefts: cyber attacks. Cybersecurity capabilities, both at the company and governmental level, have therefore become of paramount importance.

In this sense, this year’s Ranking provides interesting insights on two levels. On the one hand, the results shed light on those factors that facilitate the strengthening of governments’ and private sectors’ capacities to protect their digital infrastructure from cyber attacks. On the other, they show how doing so encourages the adoption and diffusion of digital technologies.

Our analysis shows how economies that built strong knowledge generation hubs (**Figure 1**) and that also invest heavily in R&D (e.g. total expenditure on R&D) are

Figure 3: Government cybersecurity capacity index by region

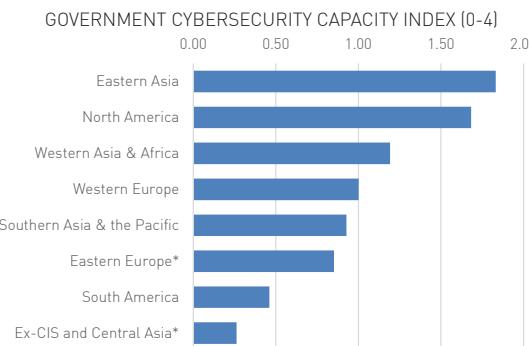


Figure 4: E-government index by region

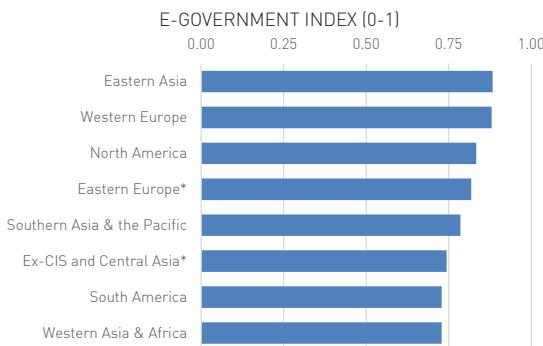
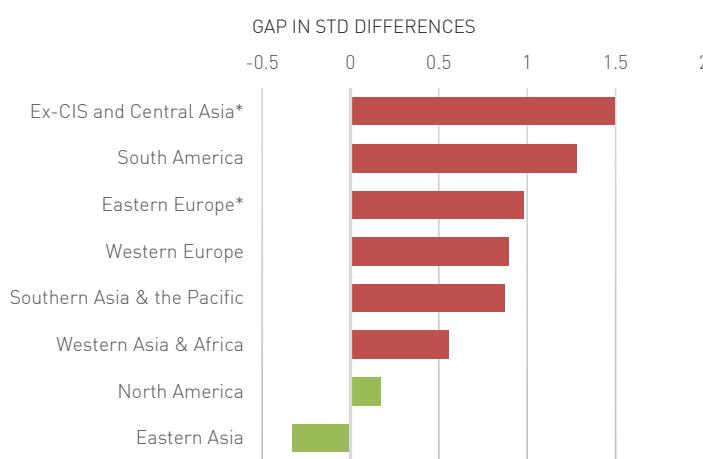


Figure 5: Gap between scores in the E-government index and the Cybersecurity capacity index. IMD (2022)



NOTE: *Eastern Europe does not include values for Ukraine; Ex-CIS and Central Asia does not include values for Russia.

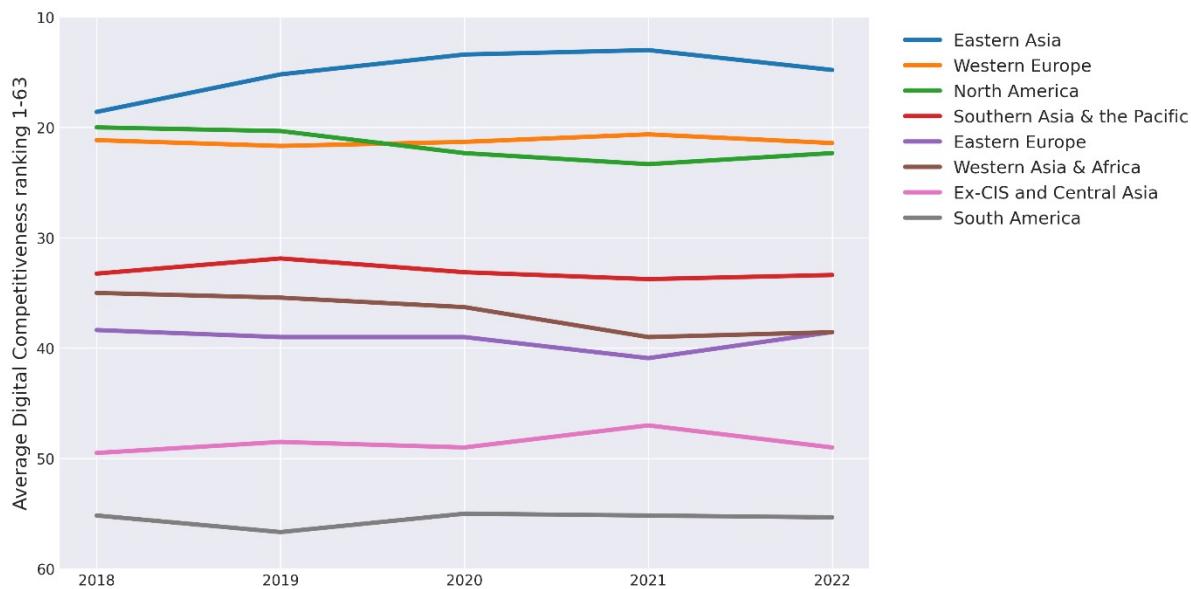
better positioned both in the provision of e-government services (i.e. E-government) and in the protection of their systems from cyber attacks (i.e. Government cybersecurity capacity). Furthermore, both a government's capacity to provide e-government services as well as its cybersecurity strength are strongly linked to the presence of a supportive regulatory framework for business creation/technology development (e.g. development & application of technology are supported by legal framework, enforcing contracts) and this, in turn, protects intellectual property rights (i.e. low software piracy rates) – see **Figure 2**. In turn, a supportive scientific & technological regulatory framework (e.g. scientific research legislation and development & application of tech are supported by legal framework) is shown to be key to the creation of strong cybersecurity capacities in the private sector (i.e. cybersecurity – a survey question).

Secured networks and solid regulation that together facilitate innovation also constitute the fundamental building blocks for technology adoption in society. What emerges from this year's analysis is that the introduction of regulation that is supportive of business creation and technology development along with a transparent legal framework that protects internet users' privacy (i.e. Privacy protection by

law content) are key drivers for a widespread use of online services (i.e. e-participation) in a country. In other words, systems' safety and digital actors' transparency in the use of data are essential for technology diffusion.

When looking at cybersecurity levels across the world, differences emerge in the levels of cybersecurity and potential exposure to security breaches among regions. **Figure 3** shows the average regional values of the for the Government cybersecurity capacity index, which measures a government's capability to mitigate harm from cybersecurity threats using a scale of zero to four. In general, all regions are far from being fully prepared to combat sophisticated cyber attacks (value four). Eastern Asia, North America and Western Asia & Africa are those regions showing the highest level of cybersecurity capacity while Ex-CIS and Central Asia and South America are those showing the lowest. **Figure 4** presents the extent and availability of e-government services (E-government index) across regions. In this case, Eastern Asia, Western Europe and North America exhibit the highest scores but regional differences are generally smaller compared to the cybersecurity indicator.

Figure 6: Average ranking positions by region in Overall Digital Competitiveness 2018-2022.



Looking at the differences between government cybersecurity preparedness and the extent of e-government online services reveals discrepancies that signal potential exposure to cyber attacks. Regions with a high score in the E-government index but a low score in the Government cybersecurity capacity index could be considered more exposed to cyber-risks. After normalizing the two indices, we looked at the differences between the availability of e-government services and the government cybersecurity capacity of each region (**Figure 5**). This exercise shows that regions like Ex-CIS and Central Asia, South America,

Eastern Europe, Western Europe and Southern Asia & the Pacific present relevant gaps between the extent of e-government tools and the cybersecurity capacities of their governments. These results suggests that governments in these regions might be misallocating part of their resources by building comprehensive technological solutions for their citizens whilst simultaneously overlooking the security of their digital infrastructure.

3. Digital competitiveness trends at a regional level

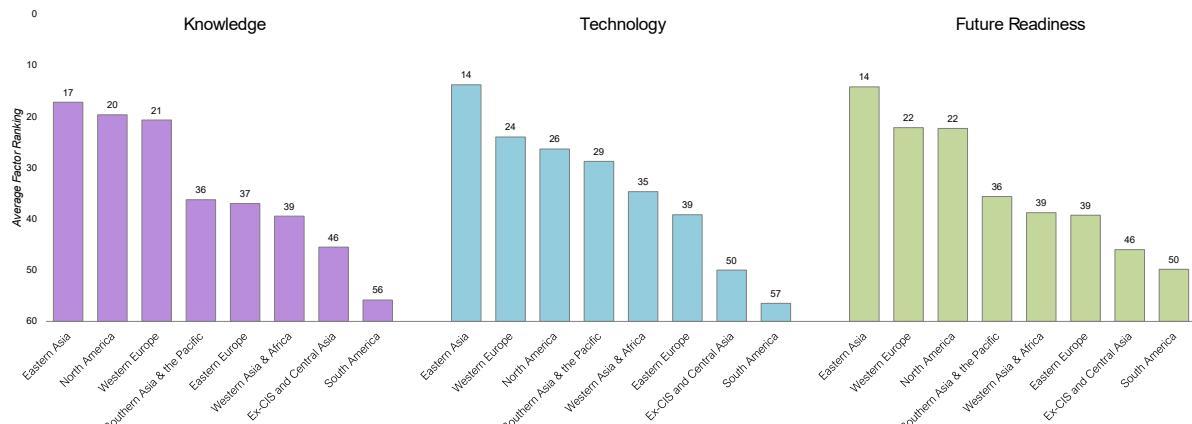
Regional digital competitiveness levels are mostly stable in 2022 with few exceptions. **Figure 6** presents the sub-regional overall digital competitiveness ranking trend for the years 2018 to 2022. Over the past year, North America and Eastern Europe have improved their levels of digitalization; Eastern Asia, Western Europe and Ex-CIS and Central Asia have fallen; while the other sub-regions remain relatively stagnant in their overall average positions. In North America, digital competitiveness levels rise from an average 24th to 22nd place, with Canada and Mexico's improvements compensating for the USA's loss of first place in the Ranking.

Similarly, Eastern Europe's average digital competitiveness position rises to 38th (up two points from 2021). Eastern Asia remains at the top of the sub-regional rankings. However, the average digital competitiveness ranking of the economies in this area (China, Hong Kong SAR, Japan,

Korean Republic and Taiwan, China) slides by two positions from 13th to 15th, marking a reversal of the positive trend that began in 2018.

There are also disruptions to Western Europe's positive competitiveness progression which started in 2019 but has now dropped to an average 21st rank. The average digital competitiveness performance of Southern Asia & the Pacific, Western Asia and Africa and South American economies remains stable in 2022. Since 2019, however, digital competitiveness levels in the first two regions have fallen to an average 2022 place of 33rd and 38th respectively. South American economies, on average, continue their long-term trend, lagging behind in digitalization when compared to the rest of the world. Finally, Ex-CIS and Central Asian economies experience a downturn in their overall competitiveness, with an average position of 49th.

Figure 7: Average digital competitiveness factor ranking by region, 2022



The decline of countries in this area recorded between 2021 and 2022 lowers the region's competitiveness, taking it back to its 2019 level.

Figure 7 presents the sub-regional average rankings in digital competitiveness at factor level. In 2022, the sub-regions of Eastern Asia and Western Europe were the

leaders in Future Readiness and Technology. However, in the Knowledge factor, North America displays higher positions than Western Europe, meaning that this year's edition reemphasizes how Eastern Asian and North American economies remain the central hubs of digital innovation.

4. Performance at the country level

Top 10 economies

Denmark takes the top position, while the USA (2nd) loses the top spot for the first time since the inception of the IMD World Digital Competitiveness Ranking in 2017. Sweden remains in 3rd place, Singapore gains one position in 4th, and Switzerland moves up to 5th (from 6th) and the Netherlands to 6th (from 7th). Finland returns to the top 10 taking 7th place (up from 11th), while Korea Republic also rejoins the top 10 in 8th position (from 12th). Hong Kong SAR drops from 2nd to 9th place. Canada (up from 13th) joins the top-ten economies for the first time since 2018.

Denmark's achievement is mainly due to its performance in the future readiness factor, where it attains the top position in the business agility and IT integration sub-factors, reaching 5th in the adaptive attitudes sub-factor. Its ranking in the knowledge and technology factors are robust, slightly increasing in both. Denmark remains among the leading economies in talent and training and education sub-factors. That said, at the criteria level its performance in higher education achievement (26th), graduates in sciences (38th) and women with degrees (24th) is relatively low. Executives' perceptions about whether or not immigration laws constrain the competitiveness of the country's private sector experience a downturn, with a 42nd position.

The USA (2nd) sees a drop in all factors with the largest (five positions) being in the technology factor in which it ranks 9th. At the sub-factor level and looking at knowledge in particular, there is much room for improvement and this is despite the fact it maintained a strong position in scientific concentration (1st), talent (14th) and training and education (23rd). Under technology, the regulatory framework sub-factor remains relatively low at 12th as does the technological framework which drops to 13th (from 9th). All sub-factors encompassed in the future readiness factor decline with the largest drop being in IT integration, where the USA ranks 10th (down from 3rd). However, it remains in the top 10 in all of these sub-factors.

Among US business executives, there are pessimistic perceptions about the banking and financial services supporting activities efficiently, enterprises responding quickly to opportunities and threats, the agility of companies, the degree to which public-private partnerships support technological development and the way in which cybersecurity is being addressed by corporations.

Sweden's hold on 3rd position results from its positive performance in all factors. It remains 2nd in the knowledge factor in which it continues to rank among the top economies in the Ranking, with a slight gain in talent (6th) and scientific concentration (2nd). This is despite a small drop to 4th position in training and education. Other highlights of Sweden's performance are in the regulatory framework

sub-factor in which it ranks 2nd and in IT integration (4th), both of which saw slight improvements. At the indicator level, and similarly to Denmark, its positions in higher education achievement (22nd) and graduates in sciences (19th) are relatively low as is that of female researchers (39th).

Singapore's performance (4th) is largely down to its achievements in the technology factor, in which it ranks 1st. It reaches the top position in the regulatory framework sub-factor (from 5th), remains in the 2nd spot in the technological framework and gains three positions in the capital sub-factor (11th). Its performance in knowledge, despite a minor drop, remains strong (5th), with its relative strength within this factor in the talent sub-factor (3rd) and, to a lesser extent, in the training and education sub-factor (9th). Singapore's relatively low ranking is in the future readiness factor (10th), with the adaptive attitudes sub-factor placing at 17th. In business agility and IT integration, Singapore remains among the top economies. Under the regulatory framework sub-factor, perceptions about the impact of immigration policies (whether or not they constrain local enterprises from recruiting foreign personnel) improve this year.

Switzerland's slight improvement in the Ranking comes largely on the back of a strong performance in the knowledge factor (1st). In all the related sub-factors, it ranks among the top 10 economies, reaching 2nd position in talent, remaining in 8th place in scientific concentration and – despite a slight decline – ranking 8th in training and education. That said, it is noteworthy that executives' perceptions about the availability of digital skills are now less positive, with this criterion dropping to 18th position (from 11th). Graduates in sciences (26th), women with degrees (30th), female researchers (31st) and R&D productivity by publication (35th) all remain relatively low, despite improvements in most of them. In the technology factor, Switzerland's positions in the capital and technological sub-factor remain the same (12th and 11th, respectively) but there is a slight improvement in the regulatory framework (8th from 9th). The future readiness factor declines from 3rd to 7th because of drops in all of its sub-factors with the largest (three positions) in business agility in which it ranks 7th.

The Netherlands' performance (6th) is based on either improvements or continuity in the sub-factors that form the knowledge and technology factors. The major improvements are under the knowledge factor in the training and education (25th from 28th) and scientific concentration (12th from 16th) sub-factors; elsewhere in this factor it remains in 4th in talent. There is continuity in all the components of the technology factor which leads the Netherlands to remain among the leading economies in these sub-factors: 7th in regulatory framework, 3rd in capital and 10th in technological framework. The country's performance in the future readiness factor is similarly constant, leading it to have top 10 positions in all components within the factor, with its highest position (2nd) being in the adaptive attitudes sub-factor.

Finland joins the top 10 and does so mainly as a result of its improvements in the technology and future readiness factors. In the former, Finland improves in all sub-factors: 5th (from 11th) in regulatory framework; 5th (from 10th) in capital; and 12th (from 14th) in technological framework. In future readiness, it improves in adaptive attitudes (3rd from 7th) and business agility (16th from 21st), and ranks 3rd in IT integration in spite of a slight drop. Under knowledge, Finland improves in talent (9th from 10th) and in training and education (17th from 19th) and it remains in 10th position in scientific concentration. At the indicator level, executives' perceptions about the attractiveness of the country to foreign highly skilled personnel remain low (42nd) but their opinions about immigration policies as constraints for recruitment improve (30th).

Korean Republic returns to the top 10 mainly because of its performance in the future readiness factor (2nd) within which it ranks 1st in adaptive attitudes and 2nd in business agility, reaching the 14th position (up from 16th) in IT integration. Korea's greatest strengths in the knowledge and technology factors are scientific concentration (3rd) in the former, and technological framework (7th) in the latter. There are, however, some red flags for the sustainability of the country's digital competitiveness. Korean Republic ranks 33rd in talent which represents a decline (from 26th) and remains at 23rd in regulatory framework. There is also a sharp downturn in executives' perceptions about the availability of senior managers possessing international experience (59th) and the availability of digital skills (46th). Although the decline in perceptions surrounding the attractiveness of the country for foreign highly skilled personnel is less pronounced, Koreans rank 49th in this indicator.

Hong Kong SAR, whilst remaining among the top economies, experiences one of the largest drops this year (from 2nd to 9th). This results largely from declines in all of the sub-factors with the exception of technological framework in which it remains in the top position. Under knowledge, scientific concentration drops to 18th (from 14th) but, importantly, most criteria remain relatively low: 41st for total expenditure on R&D (as a percentage of GDP); 24th for R&D productivity by publication; and 53rd for robots in education and R&D. Under training and education, executives' perceptions about the prioritization of employee training by the private sector fall sharply to 32nd position. Perceptions are also less optimistic in terms of the country's attractiveness for foreign highly skilled staff (33rd). To a lesser extent, survey respondents' opinions about the availability of managers with international experience and the effective management of cities to support business development also drops but remains well-ranked (10th and 12th, respectively).

Canada's improvement originates in advancements in knowledge (3rd) and future readiness (11th). In the former, its ranking positions improves for all sub-factors: it takes 8th spot in talent, 3rd in training and education and 4th in scientific concentration. In future readiness, it reaches 2nd position in IT integration and 19th in business agility but

experiences a slight decline in adaptive attitudes (18th). Canada's strength in the technology factor is in the capital sub-factor in which it ranks 6th, which is an improvement of three positions. Its ranking in regulatory framework remains strong (13th). In technological framework, however, the country's position is its lowest (31st) at the sub-factor level.

Largest shifts

Croatia displays the largest advancement, from 55th position to 43rd. At the factor level, its greatest improvement is in future readiness in which it ranks 48th (from 60th). In this factor, Croatia achieves strong gains in business agility (58th from 64th) and IT integration (44th from 58th). In the technology factor, it improves from the 50th spot to the 42nd

with strong increases in regulatory framework (46th) and capital (35th). Under the knowledge factor (40th from 47th), it ranks highest in training and education (34th from 42nd) and scientific concentration (remains 34th), reaching 52nd position in talent (up from 61st).

Conversely, Luxembourg experiences the largest downturn; it falls from 22nd to 30th. The country drops in all factors with its steepest decline in future readiness (35th from 24th) followed by knowledge (35th from 29th) and technology (19th from 14th). At the sub-factor level, the most deficient performance is in adaptive attitudes in which it ranks 47th (from 38th) and in scientific concentration, 42nd (from 38th). The talent (35th) and business agility (36th) sub-factors are also of concern.

5. Concluding remarks

In the current context, the sustainability of digital competitiveness is greatly dependent upon economies' ability to secure the digitalization process through increasing their country's cybersecurity capacities. As we become more reliant on technology, sensitive data such as intellectual property and personally identifiable data must be protected against malicious attacks. To that end, making online services secure and protecting users' privacy are fundamental.

The results of the 2022 IMD Digital Competitiveness Ranking provide evidence about those elements that are essential for securing digitalization. Both governments and the private sector need to boost the security of their digital infrastructure so as to minimize potential data theft and damage. Greater investment in R&D will not suffice to tackle this task successfully. Increasing the effectiveness of the regulatory framework as it applies to business creation and technology and scientific development is also vital. A robust knowledge foundation is, in addition, highly important.

Our results also underline the central role that an effective regulatory framework play in the strengthening of the private sector's cybersecurity capacities. The data reveals some asymmetries between the services that governments provide and their readiness to counteract a cyber attack. A deficient allocation of resources is potentially to blame for this.

At the organizational level, most virtual security breaches occur because of human error. At the same time, cyber-criminals are becoming ever-more sophisticated in their tactics. It is thus key to provide staff with up-to-date, relevant training and to establish a well-coordinated cybersecurity program.

One of the by-products of securing digitalization, through its impact on the widespread use of online services, is the greater adoption and diffusion of new technologies which, in turn, increase digital competitiveness. Neglecting the security side of digitalization can, conversely, lead – at the very least – to disruptions in government activities and business operations, and thus to a loss in credibility of those very services provided.

Appendix: Sub-regions composition

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
	<ul style="list-style-type: none"> ▪ Bulgaria ▪ Czech Republic ▪ Estonia ▪ Croatia ▪ Hungary ▪ Latvia 	<ul style="list-style-type: none"> ▪ Lithuania ▪ Poland ▪ Romania ▪ Slovenia ▪ Slovak Republic 	
	<ul style="list-style-type: none"> ▪ Bahrain ▪ Botswana ▪ Israel ▪ Jordan ▪ Qatar 	<ul style="list-style-type: none"> ▪ Saudi Arabia ▪ South Africa ▪ Turkey ▪ UAE 	
	<ul style="list-style-type: none"> ▪ Kazakhstan ▪ Mongolia 		
	<ul style="list-style-type: none"> ▪ China ▪ Hong Kong SAR ▪ Japan 	<ul style="list-style-type: none"> ▪ Korea Rep. ▪ Taiwan, China 	
	<ul style="list-style-type: none"> ▪ Australia ▪ India ▪ Indonesia ▪ Malaysia 	<ul style="list-style-type: none"> ▪ New Zealand ▪ Philippines ▪ Singapore ▪ Thailand 	
	<ul style="list-style-type: none"> ▪ Canada ▪ Mexico 	<ul style="list-style-type: none"> ▪ USA 	
	<ul style="list-style-type: none"> ▪ Argentina ▪ Brazil ▪ Chile 	<ul style="list-style-type: none"> ▪ Colombia ▪ Peru ▪ Venezuela 	
			Asia & Pacific
			The Americas

IMD World Digital Competitiveness Ranking 2022

The statistical tables are available for subscribers of the

[IMD World Competitiveness Online.](#)

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The 2022 IMD World Digital Competitiveness Ranking

2022 COMPETITIVENESS RANKING

		Score	
01	Denmark	100.00	↗ 3
02	USA	99.81	↖ 1
03	Sweden	99.81	-
04	Singapore	99.48	↗ 1
05	Switzerland	98.23	↗ 1
06	Netherlands	97.85	↗ 1
07	Finland	96.60	↗ 4
08	Korea Rep.	95.20	↗ 4
09	Hong Kong SAR	94.36	↖ 7
10	Canada	94.15	↗ 3
11	Taiwan, China	94.11	↖ 3
12	Norway	93.23	↖ 3
13	UAE	91.42	↖ 3
14	Australia	87.89	↗ 6
15	Israel	87.37	↗ 2
16	United Kingdom	86.45	↖ 2
17	China	86.42	↖ 2
18	Austria	85.35	↖ 2
19	Germany	85.17	↖ 1
20	Estonia	85.06	↗ 5
21	Iceland	84.97	-
22	France	81.42	↗ 2
23	Belgium	81.34	↗ 3
24	Ireland	79.56	↖ 5
25	Lithuania	79.32	↗ 5
26	Qatar	78.37	↗ 3
27	New Zealand	77.44	↖ 4
28	Spain	77.40	↗ 3
29	Japan	76.84	↖ 1
30	Luxembourg	76.47	↖ 8

The IMD World Digital Competitiveness Ranking presents the 2022 overall ranking for the 63 economies covered by the Center. The economies are ranked from the most to the least competitive. The Scores shown to the right are actually indices (0 to 100) generated for the unique purpose of constructing charts and graphics. The final column shows the improvement or decline from the previous year.

IMD World Digital Competitiveness Ranking 2022

2022 COMPETITIVENESS RANKING

		Score	
31	Malaysia	76.42	↓ 4
32	Bahrain	75.85	-
33	Czech Republic	75.54	-
34	Latvia	74.24	↗ 3
35	Saudi Arabia	73.87	↗ 1
36	Kazakhstan	73.03	↓ 4
37	Slovenia	71.45	↓ 2
38	Portugal	70.84	↓ 4
39	Italy	68.33	↗ 1
40	Thailand	68.19	↓ 2
41	Chile	66.23	↓ 2
42	Hungary	65.25	↗ 3
43	Croatia	64.58	↗ 12
44	India	63.93	↗ 2
45	Cyprus	63.67	↓ 2
46	Poland	63.09	↓ 5
47	Slovak Republic	59.64	-
48	Bulgaria	58.51	↗ 4
49	Romania	58.32	↗ 1
50	Greece	56.93	↓ 6
51	Indonesia	56.74	↗ 2
52	Brazil	56.14	↓ 1
53	Jordan	56.04	↓ 4
54	Turkey	55.02	↓ 6
55	Mexico	54.72	↗ 1
56	Philippines	52.81	↗ 2
57	Peru	52.06	-
58	South Africa	51.24	↗ 2
59	Argentina	50.22	↗ 2
60	Colombia	49.22	↓ 1
61	Botswana	48.25	↗ 2
62	Mongolia	45.25	-
63	Venezuela	27.00	↗ 1

Methodology in a Nutshell

- › 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.
- › 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.
- › Based on our research, the methodology of the WDC ranking defines digital competitiveness into three main factors:

Knowledge

Technology

Future readiness

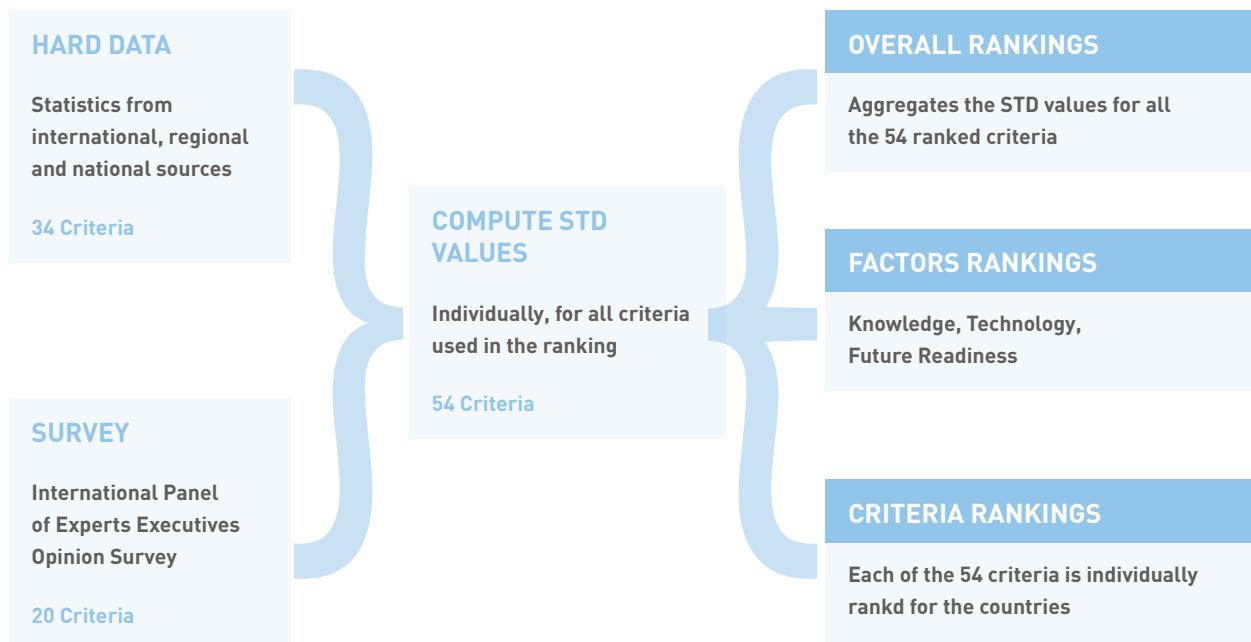
- › In turn, each of these factors is divided into 3 sub-factors which highlight every facet of the areas analyzed. Altogether, the WDC features 9 such sub-factors.
- › These 9 sub-factors comprise 54 criteria, although each sub-factor does not necessarily have the same number of criteria (for example, it takes more criteria to assess Training and Education than to evaluate IT integration).
- › 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% ($100 \div 9 \sim 11.1$).
- › 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.
- › The 54 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.
- › 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).
- › 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 Competitiveness Ranking?

Digital Competitiveness Factors and Sub-factors

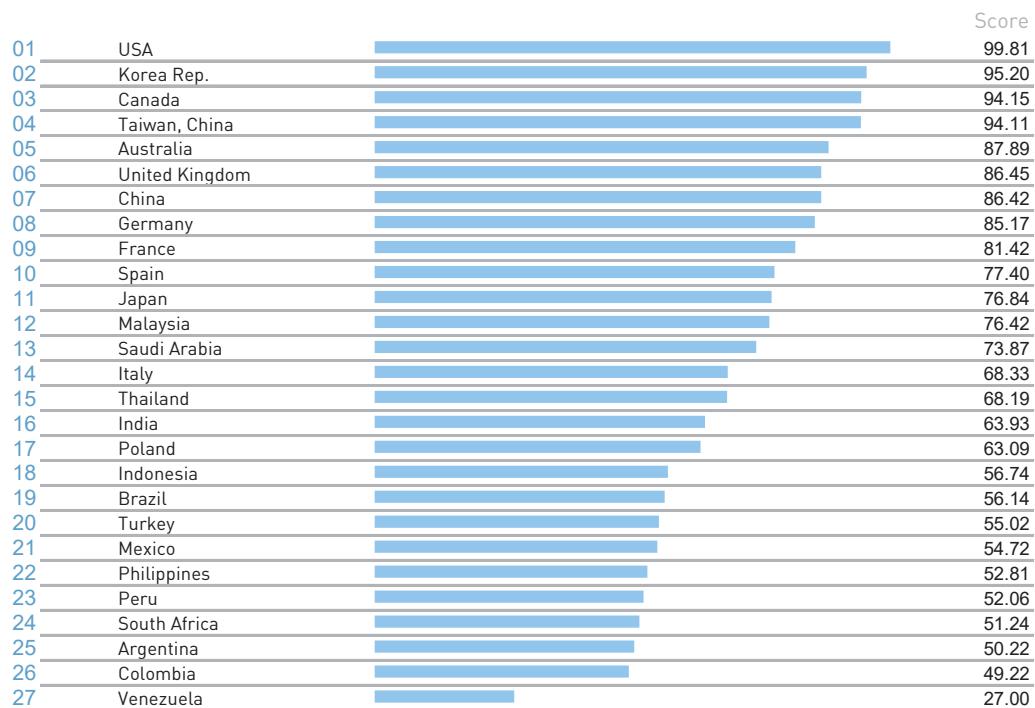
Knowledge	Technology	Future Readiness
 Know-how necessary to discover, understand and build new technologies.	 Overall context that enables the development of digital technologies.	 Level of country preparedness to exploit digital transformation.
<ul style="list-style-type: none">› Talent› Training and Education› Scientific Concentration	<ul style="list-style-type: none">› Regulatory Framework› Capital› Technological Framework	<ul style="list-style-type: none">› Adaptive Attitudes› Business Agility› IT Integration

Computing the Rankings

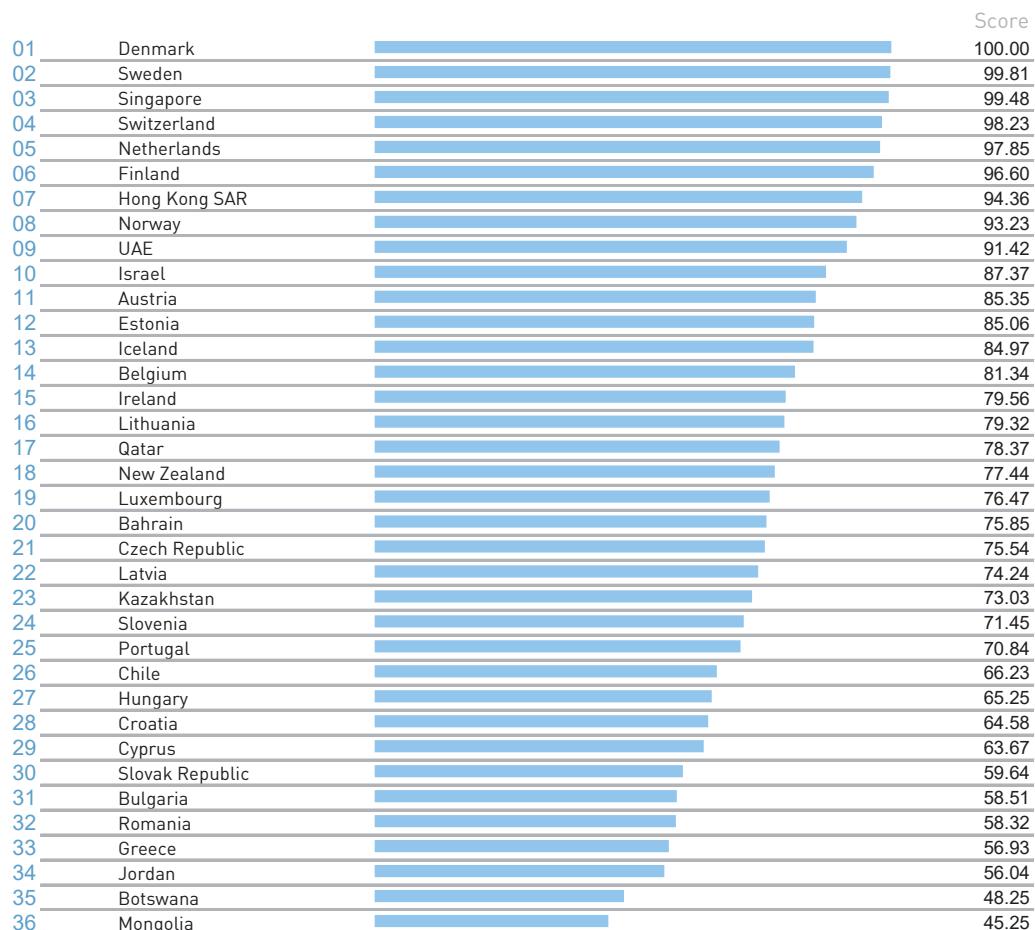


The 2022 IMD World Digital Competitiveness Rankings

Populations greater than 20 million

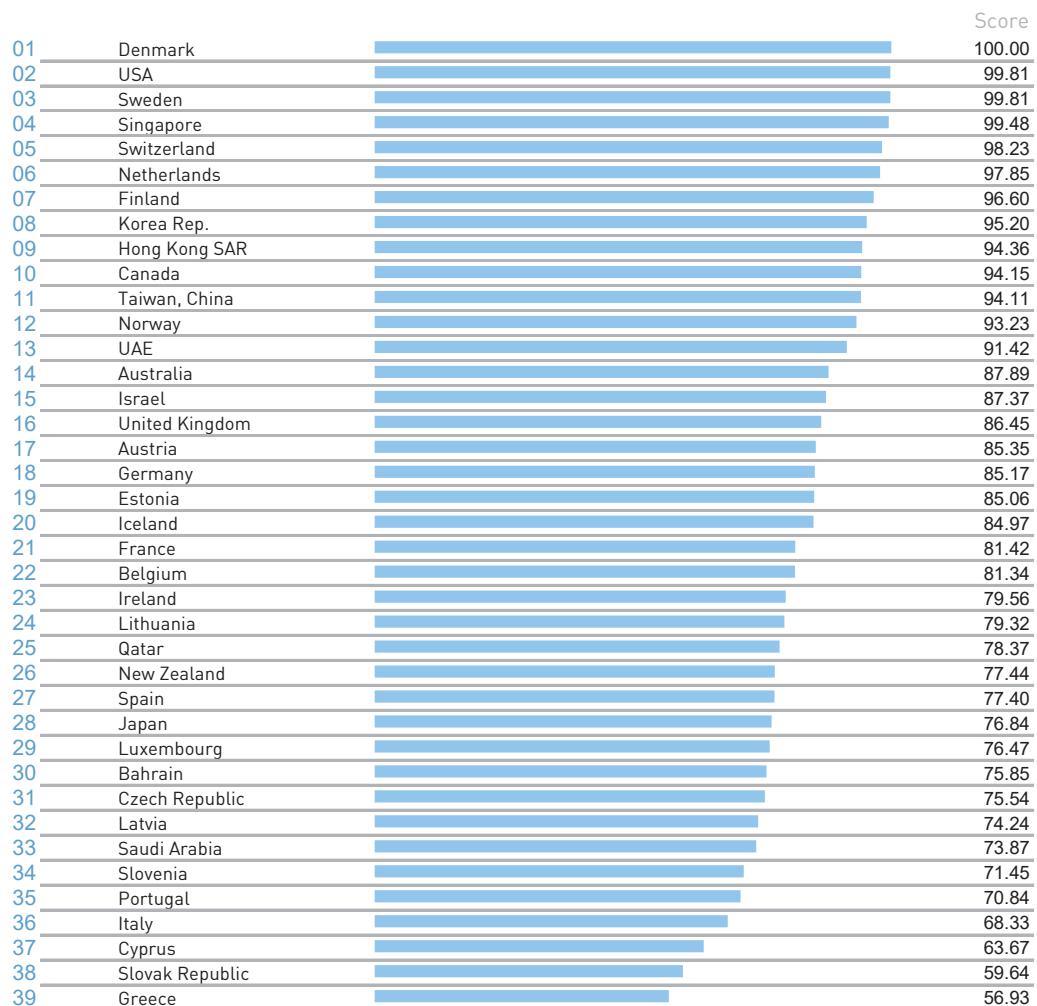


Populations less than 20 million

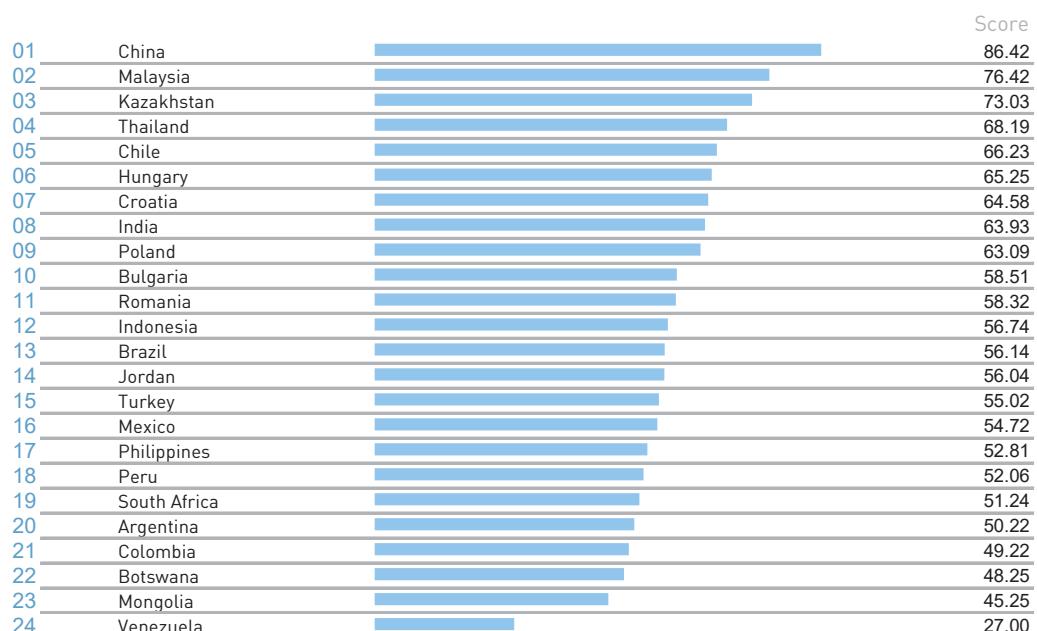


Selected Breakdowns

GDP per capita greater than \$20,000

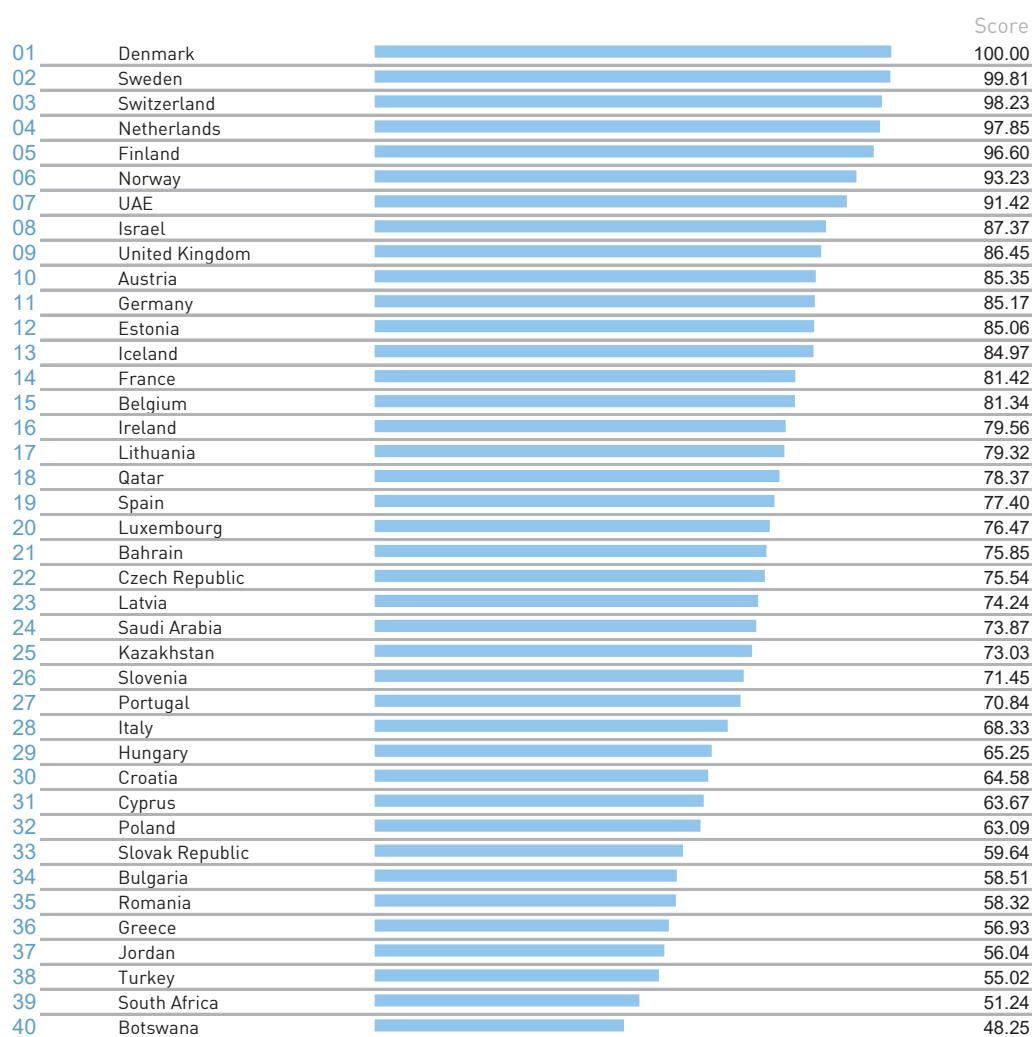


GDP per capita less than \$20,000



The 2022 IMD World Digital Competitiveness Rankings

Europe - Middle East - Africa



Selected Breakdowns

Asia - Pacific

		Score
01	Singapore	99.48
02	Korea Rep.	95.20
03	Hong Kong SAR	94.36
04	Taiwan, China	94.11
05	Australia	87.89
06	China	86.42
07	New Zealand	77.44
08	Japan	76.84
09	Malaysia	76.42
10	Thailand	68.19
11	India	63.93
12	Indonesia	56.74
13	Philippines	52.81
14	Mongolia	45.25

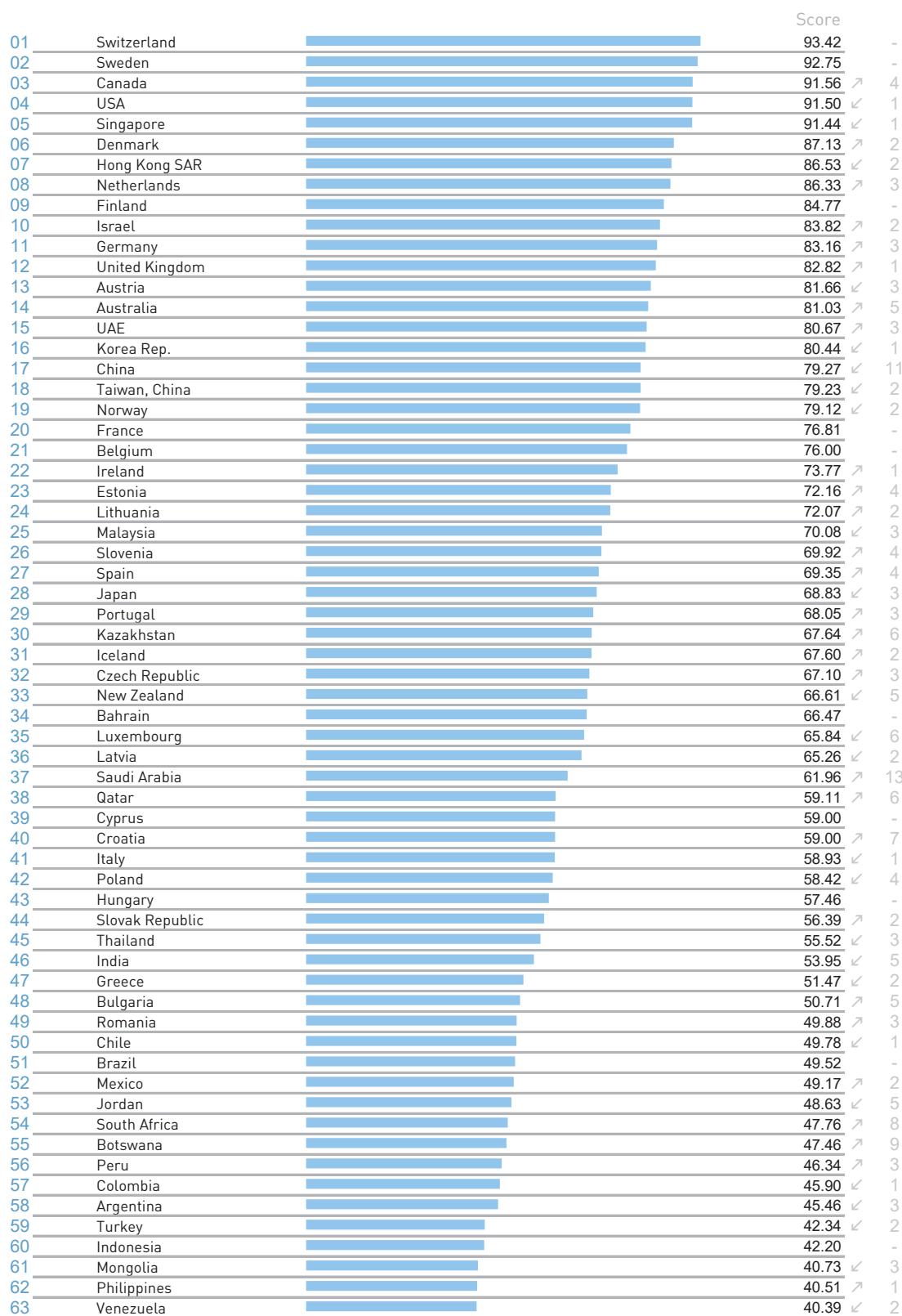
The Americas

		Score
01	USA	99.81
02	Canada	94.15
03	Chile	66.23
04	Brazil	56.14
05	Mexico	54.72
06	Peru	52.06
07	Argentina	50.22
08	Colombia	49.22
09	Venezuela	27.00

The 2022 IMD World Digital Competitiveness Rankings

KNOWLEDGE

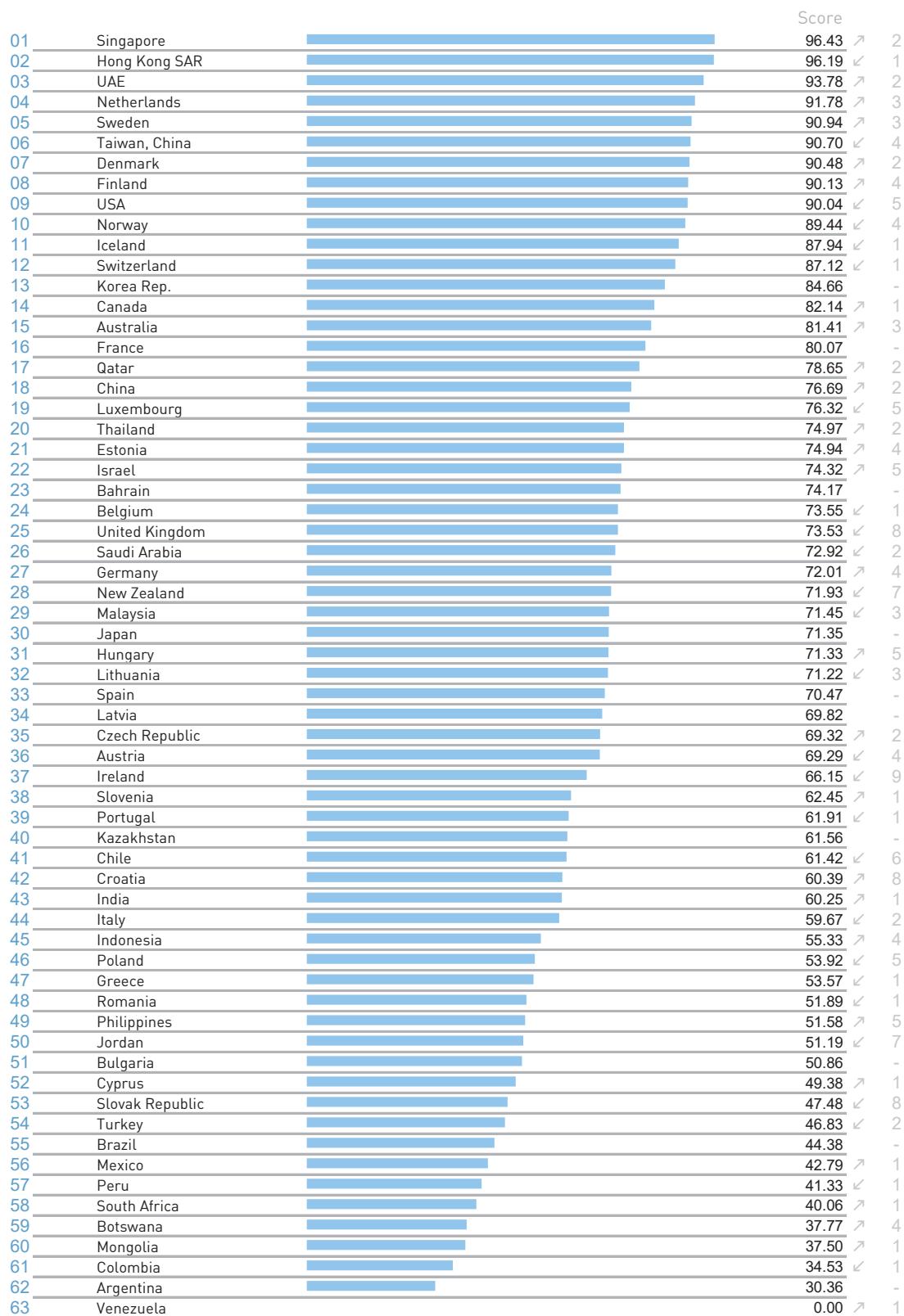
Know-how necessary to discover, understand and build new technologies



Selected Breakdowns

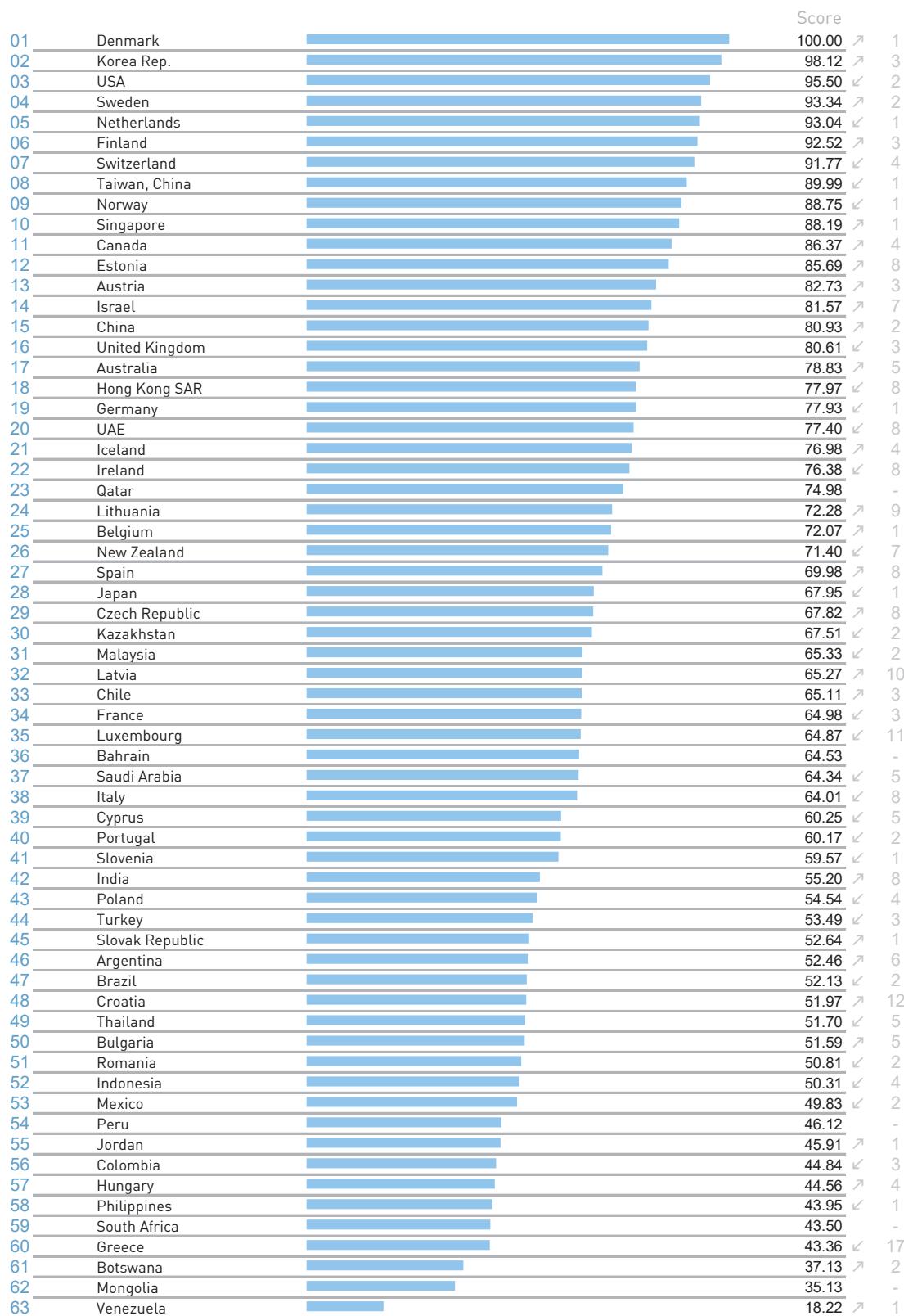
TECHNOLOGY

Overall context that enables the development of digital technologies



FUTURE READINESS

Level of country preparedness to exploit digital transformation



FACTOR RANKINGS

OVERALL

	2018	2019	2020	2021	2022
Argentina	55	59	59	61	59
Australia	13	14	15	20	14
Austria	15	20	17	16	18
Bahrain	-	-	-	-	32
Belgium	23	25	25	26	23
Botswana	-	-	-	63	61
Brazil	57	57	51	51	52
Bulgaria	43	45	45	52	48
Canada	08	11	12	13	10
Chile	37	42	41	39	41
China	30	22	16	15	17
Colombia	59	58	61	59	60
Croatia	44	51	52	55	43
Cyprus	54	54	40	43	45
Czech Republic	33	37	35	33	33
Denmark	04	04	03	04	01
Estonia	25	29	21	25	20
Finland	07	07	10	11	07
France	26	24	24	24	22
Germany	18	17	18	18	19
Greece	53	53	46	44	50
Hong Kong SAR	11	08	05	02	09
Hungary	46	43	47	45	42
Iceland	21	27	23	21	21
India	48	44	48	46	44
Indonesia	62	56	56	53	51
Ireland	20	19	20	19	24
Israel	12	16	19	17	15
Italy	41	41	42	40	39
Japan	22	23	27	28	29
Jordan	45	50	53	49	53
Kazakhstan	38	35	36	32	36
Korea Rep.	14	10	08	12	08
Latvia	35	36	38	37	34
Lithuania	29	30	29	30	25
Luxembourg	24	21	28	22	30
Malaysia	27	26	26	27	31
Mexico	51	49	54	56	55
Mongolia	61	62	62	62	62
Netherlands	09	06	07	07	06
New Zealand	19	18	22	23	27
Norway	06	09	09	09	12
Peru	60	61	55	57	57
Philippines	56	55	57	58	56
Poland	36	33	32	41	46
Portugal	32	34	37	34	38
Qatar	28	31	30	29	26
Romania	47	46	49	50	49
Saudi Arabia	42	39	34	36	35
Singapore	02	02	02	05	04
Slovak Republic	50	47	50	47	47
Slovenia	34	32	31	35	37
South Africa	49	48	60	60	58
Spain	31	28	33	31	28
Sweden	03	03	04	03	03
Switzerland	05	05	06	06	05
Taiwan, China	16	13	11	08	11
Thailand	39	40	39	38	40
Turkey	52	52	44	48	54
UAE	17	12	14	10	13
United Kingdom	10	15	13	14	16
USA	01	01	01	01	02
Venezuela	63	63	63	64	63

KNOWLEDGE

	2018	2019	2020	2021	2022
58	58	50	55	58	
15	15	17	19	14	
13	10	11	10	13	
-	-	-	-	34	
25	23	21	21	21	
-	-	-	64	55	
62	59	57	51	51	
41	46	47	53	48	
03	05	05	07	03	
47	50	49	49	50	
30	18	08	06	17	
57	57	59	56	57	
43	42	41	47	40	
55	55	40	39	39	
38	37	37	35	32	
08	06	06	08	06	
29	30	23	27	23	
09	09	15	09	09	
20	20	20	20	20	
14	12	12	14	11	
51	53	48	45	47	
05	07	07	05	07	
48	44	44	43	43	
28	29	27	33	31	
46	38	39	41	46	
61	56	63	60	60	
22	24	24	23	22	
02	08	09	12	10	
42	41	42	40	41	
18	25	22	25	28	
56	49	54	48	53	
35	32	34	36	30	
11	11	10	15	16	
34	36	36	34	36	
23	26	25	26	24	
32	34	35	29	35	
17	19	19	22	25	
54	52	52	54	52	
53	62	58	58	61	
12	13	14	11	08	
21	21	28	28	33	
16	16	16	17	19	
60	61	55	59	56	
50	51	62	63	62	
33	33	30	38	42	
27	31	33	32	29	
37	45	45	44	38	
45	47	53	52	49	
40	39	46	50	37	
01	03	02	04	05	
49	48	51	46	44	
26	27	29	30	26	
52	54	60	62	54	
31	28	32	31	27	
07	04	04	02	02	
06	02	03	01	01	
19	17	18	16	18	
44	43	43	42	45	
59	60	56	57	59	
36	35	31	18	15	
10	14	13	13	12	
04	01	01	03	04	
63	63	61	61	63	

TECHNOLOGY

	2018	2019	2020	2021	2022
54	56	62	62	62	
14	14	14	18	15	
26	32	28	32	36	
-	-	-	-	23	
24	21	19	23	24	
-	-	-	63	59	
55	57	57	55	55	
42	42	45	51	51	
12	13	13	15	14	
35	41	40	35	41	
34	26	27	20	18	
60	60	61	60	61	
49	50	49	50	42	
56	59	52	53	52	
31	34	36	37	35	
10	11	09	09	07	
20	22	23	25	21	
04	08	10	12	08	
19	16	15	16	16	
21	31	31	31	27	
51	54	43	46	47	
06	04	02	01	02	
40	36	39	36	31	
18	20	21	10	11	
53	49	50	44	43	
59	47	54	49	45	
29	28	30	28	37	
25	30	32	27	22	
41	46	46	42	44	
23	24	26	30	30	
48	53	44	43	50	
39	39	41	40	40	
17	17	12	13	13	
32	23	34	34	34	
30	25	29	29	32	
15	12	17	14	19	
22	19	20	26	29	
46	52	56	57	56	
62	62	60	61	60	
08	06	08	07	04	
16	15	18	21	28	
02	03	03	06	10	
57	58	58	56	57	
58	55	53	54	49	
37	37	37	41	46	
36	38	38	38	39	
27	33	25	19	17	
44	45	48	47	48	
50	40	24	24	26	
01	01	01	03	01	
47	44	51	45	53	
38	35	35	39	38	
52	51	55	59	58	
33	29	33	33	33	
05	07	06	08	05	
09	10	11	11	12	
11	09	05	02	06	
28	27	22	22	20	
45	48	42	52	54	
07	02	04	05	03	
13	18	16	17	25	
03	05	07	04	09	
63	63	63	64	63	

FUTURE READINESS

	2018	2019	2020	2021	2022	
45	56	47	52	46		Argentina
11	14	17	22	17		Australia
14	23	16	16	13		Austria
-	-	-	-	36		Bahrain
23	25	25	26	25		Belgium
-	-	-	63	61		Botswana
47	43	43	45	47		Brazil
55	48	44	55	50		Bulgaria
09	18	15	15	11		Canada
31	37	39	36	33		Chile
28	21	18	17	15		China
56	55	50	53	56		Colombia
54	60	62	60	48		Croatia
44	40	29	34	39		Cyprus
34	39	36	37	29		Czech Republic
01	02	01	02	01		Denmark
26	30	20	20	12		Estonia
08	07	09	09	06		Finland
27	29	31	31	34		France
20	16	19	18	19		Germany
46	53	46	43	60		Greece
24	15	10	10	18		Hong Kong SAR
58	57	60	61	57		Hungary
19	26	22	25	21		Iceland
48	46	56	50	42		India
62	58	48	48	52		Indonesia
13	05	14	14	22		Ireland
07	19	23	21	14		Israel
36	31	38	30	38		Italy
25	24	26	27	28		Japan
41	52	58	56	55		Jordan
40	35	33	28	30		Kazakhstan
17	04	03	05	02		Korea Rep.
39	45	42	42	32		Latvia
33	32	30	33	24		Lithuania
21	17	27	24	35		Luxembourg
29	28	32	29	31		Malaysia
50	49	52	51	53		Mexico
59	61	59	62	62		Mongolia
04	03	04	04	05		Netherlands
18	20	21	19	26		New Zealand
06	08	06	08	09		Norway
60	59	55	54	54		Peru
52	54	54	57	58		Philippines
37	33	35	39	43		Poland
32	34	41	38	40		Portugal
16	22	24	23	23		Qatar
57	51	49	49	51		Romania
38	38	28	32	37		Saudi Arabia
15	11	12	11	10		Singapore
53	47	51	46	45		Slovak Republic
35	36	37	40	41		Slovenia
43	44	57	59	59		South Africa
30	27	40	35	27		Spain
05	06	07	06	04		Sweden
10	10	05	03	07		Switzerland
22	12	08	07	08		Taiwan, China
49	50	45	44	49		Thailand
42	41	34	41	44		Turkey
12	09	11	12	20		UAE
03	13	13	13	16		United Kingdom
02	01	02	01	03		USA
63	63	63	64	63		Venezuela

SUB-FACTOR RANKINGS

	KNOWLEDGE			TECHNOLOGY			FUTURE READINESS			
	Talent	Training & education	Scientific concentration	Regulatory framework	Capital	Technological framework	Adaptive attitudes	Business agility	IT integration	
Argentina	61	49	48	61	62	55	49	37	53	Argentina
Australia	07	29	16	10	13	26	08	40	15	Australia
Austria	16	12	15	29	36	37	19	21	11	Austria
Bahrain	13	48	31	32	34	17	23	29	46	Bahrain
Belgium	17	30	19	17	23	39	28	27	22	Belgium
Botswana	42	39	63	54	47	62	59	51	61	Botswana
Brazil	62	51	25	55	57	51	43	52	43	Brazil
Bulgaria	56	52	40	52	52	46	39	56	49	Bulgaria
Canada	08	03	04	13	06	31	18	19	02	Canada
Chile	39	54	55	41	43	36	26	43	34	Chile
China	12	33	09	16	27	24	22	03	32	China
Colombia	58	46	56	59	56	61	48	54	58	Colombia
Croatia	52	34	34	46	35	42	40	58	44	Croatia
Cyprus	53	40	26	50	54	49	36	53	29	Cyprus
Czech Republic	22	38	29	37	26	30	31	24	36	Czech Republic
Denmark	05	07	17	06	14	06	05	01	01	Denmark
Estonia	30	05	43	30	29	21	14	20	07	Estonia
Finland	09	17	10	05	05	12	03	16	03	Finland
France	23	27	13	15	19	20	41	38	21	France
Germany	20	15	07	20	16	43	27	15	19	Germany
Greece	49	59	33	42	46	50	60	61	41	Greece
Hong Kong SAR	10	02	18	09	08	01	09	11	45	Hong Kong SAR
Hungary	40	44	38	26	42	19	62	48	35	Hungary
Iceland	24	26	45	11	17	05	21	12	30	Iceland
India	34	56	50	48	01	58	56	25	48	India
Indonesia	45	62	54	49	18	56	55	22	60	Indonesia
Ireland	19	31	24	22	44	38	11	18	38	Ireland
Israel	26	06	05	31	25	23	24	23	05	Israel
Italy	43	58	23	38	41	44	32	30	40	Italy
Japan	50	21	14	47	32	08	20	62	18	Japan
Jordan	41	41	62	45	45	53	61	34	52	Jordan
Kazakhstan	46	01	51	21	50	47	34	06	56	Kazakhstan
Korea Rep.	33	16	03	23	15	07	01	02	14	Korea Rep.
Latvia	25	28	52	36	39	22	44	31	23	Latvia
Lithuania	27	13	37	28	37	32	38	17	26	Lithuania
Luxembourg	35	20	42	18	24	27	47	36	17	Luxembourg
Malaysia	36	10	35	40	33	16	30	35	31	Malaysia
Mexico	54	53	49	56	55	54	54	46	47	Mexico
Mongolia	60	47	61	60	59	57	51	63	62	Mongolia
Netherlands	04	25	12	07	03	10	02	08	09	Netherlands
New Zealand	32	32	32	33	30	25	15	49	27	New Zealand
Norway	18	14	22	04	04	14	06	13	12	Norway
Peru	59	37	60	51	53	59	53	39	59	Peru
Philippines	55	61	57	62	40	45	58	45	57	Philippines
Poland	48	42	30	57	49	33	37	47	51	Poland
Portugal	29	36	27	19	48	48	35	60	25	Portugal
Qatar	11	45	59	27	21	15	29	14	28	Qatar
Romania	51	55	44	39	61	41	46	59	42	Romania
Saudi Arabia	28	24	58	25	22	34	33	32	33	Saudi Arabia
Singapore	03	09	11	01	11	02	17	09	08	Singapore
Slovak Republic	44	43	39	58	58	40	50	50	39	Slovak Republic
Slovenia	38	18	28	43	38	35	45	33	37	Slovenia
South Africa	57	50	53	53	51	60	57	57	55	South Africa
Spain	31	35	20	35	31	28	25	44	20	Spain
Sweden	06	04	02	02	07	09	07	10	04	Sweden
Switzerland	02	08	08	08	12	11	12	07	06	Switzerland
Taiwan, China	21	11	21	14	09	04	13	05	13	Taiwan, China
Thailand	37	57	36	34	20	18	52	41	50	Thailand
Turkey	47	63	41	44	60	52	42	42	54	Turkey
UAE	01	22	46	03	10	03	16	28	16	UAE
United Kingdom	15	19	06	24	28	29	10	28	16	United Kingdom
USA	14	23	01	12	02	13	04	04	10	USA
Venezuela	63	60	47	63	63	63	63	55	63	Venezuela

IMD World Digital Competitiveness Country Profiles

The statistical tables are available for subscribers of the

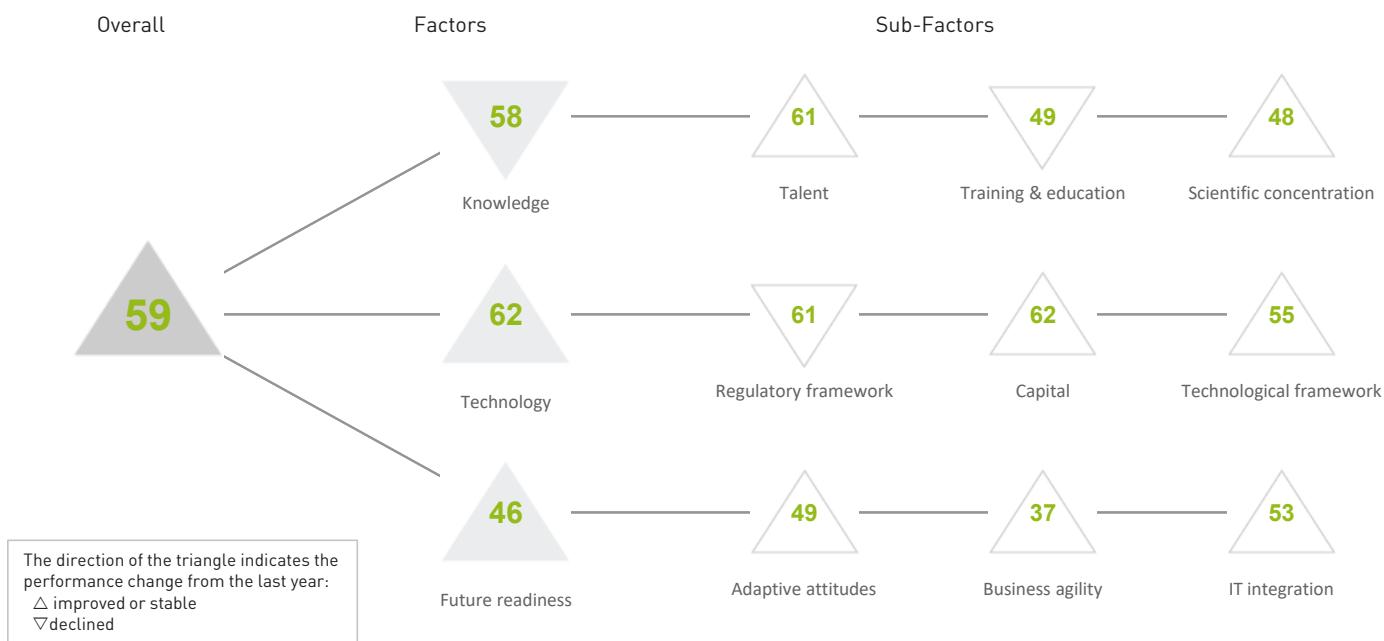
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ARGENTINA

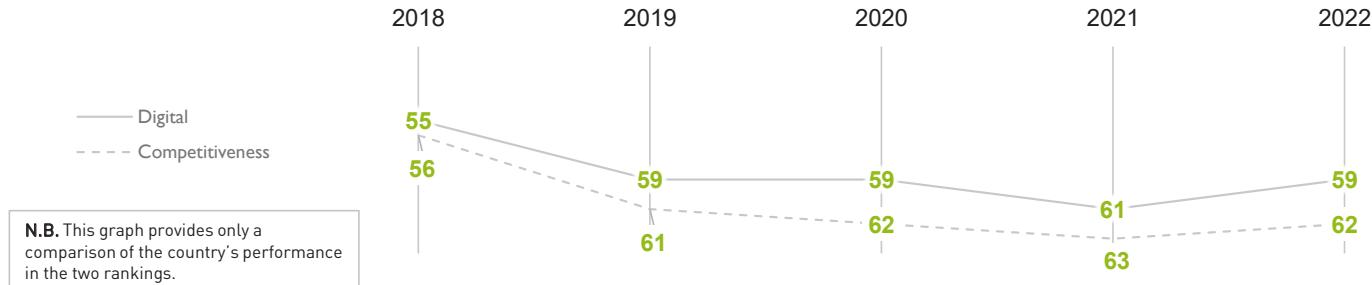
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	55	59	59	61	59
Knowledge	58	58	50	55	58
Technology	54	56	62	62	62
Future readiness	45	56	47	52	46

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



ARGENTINA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	47	51	56	62	61
Training & education	63	62	43	46	49
Scientific concentration	41	50	55	48	48

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	54	Employee training	62	Total expenditure on R&D (%)	52
International experience	52	Total public expenditure on education	35	Total R&D personnel per capita	43
Foreign highly-skilled personnel	62	Higher education achievement	38	► Female researchers	02
Management of cities	58	Pupil-teacher ratio (tertiary education)	22	R&D productivity by publication	23
Digital/Technological skills	57	Graduates in Sciences	59	Scientific and technical employment	51
► Net flow of international students	16	Women with degrees	32	High-tech patent grants	58
				Robots in Education and R&D	36

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	48	49	57	57	61
Capital	48	51	62	63	62
Technological framework	53	57	56	56	55

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	60	IT & media stock market capitalization	38	► Communications technology	62
Enforcing contracts	48	► Funding for technological development	62	Mobile Broadband subscribers	52
► Immigration laws	15	► Banking and financial services	62	Wireless broadband	58
Development & application of tech.	62	► Country credit rating	62	Internet users	25
Scientific research legislation	60	► Venture capital	62	Internet bandwidth speed	57
Intellectual property rights	61	Investment in Telecommunications	36	High-tech exports (%)	53

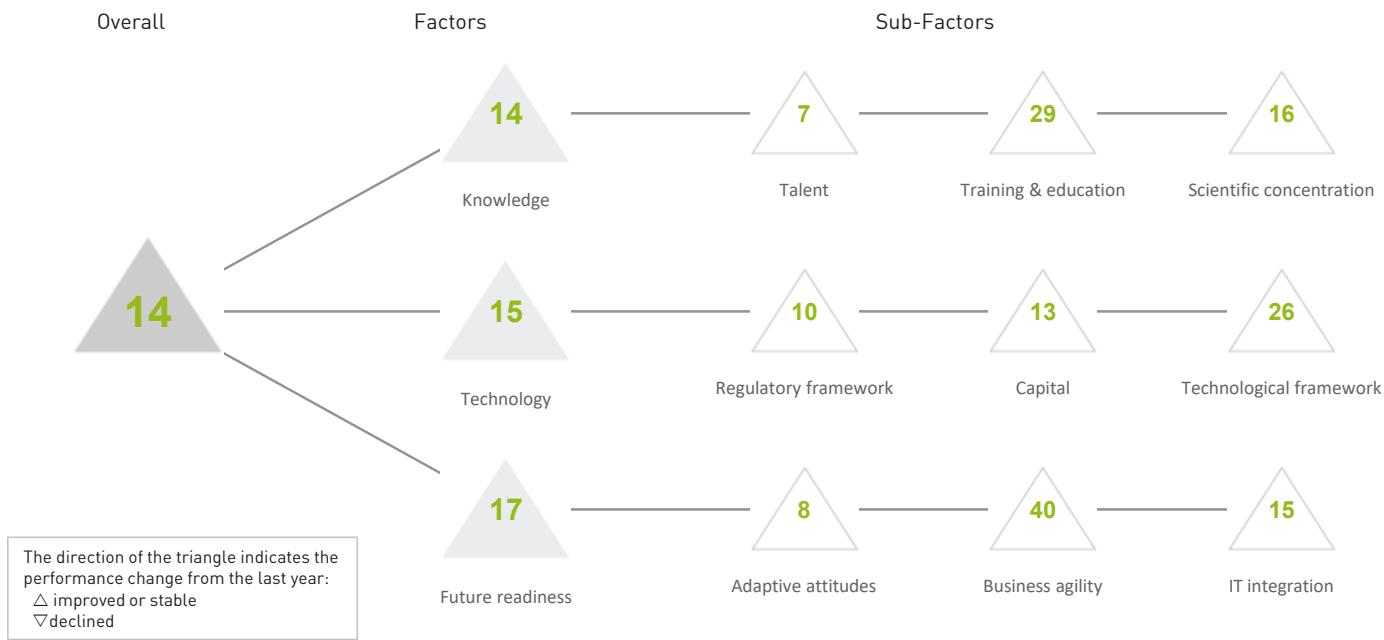
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	49	57	49	50	49
Business agility	37	48	39	43	37
IT integration	52	52	52	59	53

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	27	► Opportunities and threats	14	E-Government	29
Internet retailing	39	World robots distribution	36	Public-private partnerships	57
Tablet possession	40	Agility of companies	57	Cyber security	61
Smartphone possession	50	Use of big data and analytics	41	Software piracy	58
Attitudes toward globalization	61	Knowledge transfer	56	Government cyber security capacity	33
		► Entrepreneurial fear of failure	08	Privacy protection by law content	31

AUSTRALIA

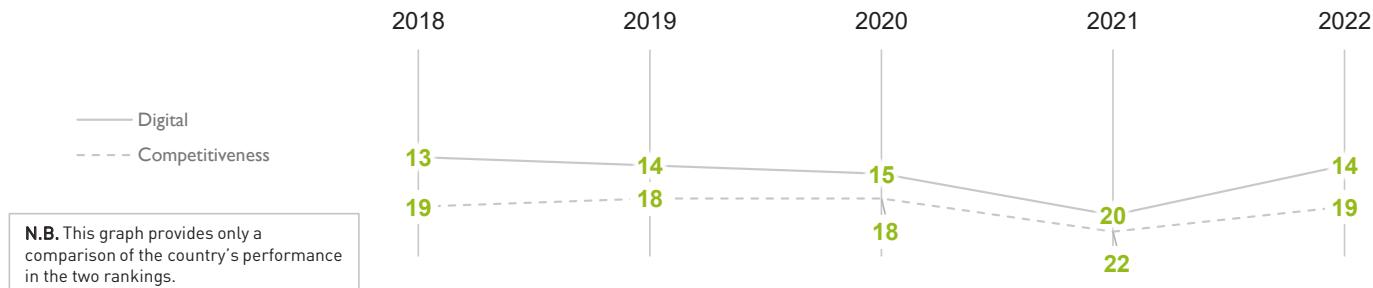
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	13	14	15	20	14
Knowledge	15	15	17	19	14
Technology	14	14	14	18	15
Future readiness	11	14	17	22	17

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



AUSTRALIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	08	07	06	08	07
Training & education	32	29	28	37	29
Scientific concentration	11	13	19	18	16

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	28	▷ Employee training	44	Total expenditure on R&D (%)	22
▷ International experience	49	Total public expenditure on education	17	Total R&D personnel per capita	-
Foreign highly-skilled personnel	12	Higher education achievement	15	Female researchers	-
Management of cities	21	Pupil-teacher ratio (tertiary education)	-	R&D productivity by publication	15
Digital/Technological skills	39	▷ Graduates in Sciences	52	Scientific and technical employment	09
▶ Net flow of international students	02	Women with degrees	07	High-tech patent grants	36
				Robots in Education and R&D	24

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	06	07	06	17	10
Capital	18	19	13	17	13
Technological framework	19	17	20	27	26

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	05	IT & media stock market capitalization	35	▷ Communications technology	47
Enforcing contracts	06	Funding for technological development	37	Mobile Broadband subscribers	09
Immigration laws	33	Banking and financial services	19	Wireless broadband	14
Development & application of tech.	24	▶ Country credit rating	01	Internet users	33
Scientific research legislation	24	Venture capital	23	▷ Internet bandwidth speed	45
Intellectual property rights	12	▶ Investment in Telecommunications	04	High-tech exports (%)	19

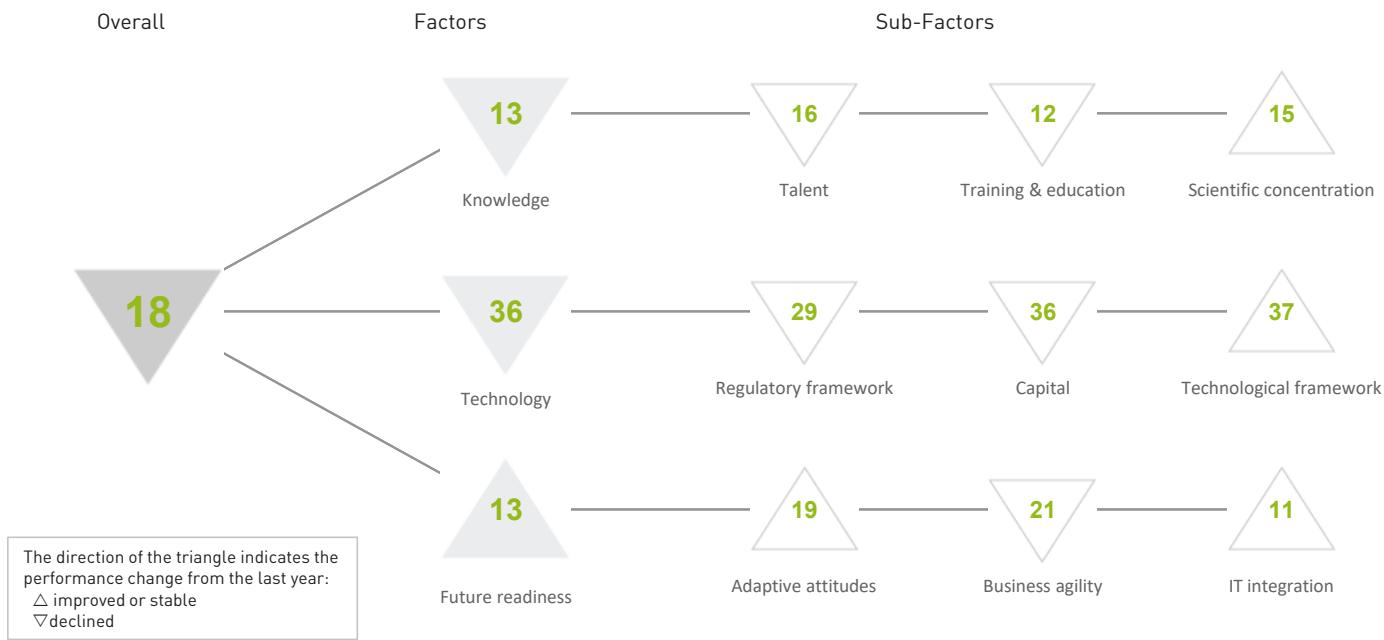
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	02	07	05	14	08
Business agility	28	35	43	55	40
IT integration	06	11	12	21	15

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	09	Opportunities and threats	41	E-Government	05
▶ Internet retailing	05	World robots distribution	30	Public-private partnerships	30
Tablet possession	06	Agility of companies	39	Cyber security	31
Smartphone possession	17	Use of big data and analytics	30	▶ Software piracy	05
Attitudes toward globalization	35	Knowledge transfer	29	Government cyber security capacity	38
		Entrepreneurial fear of failure	33	Privacy protection by law content	23

AUSTRIA

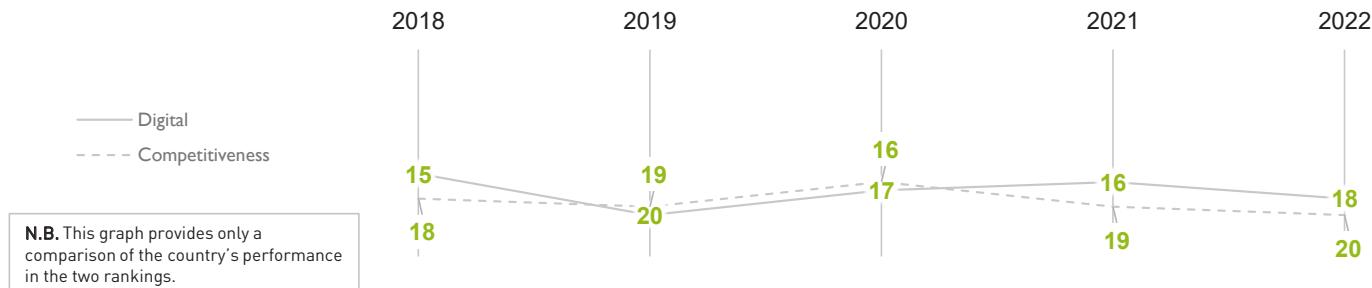
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	15	20	17	16	18
Knowledge	13	10	11	10	13
Technology	26	32	28	32	36
Future readiness	14	23	16	16	13

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



AUSTRIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	12	12	12	15	16
Training & education	07	08	12	05	12
Scientific concentration	18	14	14	15	15

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	22	▶ Employee training	03	Total expenditure on R&D (%)	08
International experience	28	Total public expenditure on education	29	Total R&D personnel per capita	09
Foreign highly-skilled personnel	22	Higher education achievement	37	Female researchers	43
Management of cities	10	▶ Pupil-teacher ratio (tertiary education)	02	▷ R&D productivity by publication	47
Digital/Technological skills	40	Graduates in Sciences	07	Scientific and technical employment	14
Net flow of international students	06	Women with degrees	37	High-tech patent grants	22
				Robots in Education and R&D	10

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	24	25	24	26	29
Capital	38	34	30	32	36
Technological framework	21	31	33	38	37

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
▷ Starting a business	52	▷ IT & media stock market capitalization	47	Communications technology	24
Enforcing contracts	10	Funding for technological development	18	Mobile Broadband subscribers	33
▷ Immigration laws	52	Banking and financial services	22	Wireless broadband	32
Development & application of tech.	25	Country credit rating	12	Internet users	30
Scientific research legislation	14	Venture capital	39	Internet bandwidth speed	41
Intellectual property rights	08	▷ Investment in Telecommunications	53	High-tech exports (%)	34

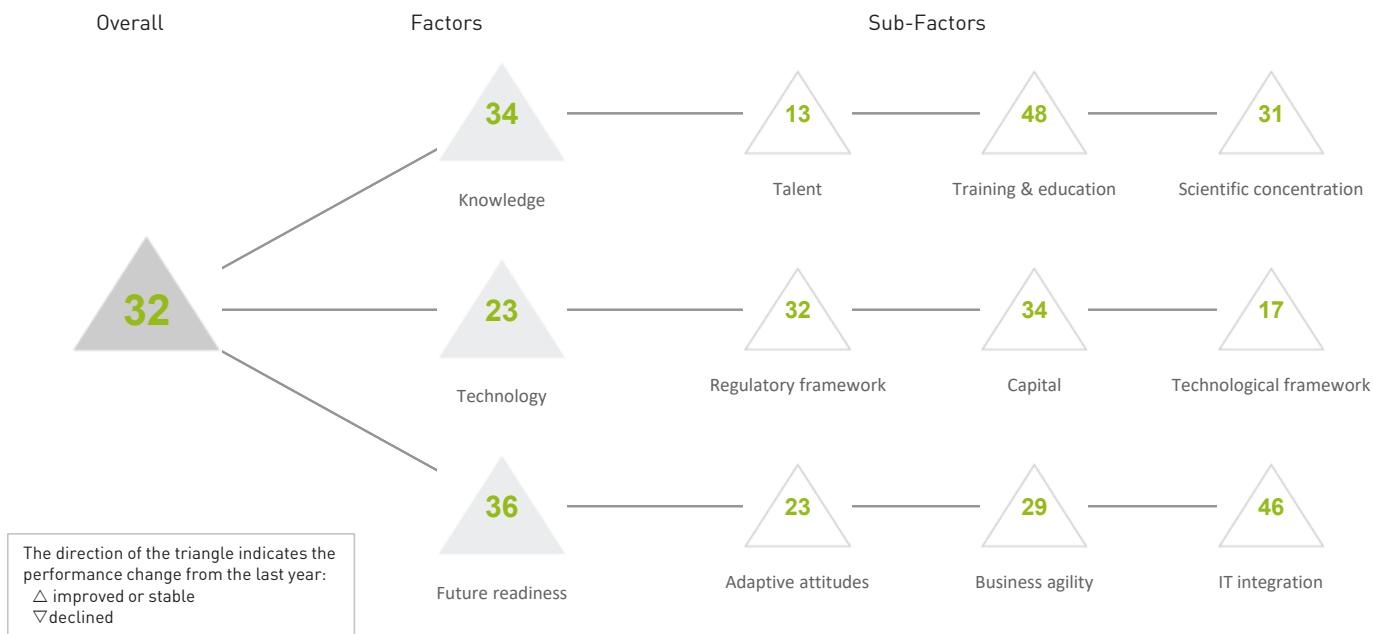
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	25	29	21	21	19
Business agility	05	25	21	18	21
IT integration	10	15	09	11	11

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
▶ E-Participation	06	Opportunities and threats	22	E-Government	15
Internet retailing	17	World robots distribution	23	Public-private partnerships	38
Tablet possession	18	Agility of companies	14	▷ Cyber security	04
Smartphone possession	15	Use of big data and analytics	44	▷ Software piracy	06
Attitudes toward globalization	43	Knowledge transfer	14	Government cyber security capacity	26
		Entrepreneurial fear of failure	10	Privacy protection by law content	16

BAHRAIN

OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	-	-	-	-	32
Knowledge	-	-	-	-	34
Technology	-	-	-	-	23
Future readiness	-	-	-	-	36

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)

POPULATIONS < 20 MILLION (36 countries)



BAHRAIN

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	-	-	-	-	13
Training & education	-	-	-	-	48
Scientific concentration	-	-	-	-	31

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	-	Employee training	25	Total expenditure on R&D (%)	-
International experience	07	▷ Total public expenditure on education	61	Total R&D personnel per capita	-
Foreign highly-skilled personnel	08	Higher education achievement	34	Female researchers	19
Management of cities	17	Pupil-teacher ratio (tertiary education)	49	R&D productivity by publication	-
Digital/Technological skills	13	▷ Graduates in Sciences	58	Scientific and technical employment	-
Net flow of international students	29	▷ Women with degrees	03	High-tech patent grants	41

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	-	-	-	-	32
Capital	-	-	-	-	34
Technological framework	-	-	-	-	17

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	33	IT & media stock market capitalization	26	Communications technology	14
Enforcing contracts	42	Funding for technological development	28	▷ Mobile Broadband subscribers	04
▶ Immigration laws	04	Banking and financial services	18	Wireless broadband	10
Development & application of tech.	15	▷ Country credit rating	59	▷ Internet users	04
Scientific research legislation	33	Venture capital	38	Internet bandwidth speed	34
Intellectual property rights	33	Investment in Telecommunications	06	▷ High-tech exports (%)	58

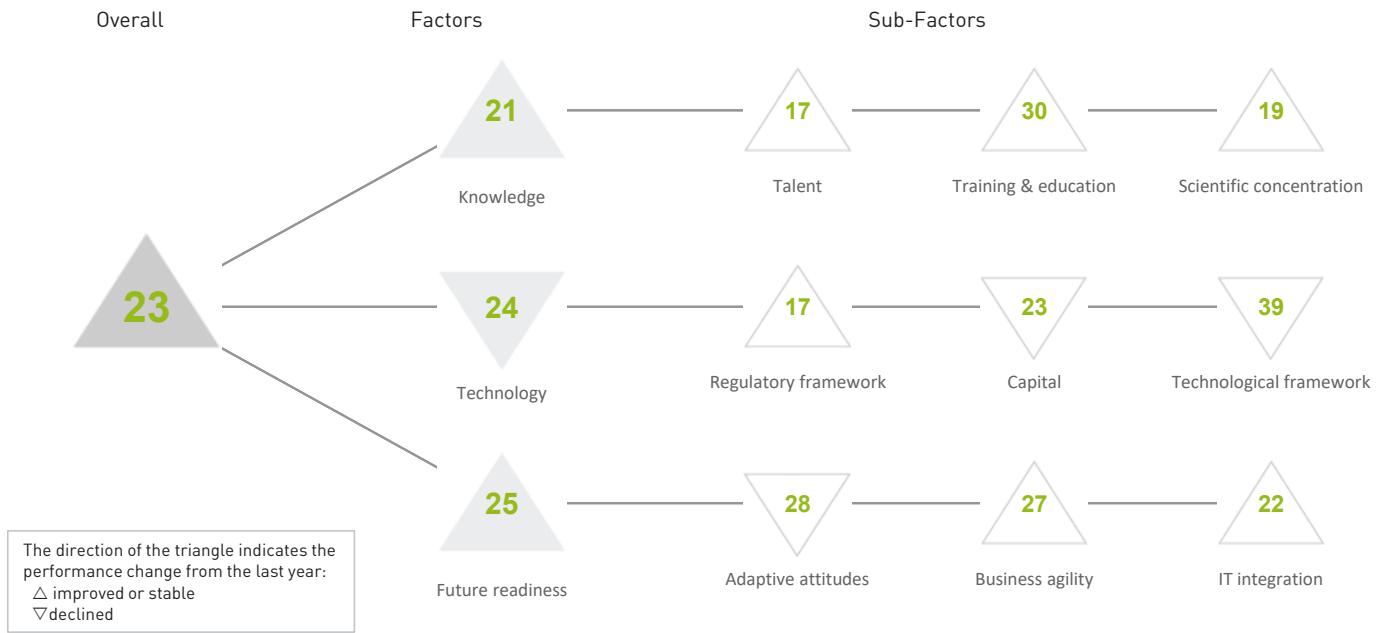
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	-	-	-	-	23
Business agility	-	-	-	-	29
IT integration	-	-	-	-	46

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	40	Opportunities and threats	34	E-Government	34
Internet retailing	41	World robots distribution	-	Public-private partnerships	17
▶ Tablet possession	01	Agility of companies	30	Cyber security	11
Smartphone possession	24	Use of big data and analytics	32	Software piracy	46
Attitudes toward globalization	13	Knowledge transfer	25	Government cyber security capacity	51
		Entrepreneurial fear of failure	-	▷ Privacy protection by law content	60

BELGIUM

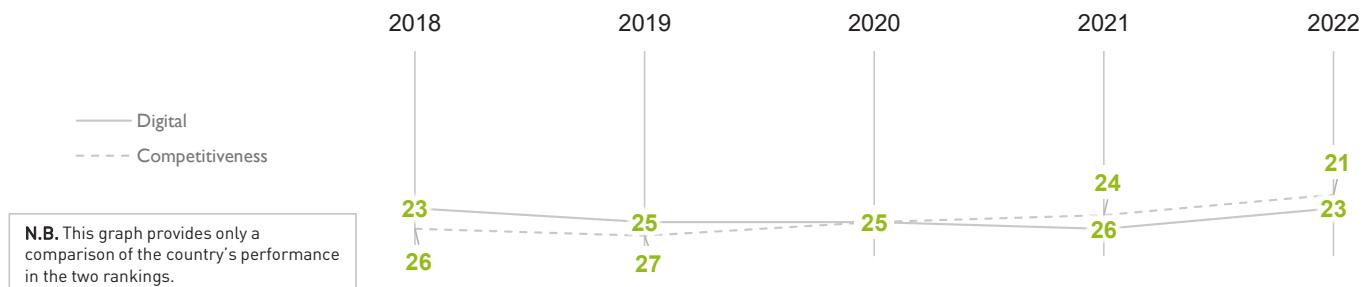
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

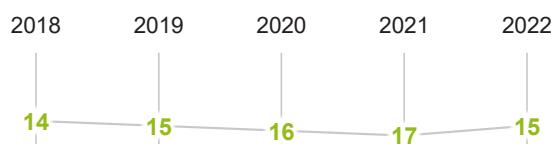
	2018	2019	2020	2021	2022
OVERALL	23	25	25	26	23
Knowledge	25	23	21	21	21
Technology	24	21	19	23	24
Future readiness	23	25	25	26	25

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



BELGIUM

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	17	18	20	20	17
Training & education	30	26	31	31	30
Scientific concentration	29	24	21	20	19

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	14	Employee training	22	► Total expenditure on R&D (%)	05
International experience	12	► Total public expenditure on education	08	Total R&D personnel per capita	12
Foreign highly-skilled personnel	20	Higher education achievement	23	Female researchers	40
Management of cities	31	Pupil-teacher ratio (tertiary education)	38	▷ R&D productivity by publication	44
Digital/Technological skills	36	▷ Graduates in Sciences	57	Scientific and technical employment	20
Net flow of international students	13	Women with degrees	22	High-tech patent grants	34
				Robots in Education and R&D	18

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	17	22	19	18	17
Capital	23	25	21	20	23
Technological framework	33	26	29	37	39

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	27	IT & media stock market capitalization	40	Communications technology	36
Enforcing contracts	39	Funding for technological development	19	Mobile Broadband subscribers	39
► Immigration laws	07	Banking and financial services	21	▷ Wireless broadband	59
Development & application of tech.	21	Country credit rating	20	Internet users	18
Scientific research legislation	13	Venture capital	15	Internet bandwidth speed	24
Intellectual property rights	14	Investment in Telecommunications	43	High-tech exports (%)	29

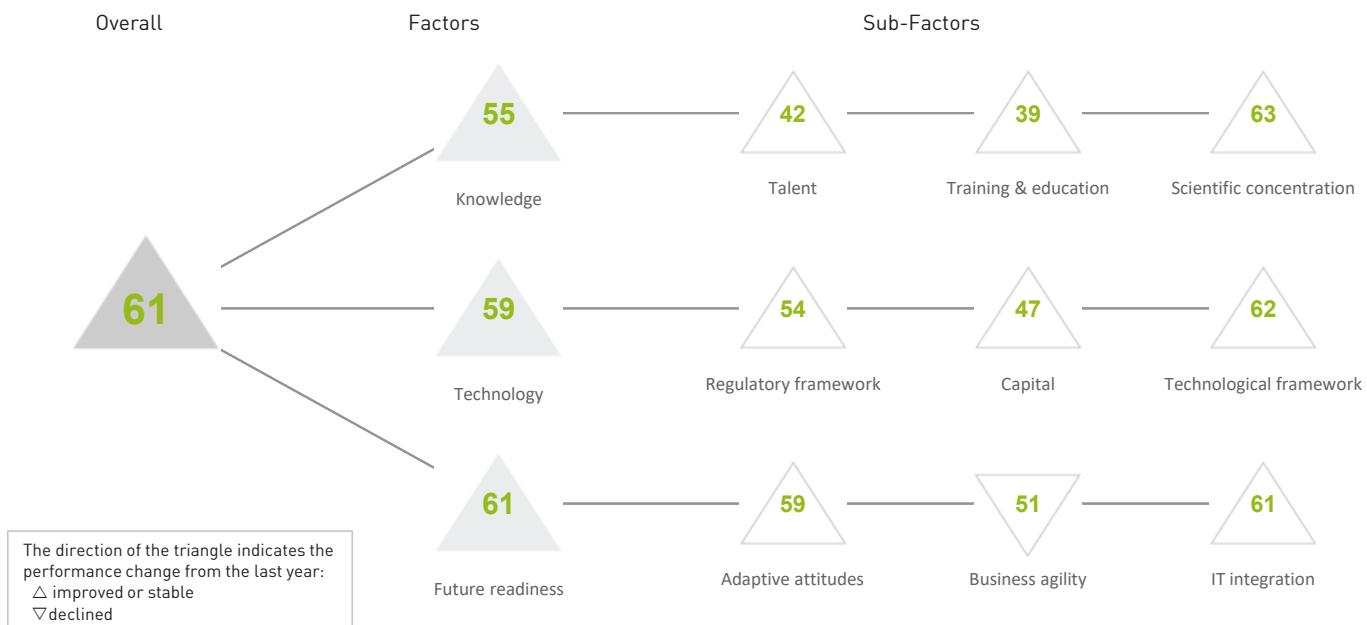
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	19	23	24	22	28
Business agility	21	33	35	38	27
IT integration	21	23	26	26	22

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
▷ E-Participation	55	Opportunities and threats	33	E-Government	36
Internet retailing	12	World robots distribution	25	Public-private partnerships	15
► Tablet possession	11	Agility of companies	29	Cyber security	35
Smartphone possession	43	Use of big data and analytics	31	Software piracy	13
Attitudes toward globalization	39	Knowledge transfer	16	▷ Government cyber security capacity	43
		Entrepreneurial fear of failure	-	► Privacy protection by law content	10

BOTSWANA

OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	-	-	-	63	61
Knowledge	-	-	-	64	55
Technology	-	-	-	63	59
Future readiness	-	-	-	63	61

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



BOTSWANA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	-	-	-	53	42
Training & education	-	-	-	48	39
Scientific concentration	-	-	-	63	63

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	-	Employee training	57	Total expenditure on R&D (%)	-
International experience	45	► Total public expenditure on education	01	Total R&D personnel per capita	-
► Foreign highly-skilled personnel	21	▷ Higher education achievement	61	Female researchers	-
Management of cities	49	Pupil-teacher ratio (tertiary education)	41	R&D productivity by publication	-
Digital/Technological skills	55	Graduates in Sciences	34	Scientific and technical employment	50
Net flow of international students	47	Women with degrees	-	High-tech patent grants	61
				Robots in Education and R&D	-

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	-	-	-	63	54
Capital	-	-	-	56	47
Technological framework	-	-	-	64	62

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	61	IT & media stock market capitalization	-	Communications technology	53
Enforcing contracts	56	Funding for technological development	51	► Mobile Broadband subscribers	63
Immigration laws	45	Banking and financial services	50	Wireless broadband	49
Development & application of tech.	49	Country credit rating	39	▷ Internet users	62
Scientific research legislation	42	Venture capital	51	▷ Internet bandwidth speed	63
Intellectual property rights	50	Investment in Telecommunications	41	▷ High-tech exports (%)	62

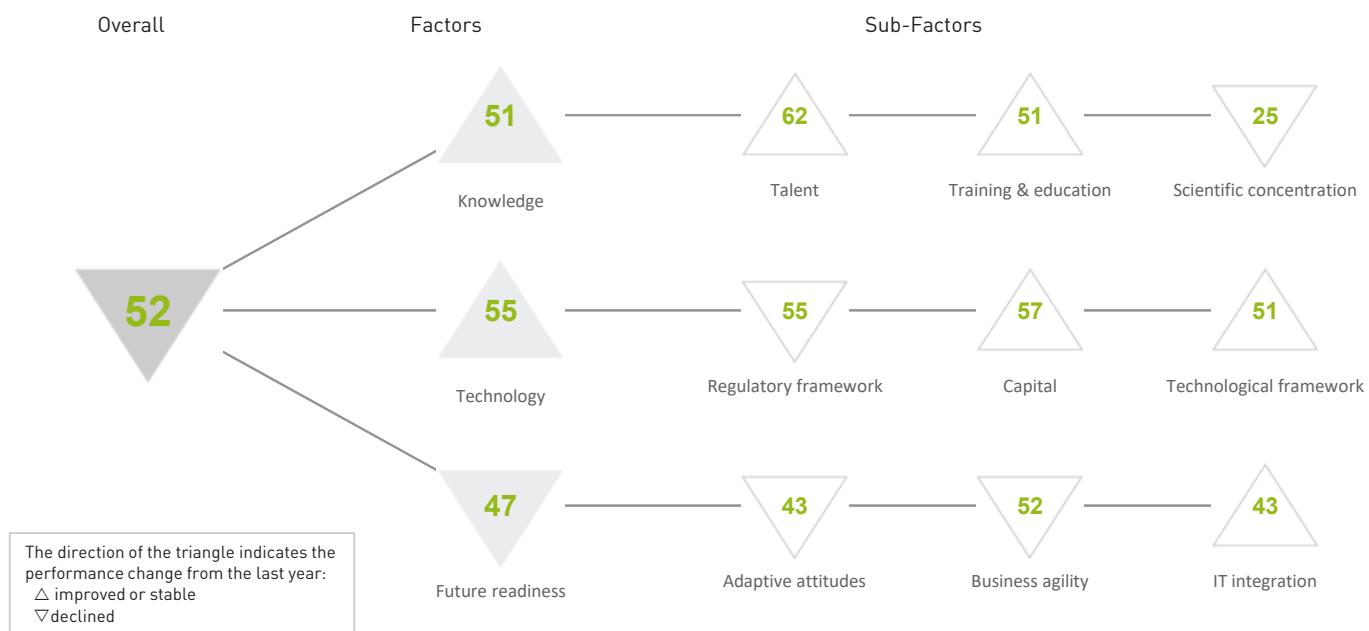
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	-	-	-	63	59
Business agility	-	-	-	46	51
IT integration	-	-	-	63	61

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	59	Opportunities and threats	61	E-Government	59
Internet retailing	-	World robots distribution	-	Public-private partnerships	44
Tablet possession	-	Agility of companies	60	Cyber security	51
► Smartphone possession	16	Use of big data and analytics	49	Software piracy	60
Attitudes toward globalization	55	Knowledge transfer	53	Government cyber security capacity	61
		Entrepreneurial fear of failure	-	► Privacy protection by law content	27

BRAZIL

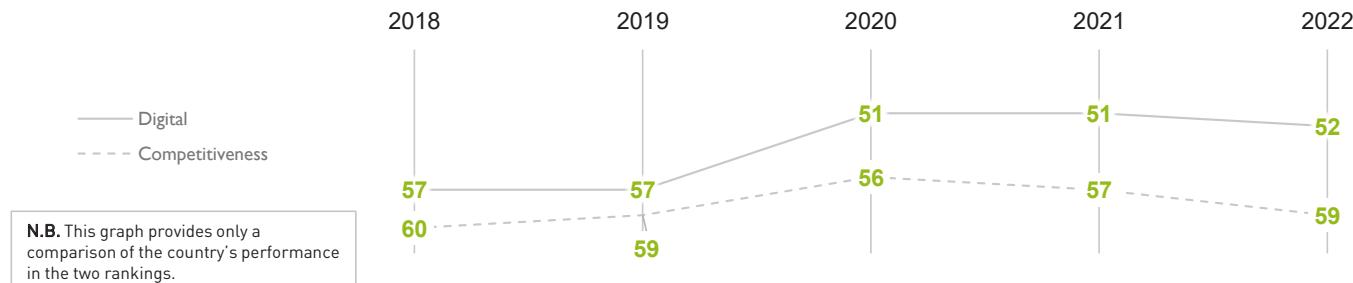
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	57	57	51	51	52
Knowledge	62	59	57	51	51
Technology	55	57	57	55	55
Future readiness	47	43	43	45	47

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



BRAZIL

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	61	61	62	63	62
Training & education	57	59	61	58	51
Scientific concentration	54	44	27	21	25

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	53	Employee training	45	Total expenditure on R&D (%)	37
▷ International experience	62	► Total public expenditure on education	07	Total R&D personnel per capita	-
▷ Foreign highly-skilled personnel	60	Higher education achievement	56	► Female researchers	16
▷ Management of cities	60	Pupil-teacher ratio (tertiary education)	44	► R&D productivity by publication	08
Digital/Technological skills	60	Graduates in Sciences	54	Scientific and technical employment	35
Net flow of international students	43	Women with degrees	49	High-tech patent grants	44
				► Robots in Education and R&D	16

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	59	57	52	51	55
Capital	56	61	58	59	57
Technological framework	47	47	50	51	51

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	57	IT & media stock market capitalization	45	Communications technology	58
Enforcing contracts	41	Funding for technological development	59	Mobile Broadband subscribers	36
Immigration laws	26	Banking and financial services	56	Wireless broadband	48
Development & application of tech.	57	Country credit rating	56	Internet users	49
Scientific research legislation	59	Venture capital	52	Internet bandwidth speed	44
▷ Intellectual property rights	60	► Investment in Telecommunications	12	High-tech exports (%)	38

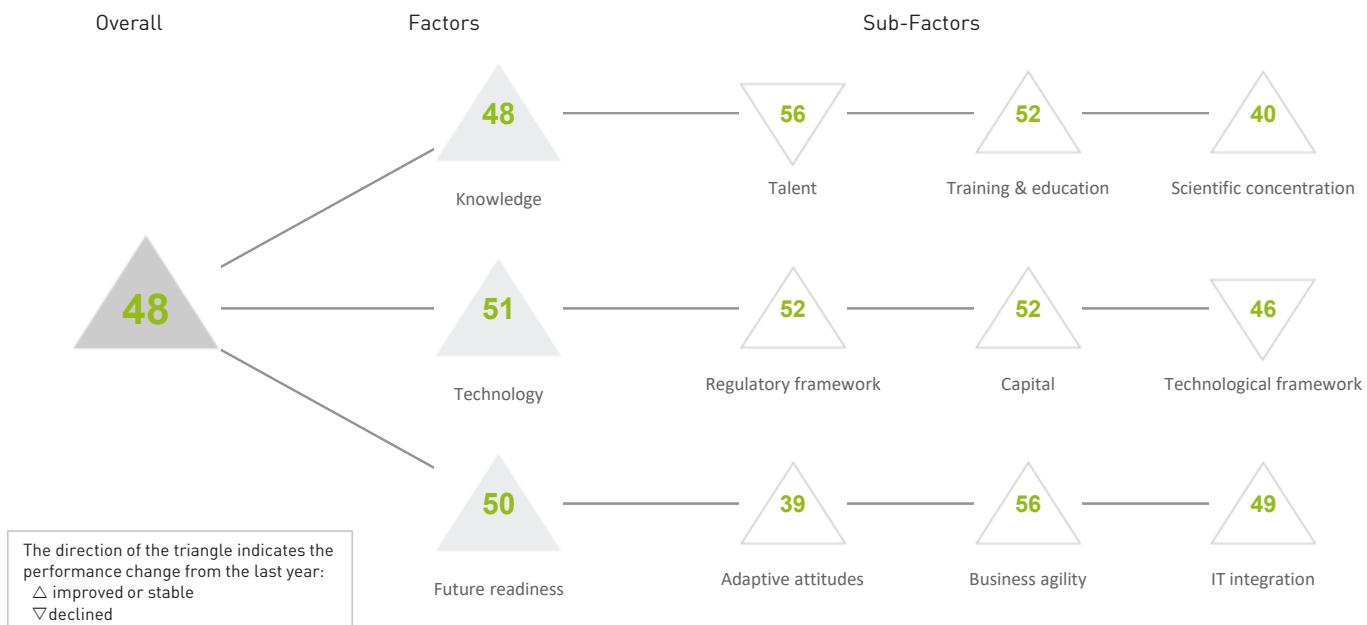
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	38	33	39	40	43
Business agility	52	58	41	42	52
IT integration	51	49	48	49	43

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	18	Opportunities and threats	42	E-Government	47
Internet retailing	43	World robots distribution	19	Public-private partnerships	55
Tablet possession	47	Agility of companies	50	Cyber security	59
Smartphone possession	33	Use of big data and analytics	60	Software piracy	36
Attitudes toward globalization	53	▷ Knowledge transfer	61	Government cyber security capacity	25
		Entrepreneurial fear of failure	27	Privacy protection by law content	29

BULGARIA

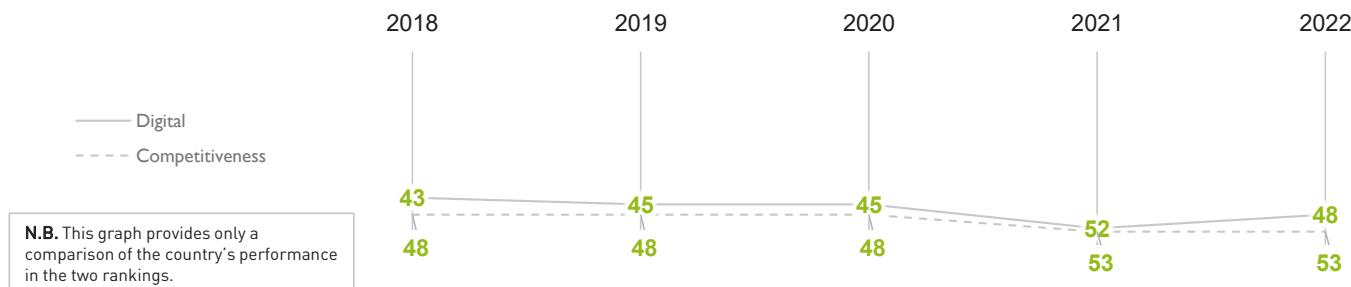
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

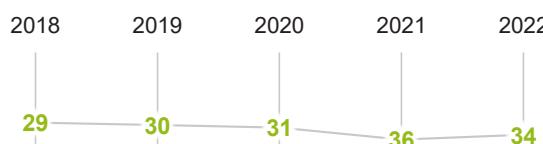
	2018	2019	2020	2021	2022
OVERALL	43	45	45	52	48
Knowledge	41	46	47	53	48
Technology	42	42	45	51	51
Future readiness	55	48	44	55	50

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



BULGARIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	53	50	48	54	56
Training & education	42	46	50	53	52
Scientific concentration	33	37	42	46	40

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	42	▷ Employee training	59	Total expenditure on R&D (%)	43
International experience	56	Total public expenditure on education	48	Total R&D personnel per capita	35
▷ Foreign highly-skilled personnel	61	Higher education achievement	48	▶ Female researchers	11
Management of cities	51	▶ Pupil-teacher ratio (tertiary education)	13	R&D productivity by publication	45
Digital/Technological skills	26	Graduates in Sciences	48	Scientific and technical employment	37
Net flow of international students	52	Women with degrees	35	▶ High-tech patent grants	13
				Robots in Education and R&D	48

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	52	46	55	55	52
Capital	50	42	48	53	52
Technological framework	36	44	39	42	46

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	46	IT & media stock market capitalization	43	Communications technology	35
Enforcing contracts	31	Funding for technological development	47	Mobile Broadband subscribers	37
Immigration laws	58	Banking and financial services	52	Wireless broadband	21
Development & application of tech.	53	Country credit rating	42	Internet users	55
Scientific research legislation	53	Venture capital	50	Internet bandwidth speed	38
Intellectual property rights	55	Investment in Telecommunications	37	High-tech exports (%)	39

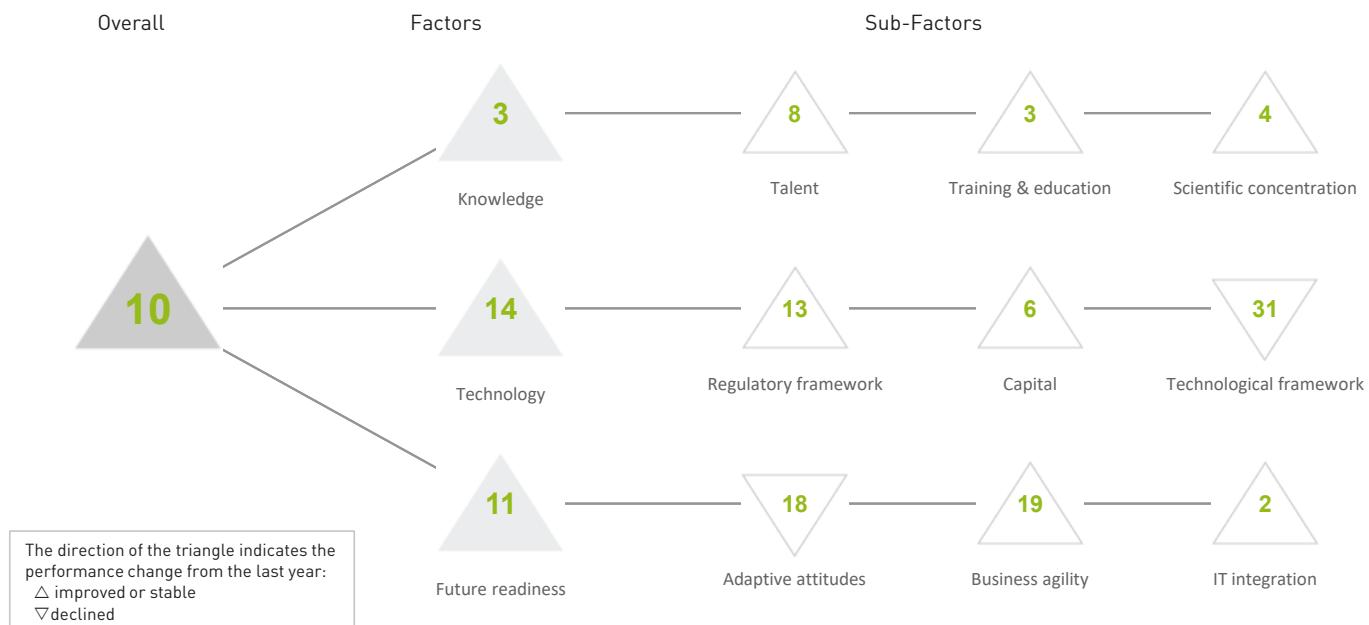
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	48	43	41	45	39
Business agility	59	56	40	61	56
IT integration	54	47	47	53	49

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	22	▷ Opportunities and threats	60	E-Government	39
Internet retailing	47	World robots distribution	44	Public-private partnerships	51
Tablet possession	45	▷ Agility of companies	62	Cyber security	53
Smartphone possession	23	Use of big data and analytics	54	Software piracy	51
Attitudes toward globalization	50	Knowledge transfer	57	▷ Government cyber security capacity	59
		▶ Entrepreneurial fear of failure	06	▶ Privacy protection by law content	20

CANADA

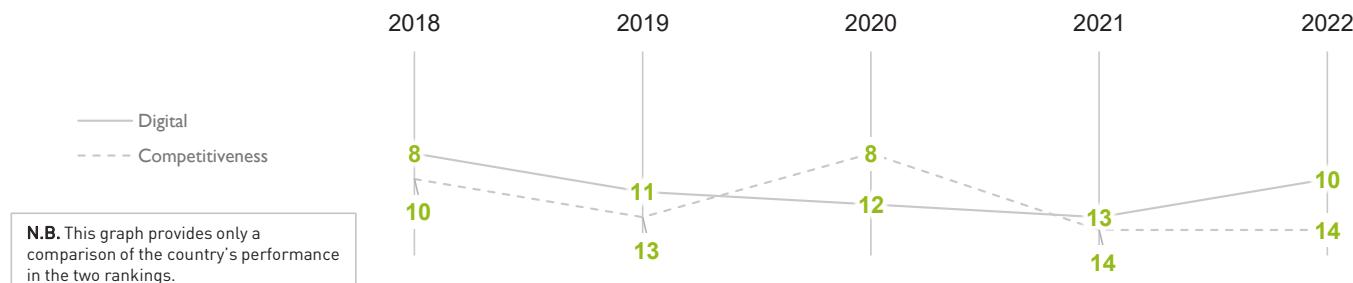
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	08	11	12	13	10
Knowledge	03	05	05	07	03
Technology	12	13	13	15	14
Future readiness	09	18	15	15	11

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



CANADA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	07	13	08	09	08
Training & education	04	07	06	10	03
Scientific concentration	04	02	07	05	04

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	11	Employee training	10	Total expenditure on R&D (%)	24
International experience	22	▷ Total public expenditure on education	32	Total R&D personnel per capita	22
Foreign highly-skilled personnel	11	Higher education achievement	05	Female researchers	19
Management of cities	19	Pupil-teacher ratio (tertiary education)	08	R&D productivity by publication	10
Digital/Technological skills	14	Graduates in Sciences	28	▶ Scientific and technical employment	01
Net flow of international students	05	▷ Women with degrees	01	High-tech patent grants	14
				Robots in Education and R&D	08

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	11	17	12	13	13
Capital	05	10	03	09	06
Technological framework	24	27	26	29	31

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
▶ Starting a business	02	IT & media stock market capitalization	19	Communications technology	30
▷ Enforcing contracts	49	Funding for technological development	15	Mobile Broadband subscribers	34
Immigration laws	05	Banking and financial services	13	▷ Wireless broadband	53
Development & application of tech.	12	Country credit rating	10	Internet users	14
Scientific research legislation	08	Venture capital	18	Internet bandwidth speed	18
Intellectual property rights	23	Investment in Telecommunications	11	High-tech exports (%)	28

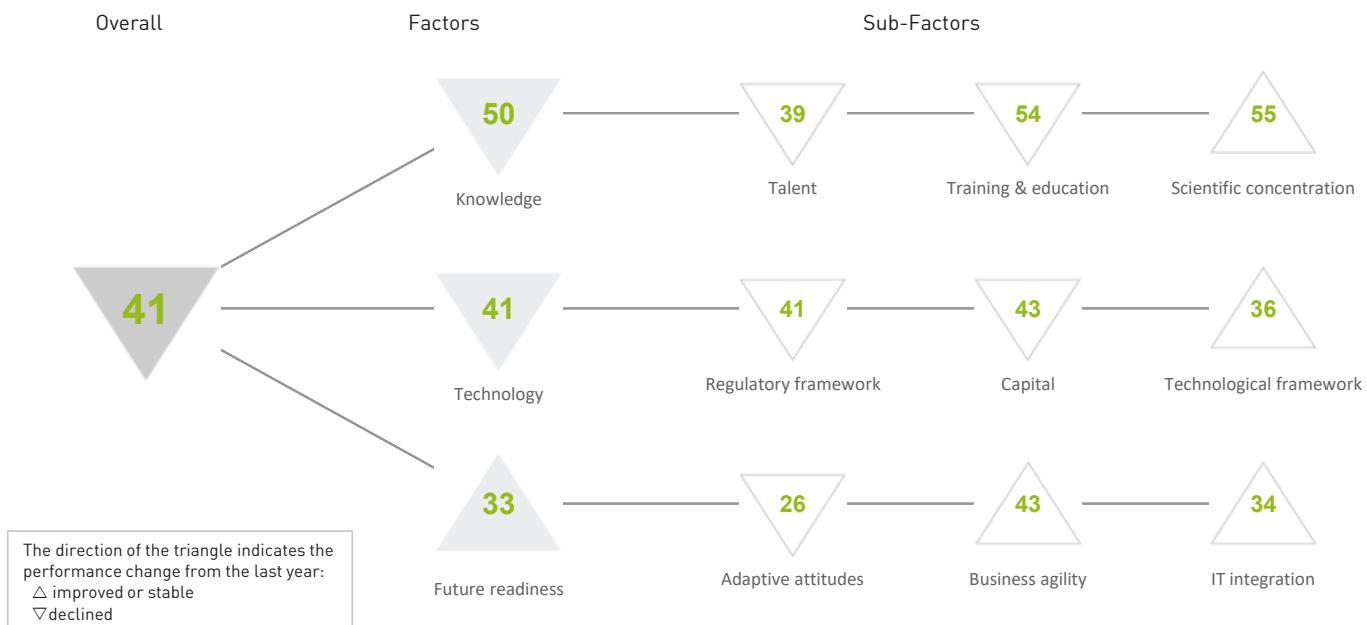
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	15	17	16	17	18
Business agility	04	16	16	20	19
IT integration	12	13	13	14	02

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	16	Opportunities and threats	18	E-Government	26
▶ Internet retailing	04	World robots distribution	13	▷ Public-private partnerships	03
Tablet possession	22	Agility of companies	18	Cyber security	12
▷ Smartphone possession	55	Use of big data and analytics	04	Software piracy	13
Attitudes toward globalization	24	Knowledge transfer	15	Government cyber security capacity	04
		▷ Entrepreneurial fear of failure	47	Privacy protection by law content	15

CHILE

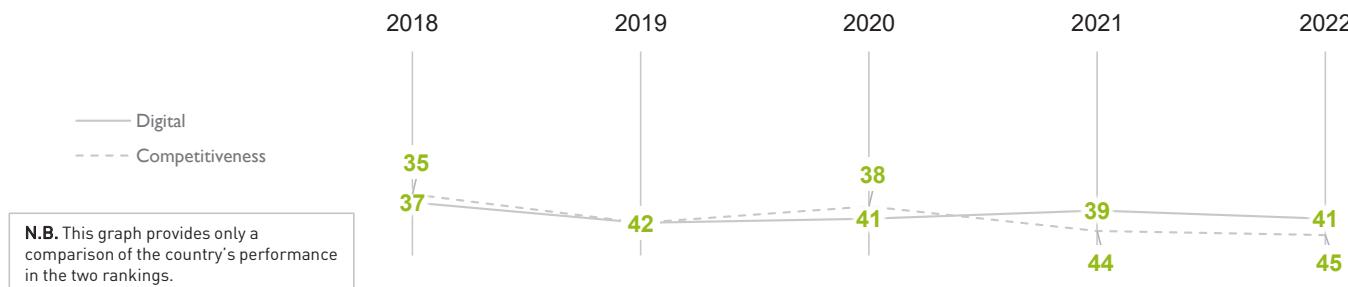
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	37	42	41	39	41
Knowledge	47	50	49	49	50
Technology	35	41	40	35	41
Future readiness	31	37	39	36	33

COMPETITIVENESS & DIGITAL RANKINGS

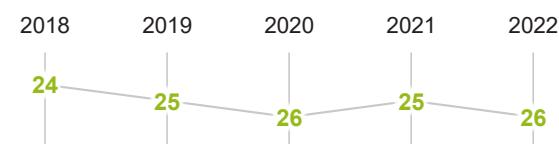


PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS < 20 MILLION (36 countries)



CHILE

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	31	36	37	36	39
Training & education	49	55	49	51	54
Scientific concentration	61	57	58	57	55

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	47	▷ Employee training	56	Total expenditure on R&D (%)	53
International experience	18	Total public expenditure on education	23	Total R&D personnel per capita	48
▶ Foreign highly-skilled personnel	12	Higher education achievement	46	Female researchers	33
▷ Management of cities	55	Pupil-teacher ratio (tertiary education)	-	R&D productivity by publication	20
Digital/Technological skills	31	Graduates in Sciences	45	Scientific and technical employment	38
Net flow of international students	45	Women with degrees	47	▷ High-tech patent grants	59
				Robots in Education and R&D	44

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	33	36	33	33	41
Capital	26	44	40	38	43
Technological framework	41	42	44	36	36

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	30	▷ IT & media stock market capitalization	53	Communications technology	26
Enforcing contracts	37	Funding for technological development	52	Mobile Broadband subscribers	32
▶ Immigration laws	09	Banking and financial services	25	Wireless broadband	41
Development & application of tech.	52	Country credit rating	32	Internet users	41
▷ Scientific research legislation	58	Venture capital	44	Internet bandwidth speed	25
Intellectual property rights	48	▶ Investment in Telecommunications	18	High-tech exports (%)	26

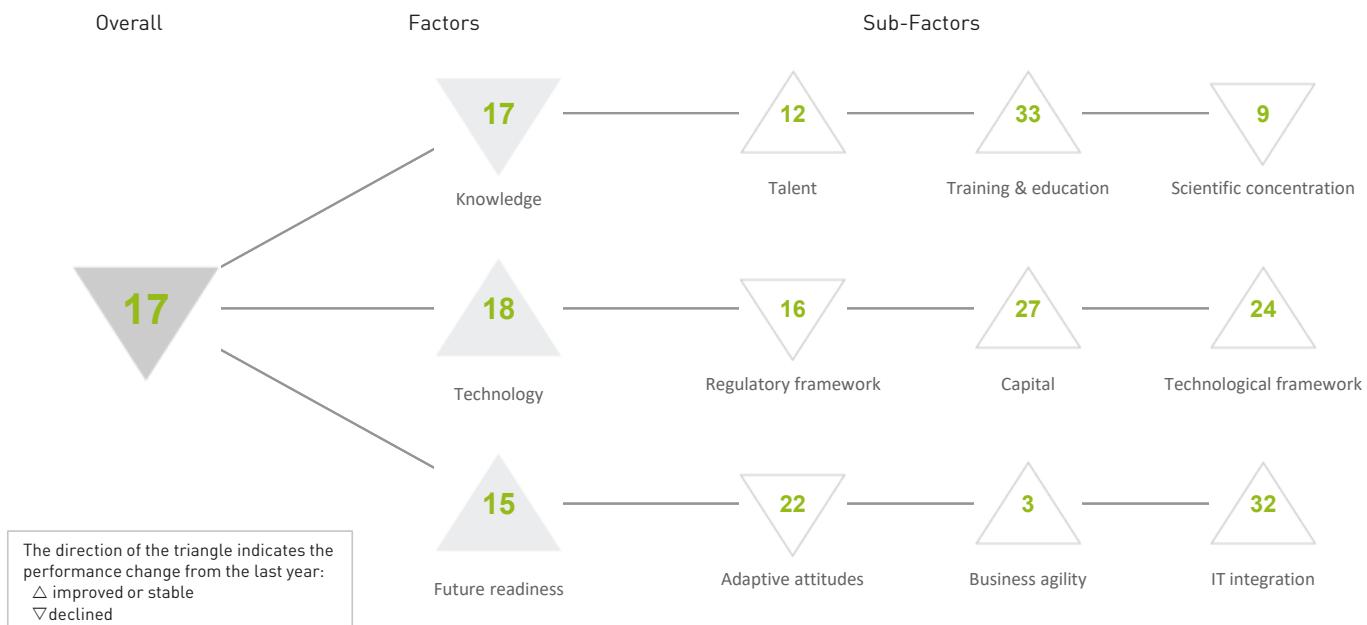
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	27	27	22	24	26
Business agility	39	50	54	54	43
IT integration	38	39	40	39	34

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	27	Opportunities and threats	25	E-Government	31
Internet retailing	34	World robots distribution	48	Public-private partnerships	23
Tablet possession	34	Agility of companies	26	Cyber security	42
▶ Smartphone possession	06	Use of big data and analytics	45	Software piracy	47
Attitudes toward globalization	19	Knowledge transfer	52	▶ Government cyber security capacity	18
		Entrepreneurial fear of failure	32	Privacy protection by law content	36

CHINA

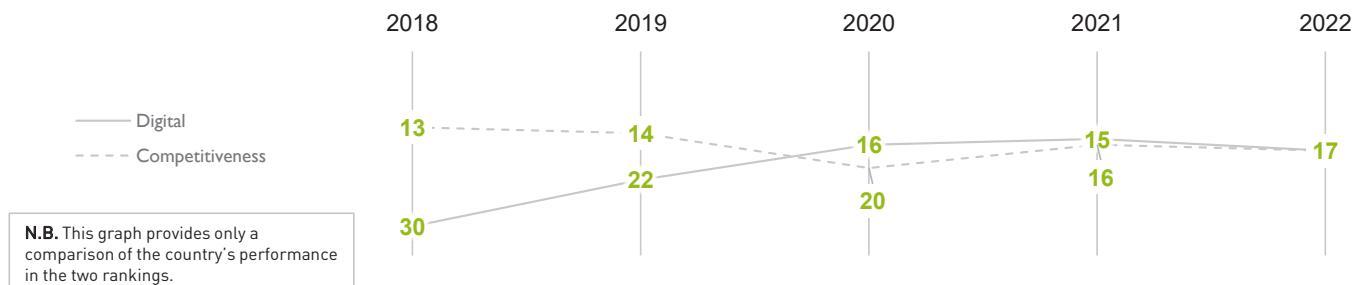
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	30	22	16	15	17
Knowledge	30	18	08	06	17
Technology	34	26	27	20	18
Future readiness	28	21	18	17	15

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



CHINA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	18	19	13	12	12
Training & education	46	37	40	35	33
Scientific concentration	21	09	02	01	09

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
▶ Educational assessment PISA - Math	01	Employee training	11	Total expenditure on R&D (%)	14
International experience	47	▷ Total public expenditure on education	53	Total R&D personnel per capita	36
Foreign highly-skilled personnel	35	Higher education achievement	16	▷ Female researchers	51
Management of cities	08	Pupil-teacher ratio (tertiary education)	40	▶ R&D productivity by publication	01
Digital/Technological skills	12	Graduates in Sciences	-	Scientific and technical employment	49
Net flow of international students	46	Women with degrees	-	High-tech patent grants	07
				▶ Robots in Education and R&D	01

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	26	20	18	15	16
Capital	30	32	31	27	27
Technological framework	40	32	32	28	24

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	16	IT & media stock market capitalization	24	Communications technology	11
Enforcing contracts	05	Funding for technological development	17	Mobile Broadband subscribers	05
Immigration laws	36	Banking and financial services	40	Wireless broadband	20
Development & application of tech.	16	Country credit rating	26	▷ Internet users	53
Scientific research legislation	19	Venture capital	31	Internet bandwidth speed	33
Intellectual property rights	36	Investment in Telecommunications	34	High-tech exports (%)	08

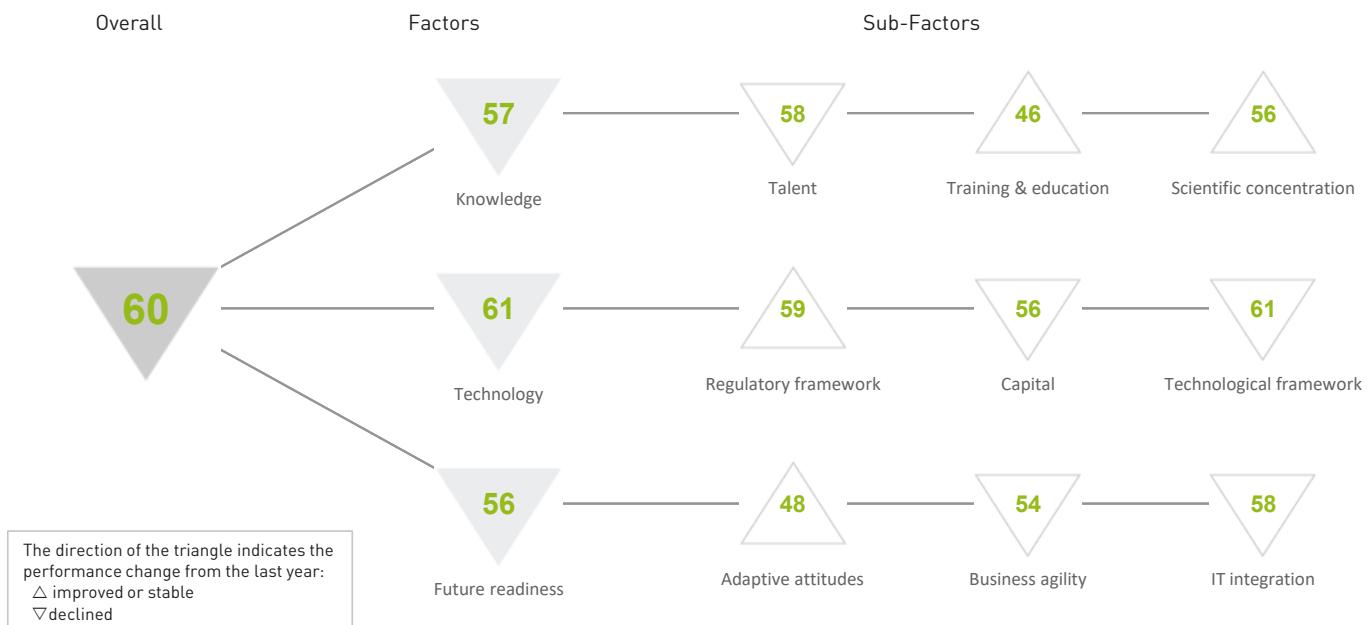
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	23	24	17	19	22
Business agility	19	01	04	03	03
IT integration	41	41	35	32	32

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	09	Opportunities and threats	13	E-Government	40
Internet retailing	25	▷ World robots distribution	01	Public-private partnerships	06
Tablet possession	38	Agility of companies	22	Cyber security	10
Smartphone possession	43	Use of big data and analytics	05	▷ Software piracy	56
Attitudes toward globalization	12	Knowledge transfer	20	▶ Government cyber security capacity	03
		Entrepreneurial fear of failure	25	▷ Privacy protection by law content	59

COLOMBIA

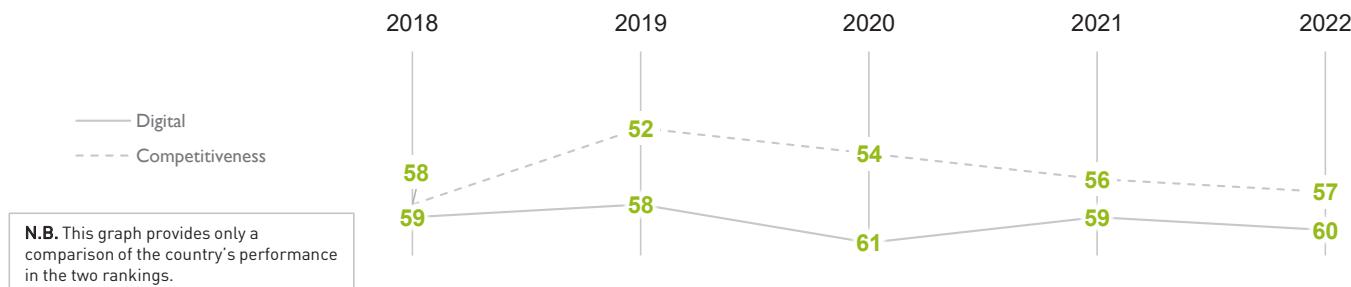
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

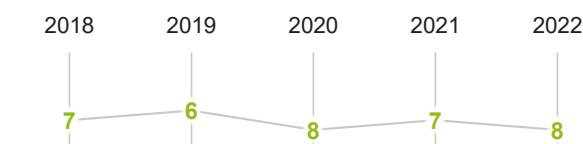
	2018	2019	2020	2021	2022
OVERALL	59	58	61	59	60
Knowledge	57	57	59	56	57
Technology	60	60	61	60	61
Future readiness	56	55	50	53	56

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



COLOMBIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	57	56	54	57	58
Training & education	45	49	48	50	46
Scientific concentration	57	58	57	58	56

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	52	Employee training	41	Total expenditure on R&D (%)	56
International experience	51	Total public expenditure on education	40	Total R&D personnel per capita	46
Foreign highly-skilled personnel	48	Higher education achievement	50	Female researchers	29
Management of cities	45	► Pupil-teacher ratio (tertiary education)	31	► R&D productivity by publication	14
Digital/Technological skills	53	Graduates in Sciences	30	Scientific and technical employment	48
Net flow of international students	49	Women with degrees	46	▷ High-tech patent grants	60
				Robots in Education and R&D	48

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	62	61	60	61	59
Capital	57	55	56	49	56
Technological framework	55	52	61	59	61

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	39	IT & media stock market capitalization	57	Communications technology	57
▷ Enforcing contracts	63	Funding for technological development	49	▷ Mobile Broadband subscribers	60
Immigration laws	48	Banking and financial services	59	▷ Wireless broadband	62
Development & application of tech.	47	Country credit rating	52	Internet users	56
Scientific research legislation	50	Venture capital	54	Internet bandwidth speed	55
Intellectual property rights	51	► Investment in Telecommunications	03	High-tech exports (%)	44

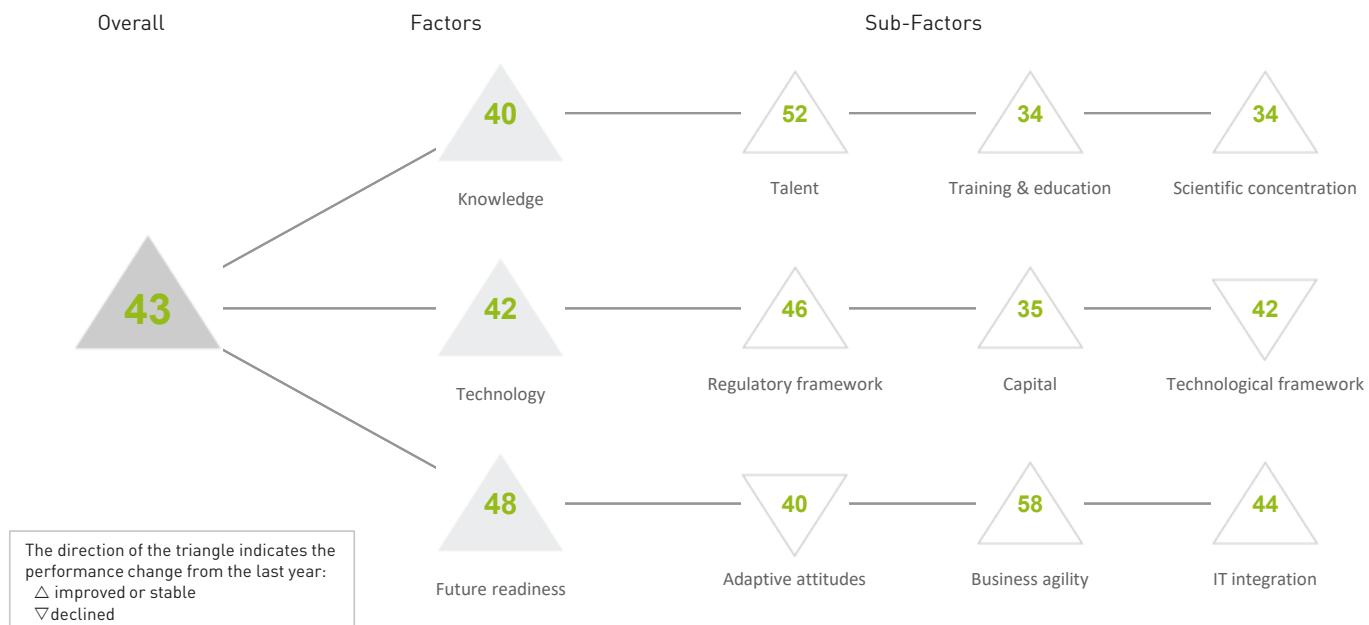
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	57	56	60	58	48
Business agility	54	55	38	47	54
IT integration	48	45	49	46	58

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
► E-Participation	26	Opportunities and threats	59	E-Government	52
Internet retailing	54	World robots distribution	49	Public-private partnerships	37
Tablet possession	52	Agility of companies	41	Cyber security	57
► Smartphone possession	31	Use of big data and analytics	36	Software piracy	40
Attitudes toward globalization	41	Knowledge transfer	43	▷ Government cyber security capacity	63
		Entrepreneurial fear of failure	37	Privacy protection by law content	52

CROATIA

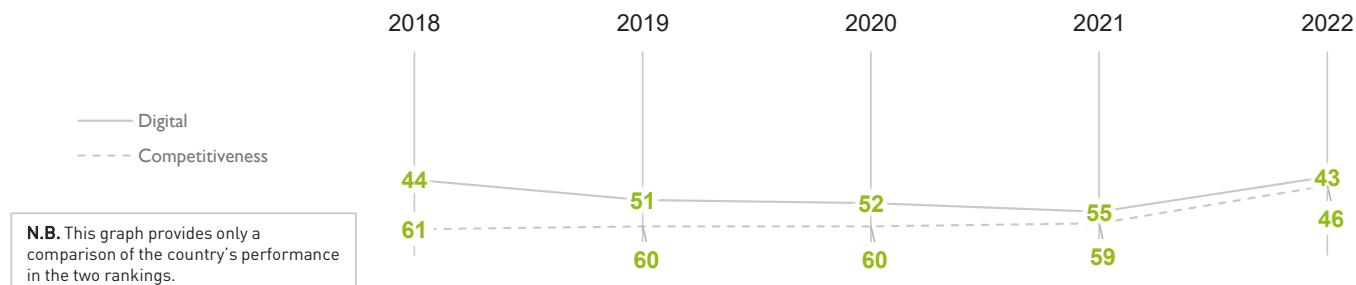
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	44	51	52	55	43
Knowledge	43	42	41	47	40
Technology	49	50	49	50	42
Future readiness	54	60	62	60	48

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



CROATIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	59	58	61	61	52
Training & education	36	31	26	42	34
Scientific concentration	32	33	32	34	34

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	36	Employee training	49	Total expenditure on R&D (%)	34
▷ International experience	57	Total public expenditure on education	21	Total R&D personnel per capita	34
▷ Foreign highly-skilled personnel	59	Higher education achievement	42	▶ Female researchers	10
Management of cities	48	► Pupil-teacher ratio (tertiary education)	07	R&D productivity by publication	49
Digital/Technological skills	32	► Graduates in Sciences	20	Scientific and technical employment	34
Net flow of international students	50	Women with degrees	42	▶ High-tech patent grants	17
				Robots in Education and R&D	37

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	55	59	59	56	46
Capital	52	50	43	50	35
Technological framework	43	41	40	41	42

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	47	IT & media stock market capitalization	22	Communications technology	32
Enforcing contracts	23	Funding for technological development	46	Mobile Broadband subscribers	23
Immigration laws	44	Banking and financial services	37	Wireless broadband	50
▷ Development & application of tech.	56	Country credit rating	50	Internet users	38
Scientific research legislation	47	Venture capital	42	Internet bandwidth speed	47
Intellectual property rights	46	► Investment in Telecommunications	05	High-tech exports (%)	46

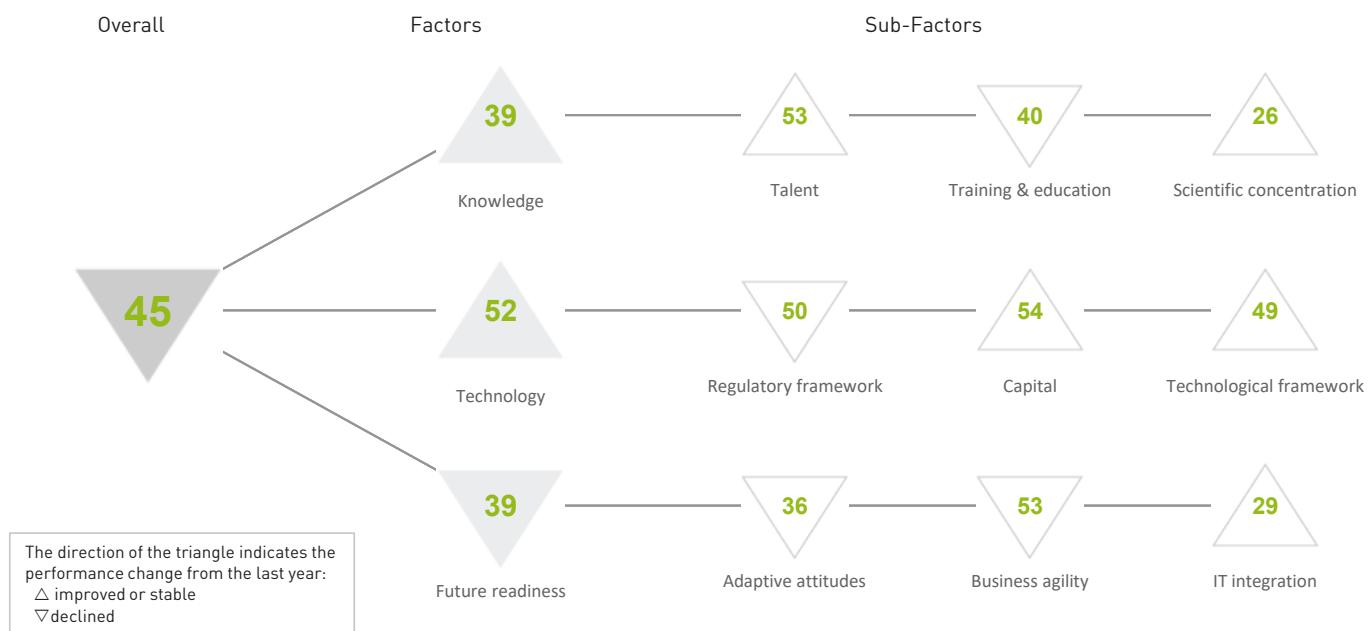
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	37	51	46	39	40
Business agility	63	62	63	64	58
IT integration	49	57	59	58	44

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	22	Opportunities and threats	53	E-Government	44
Internet retailing	45	World robots distribution	47	Public-private partnerships	56
Tablet possession	34	Agility of companies	45	Cyber security	44
Smartphone possession	40	Use of big data and analytics	51	Software piracy	43
▷ Attitudes toward globalization	57	▷ Knowledge transfer	59	Government cyber security capacity	45
		Entrepreneurial fear of failure	29	Privacy protection by law content	25

CYPRUS

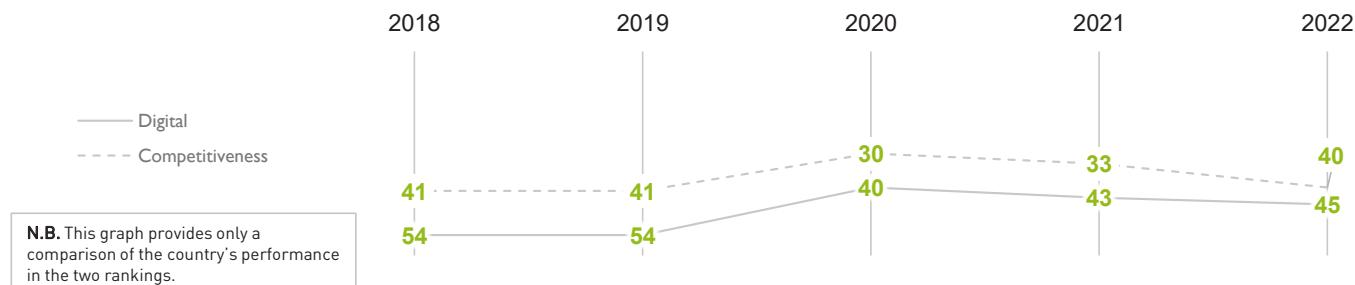
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

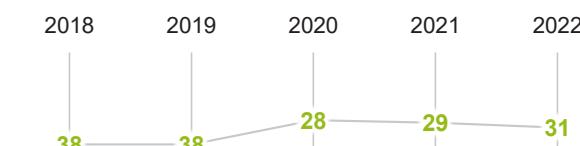
	2018	2019	2020	2021	2022
OVERALL	54	54	40	43	45
Knowledge	55	55	40	39	39
Technology	56	59	52	53	52
Future readiness	44	40	29	34	39

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



CYPRUS

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	62	62	57	56	53
Training & education	29	33	30	29	40
Scientific concentration	52	53	35	29	26

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	40	Employee training	51	Total expenditure on R&D (%)	45
International experience	34	► Total public expenditure on education	15	Total R&D personnel per capita	40
Foreign highly-skilled personnel	30	► Higher education achievement	11	Female researchers	27
Management of cities	32	Pupil-teacher ratio (tertiary education)	52	R&D productivity by publication	56
Digital/Technological skills	29	► Graduates in Sciences	60	► Scientific and technical employment	04
▷ Net flow of international students	60	Women with degrees	19	► High-tech patent grants	03
				Robots in Education and R&D	-

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	51	56	47	47	50
Capital	60	60	52	54	54
Technological framework	49	48	52	52	49

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	28	IT & media stock market capitalization	36	Communications technology	27
▷ Enforcing contracts	58	Funding for technological development	48	▷ Mobile Broadband subscribers	57
▷ Immigration laws	60	Banking and financial services	45	Wireless broadband	44
Development & application of tech.	42	Country credit rating	54	Internet users	29
Scientific research legislation	46	Venture capital	57	Internet bandwidth speed	50
Intellectual property rights	38	Investment in Telecommunications	42	High-tech exports (%)	35

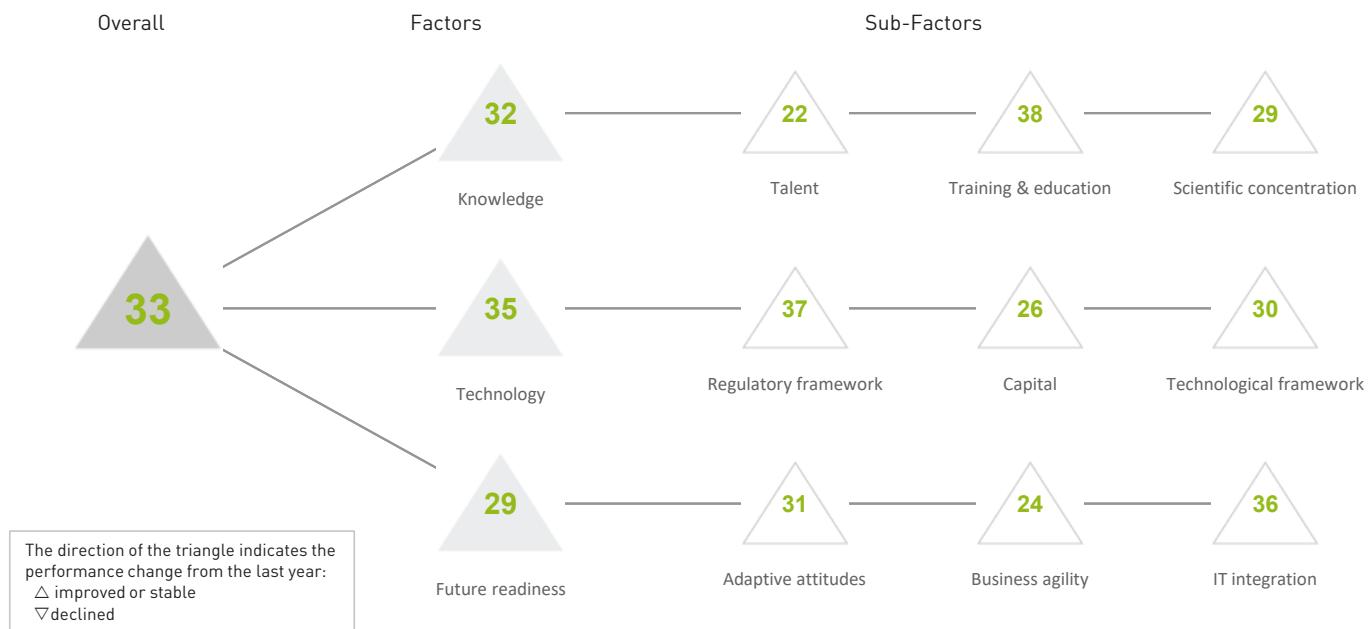
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	45	34	28	27	36
Business agility	45	57	42	50	53
IT integration	46	38	29	33	29

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
► E-Participation	14	Opportunities and threats	54	E-Government	18
Internet retailing	-	World robots distribution	-	Public-private partnerships	42
Tablet possession	46	Agility of companies	54	Cyber security	36
Smartphone possession	-	Use of big data and analytics	48	Software piracy	34
Attitudes toward globalization	54	Knowledge transfer	44	Government cyber security capacity	30
		Entrepreneurial fear of failure	40	Privacy protection by law content	24

CZECH REPUBLIC

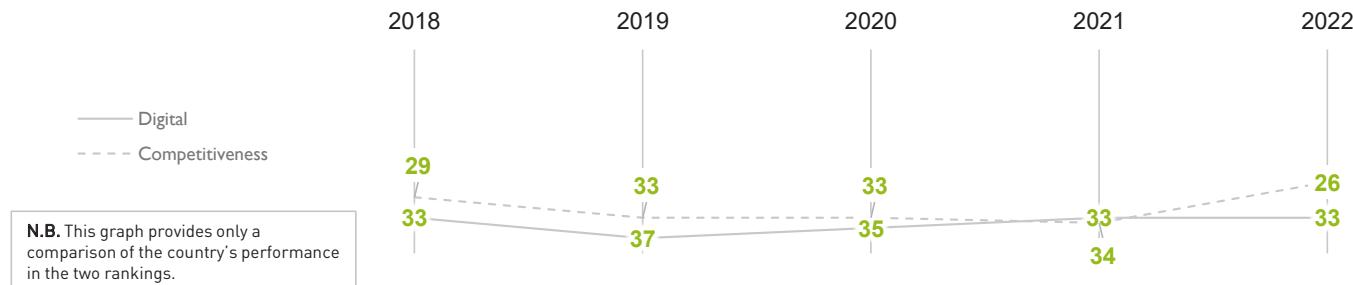
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	33	37	35	33	33
Knowledge	38	37	37	35	32
Technology	31	34	36	37	35
Future readiness	34	39	36	37	29

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



CZECH REPUBLIC

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	29	35	26	28	22
Training & education	55	44	46	45	38
Scientific concentration	36	30	31	30	29

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	21	Employee training	31	Total expenditure on R&D (%)	19
International experience	23	Total public expenditure on education	28	Total R&D personnel per capita	16
Foreign highly-skilled personnel	36	Higher education achievement	47	Female researchers	49
Management of cities	35	Pupil-teacher ratio (tertiary education)	32	R&D productivity by publication	34
Digital/Technological skills	23	Graduates in Sciences	23	Scientific and technical employment	30
► Net flow of international students	12	Women with degrees	45	High-tech patent grants	32
				► Robots in Education and R&D	15

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	44	43	45	44	37
Capital	19	28	27	29	26
Technological framework	18	28	28	32	30

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
► Starting a business	55	IT & media stock market capitalization	27	Communications technology	34
► Enforcing contracts	51	Funding for technological development	24	► Mobile Broadband subscribers	07
Immigration laws	22	► Banking and financial services	14	Wireless broadband	28
Development & application of tech.	38	Country credit rating	22	Internet users	39
Scientific research legislation	27	Venture capital	25	Internet bandwidth speed	42
Intellectual property rights	21	► Investment in Telecommunications	52	High-tech exports (%)	16

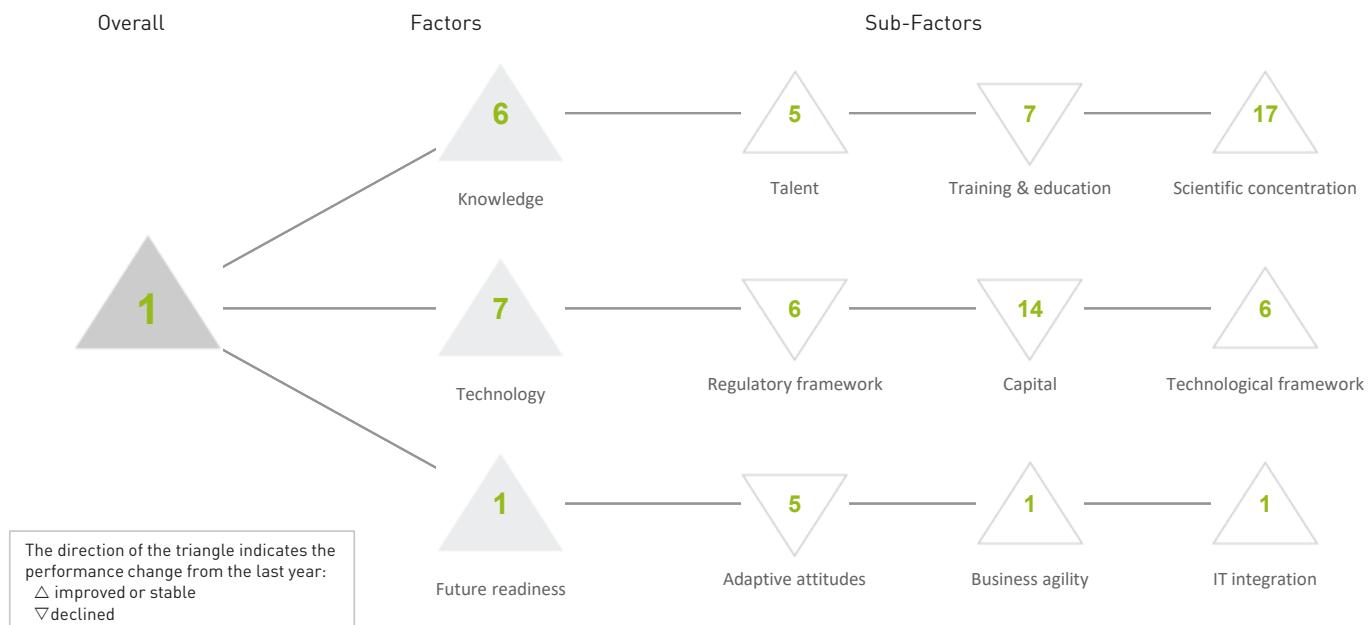
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	34	46	34	35	31
Business agility	25	37	27	32	24
IT integration	34	35	36	36	36

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	49	Opportunities and threats	15	E-Government	35
Internet retailing	21	World robots distribution	16	► Public-private partnerships	58
Tablet possession	43	Agility of companies	19	Cyber security	29
Smartphone possession	17	Use of big data and analytics	33	Software piracy	20
Attitudes toward globalization	28	Knowledge transfer	35	► Government cyber security capacity	50
		Entrepreneurial fear of failure	-	► Privacy protection by law content	12

DENMARK

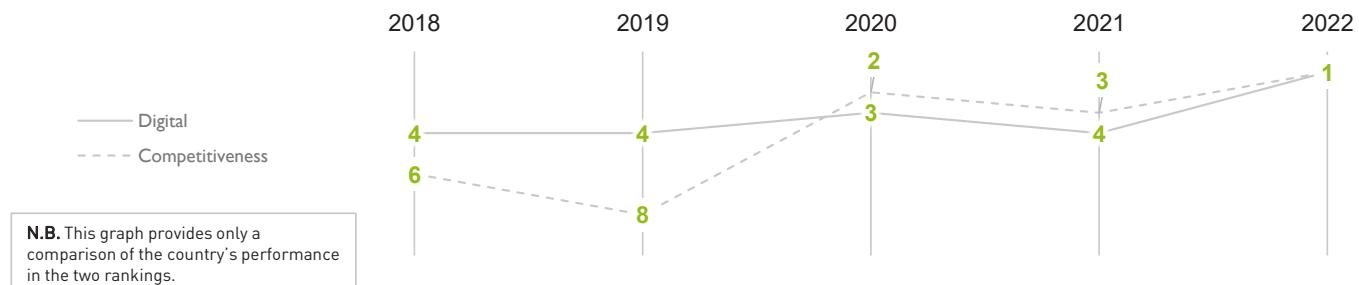
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	04	04	03	04	01
Knowledge	08	06	06	08	06
Technology	10	11	09	09	07
Future readiness	01	02	01	02	01

COMPETITIVENESS & DIGITAL RANKINGS

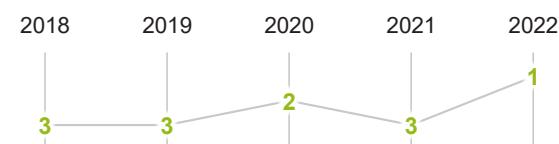


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



DENMARK

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	06	06	04	05	05
Training & education	03	06	09	04	07
Scientific concentration	14	17	15	17	17

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	12	▶ Employee training	01	Total expenditure on R&D (%)	11
International experience	11	Total public expenditure on education	10	Total R&D personnel per capita	02
Foreign highly-skilled personnel	16	Higher education achievement	26	Female researchers	32
Management of cities	02	Pupil-teacher ratio (tertiary education)	04	▷ R&D productivity by publication	43
Digital/Technological skills	05	▷ Graduates in Sciences	38	Scientific and technical employment	21
Net flow of international students	10	Women with degrees	24	High-tech patent grants	33
				Robots in Education and R&D	25

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	08	10	04	04	06
Capital	22	27	23	13	14
Technological framework	05	08	06	06	06

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	25	▷ IT & media stock market capitalization	54	Communications technology	03
Enforcing contracts	13	Funding for technological development	03	Mobile Broadband subscribers	08
▷ Immigration laws	42	Banking and financial services	01	Wireless broadband	11
Development & application of tech.	01	Country credit rating	01	Internet users	07
Scientific research legislation	05	Venture capital	07	Internet bandwidth speed	03
Intellectual property rights	03	▷ Investment in Telecommunications	35	High-tech exports (%)	32

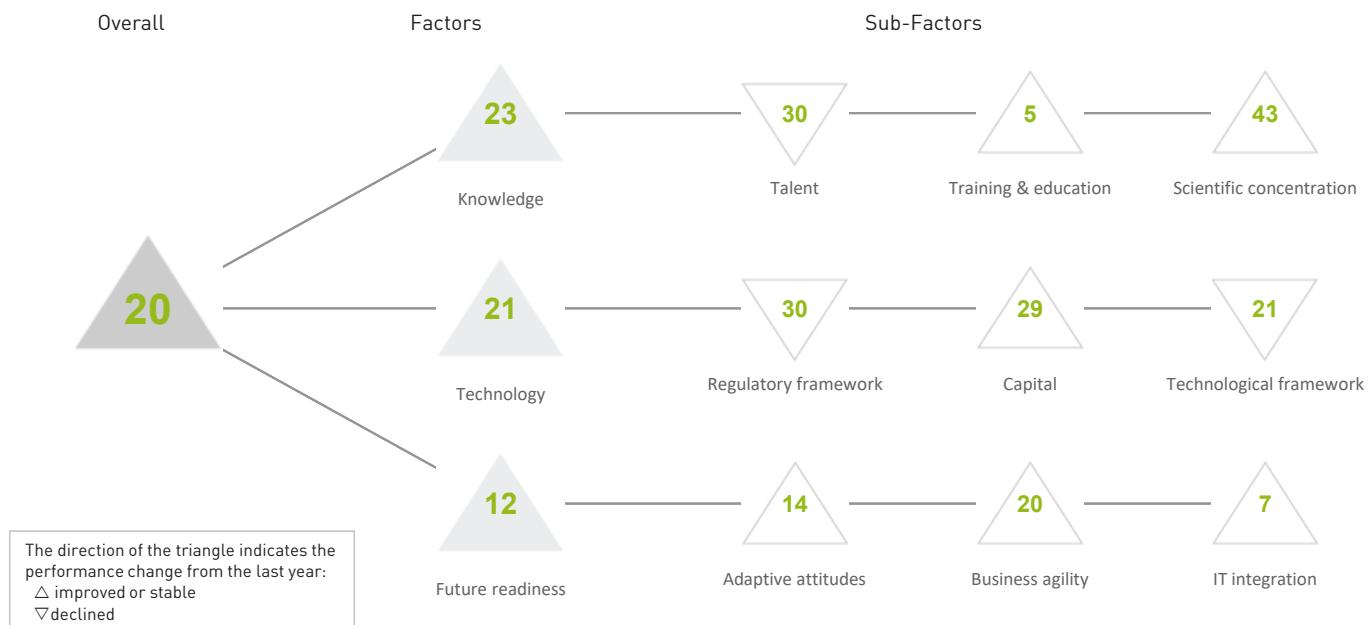
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	05	01	02	04	05
Business agility	06	10	05	07	01
IT integration	05	01	01	01	01

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	09	▶ Opportunities and threats	01	▷ E-Government	01
Internet retailing	08	World robots distribution	29	▷ Public-private partnerships	01
Tablet possession	19	▷ Agility of companies	01	Cyber security	14
Smartphone possession	35	Use of big data and analytics	06	Software piracy	08
Attitudes toward globalization	03	Knowledge transfer	04	Government cyber security capacity	08
		Entrepreneurial fear of failure	-	Privacy protection by law content	26

ESTONIA

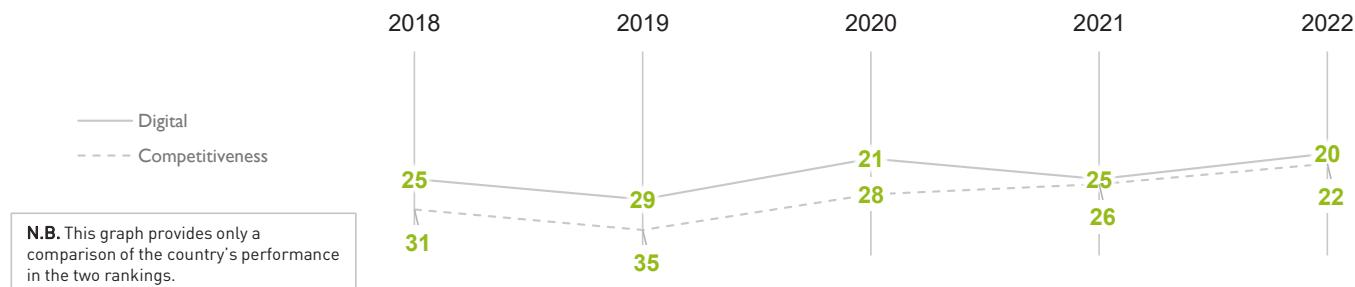
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	25	29	21	25	20
Knowledge	29	30	23	27	23
Technology	20	22	23	25	21
Future readiness	26	30	20	20	12

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



ESTONIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	34	37	31	29	30
Training & education	17	10	03	08	05
Scientific concentration	39	46	47	45	43

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	07	Employee training	08	Total expenditure on R&D (%)	21
International experience	37	Total public expenditure on education	09	Total R&D personnel per capita	29
Foreign highly-skilled personnel	26	Higher education achievement	33	Female researchers	18
Management of cities	42	Pupil-teacher ratio (tertiary education)	14	▷ R&D productivity by publication	59
Digital/Technological skills	44	Graduates in Sciences	17	Scientific and technical employment	29
Net flow of international students	28	Women with degrees	12	High-tech patent grants	16
				▷ Robots in Education and R&D	48

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	25	31	30	28	30
Capital	21	24	29	33	29
Technological framework	15	16	17	20	21

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	07	▷ IT & media stock market capitalization	48	Communications technology	37
Enforcing contracts	08	Funding for technological development	22	Mobile Broadband subscribers	46
▷ Immigration laws	53	Banking and financial services	16	▷ Wireless broadband	04
Development & application of tech.	23	Country credit rating	24	Internet users	12
Scientific research legislation	36	Venture capital	10	Internet bandwidth speed	27
Intellectual property rights	25	Investment in Telecommunications	45	High-tech exports (%)	20

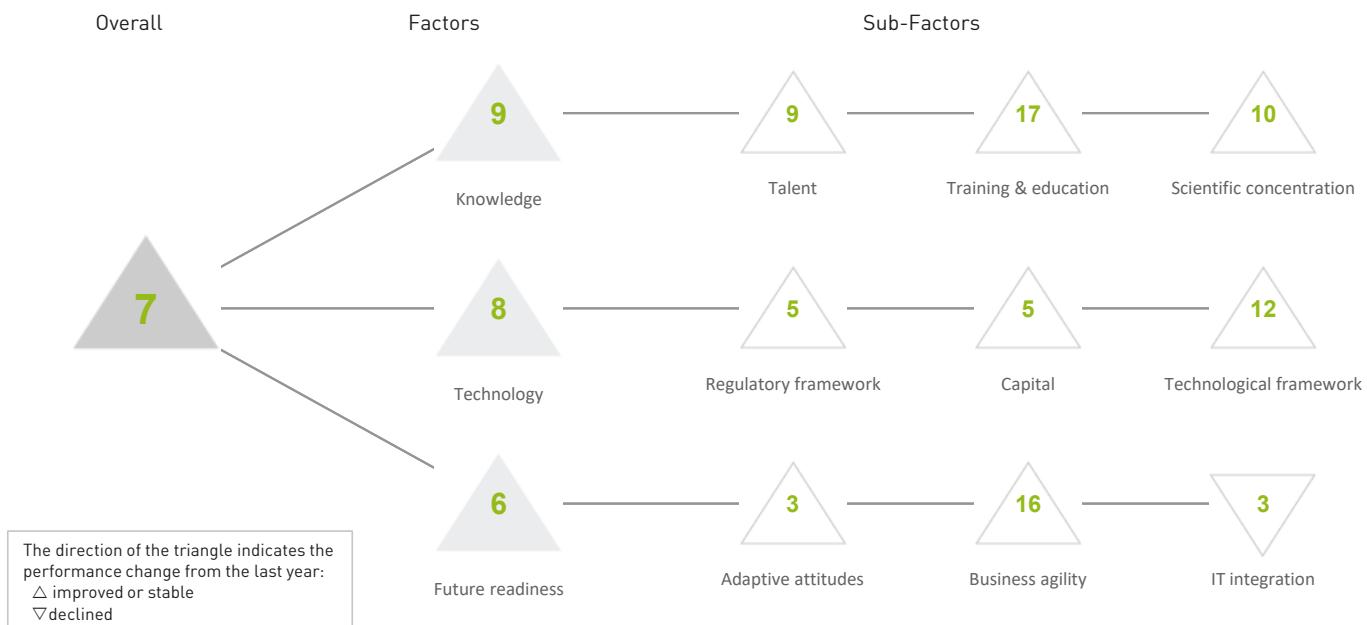
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	24	26	18	20	14
Business agility	29	43	26	25	20
IT integration	22	26	22	25	07

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
▶ E-Participation	01	Opportunities and threats	28	▷ E-Government	03
Internet retailing	24	World robots distribution	46	▷ Public-private partnerships	50
Tablet possession	07	Agility of companies	11	Cyber security	16
Smartphone possession	13	Use of big data and analytics	22	Software piracy	30
Attitudes toward globalization	34	Knowledge transfer	25	▷ Government cyber security capacity	02
		▷ Entrepreneurial fear of failure	07	Privacy protection by law content	09

FINLAND

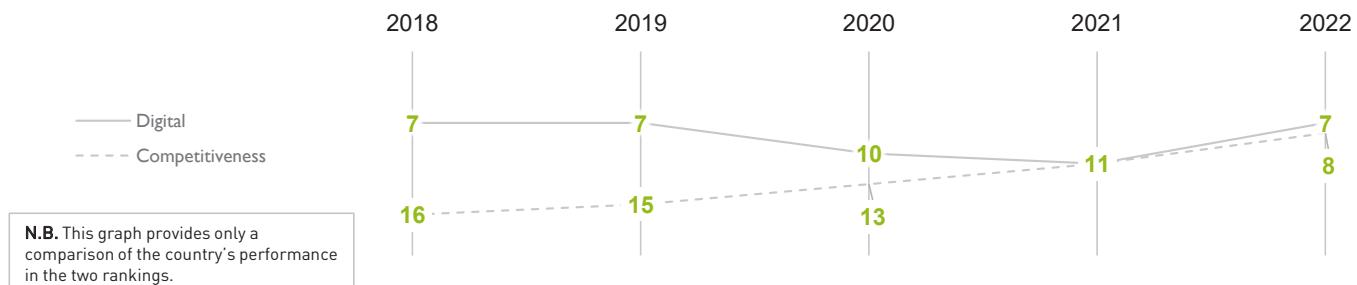
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	07	07	10	11	07
Knowledge	09	09	15	09	09
Technology	04	08	10	12	08
Future readiness	08	07	09	09	06

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



FINLAND

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	13	09	11	10	09
Training & education	09	16	20	19	17
Scientific concentration	09	10	12	10	10

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	15	Employee training	09	Total expenditure on R&D (%)	12
International experience	15	Total public expenditure on education	16	Total R&D personnel per capita	05
▷ Foreign highly-skilled personnel	42	Higher education achievement	29	Female researchers	36
Management of cities	03	▷ Pupil-teacher ratio (tertiary education)	45	▷ R&D productivity by publication	48
Digital/Technological skills	03	Graduates in Sciences	13	Scientific and technical employment	11
Net flow of international students	18	Women with degrees	05	High-tech patent grants	09
				Robots in Education and R&D	22

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	04	09	13	11	05
Capital	09	11	06	10	05
Technological framework	06	13	10	14	12

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	18	IT & media stock market capitalization	16	▷ Communications technology	01
Enforcing contracts	33	▷ Funding for technological development	01	Mobile Broadband subscribers	12
Immigration laws	30	Banking and financial services	02	Wireless broadband	07
▷ Development & application of tech.	02	Country credit rating	12	Internet users	15
Scientific research legislation	03	Venture capital	02	Internet bandwidth speed	30
▷ Intellectual property rights	01	▷ Investment in Telecommunications	56	▷ High-tech exports (%)	43

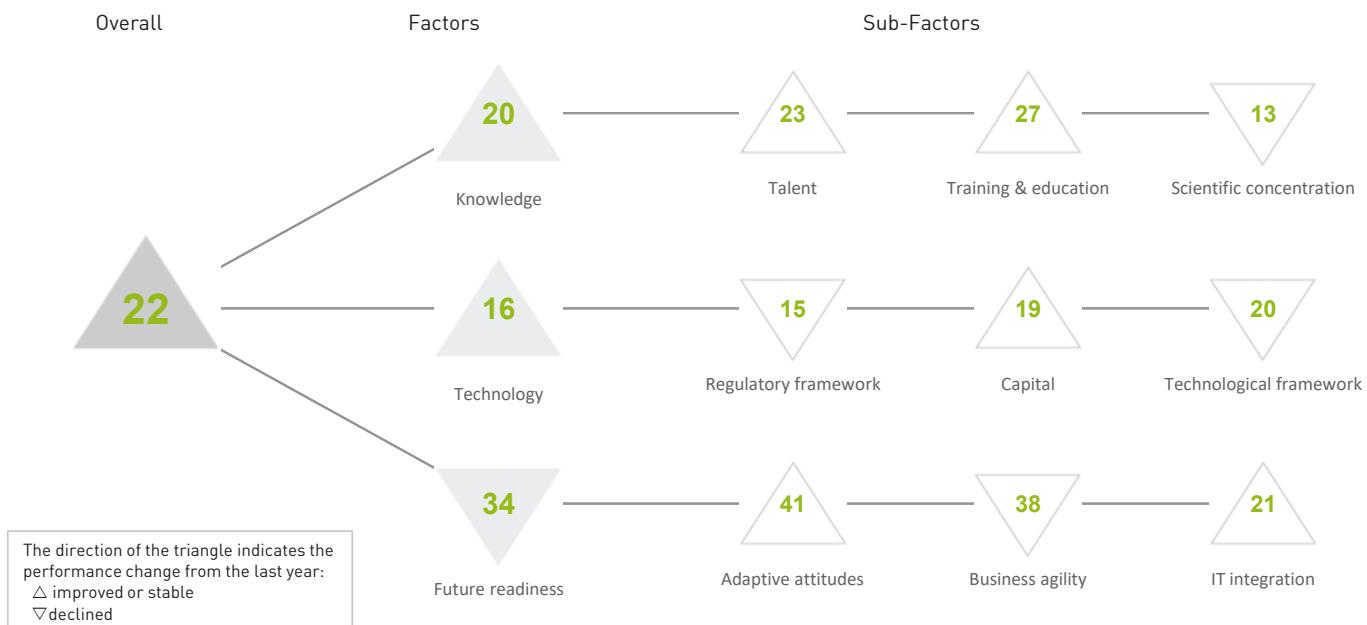
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	06	06	10	07	03
Business agility	22	27	22	21	16
IT integration	01	02	02	02	03

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	14	Opportunities and threats	15	E-Government	04
Internet retailing	13	World robots distribution	33	Public-private partnerships	04
Tablet possession	08	Agility of companies	15	Cyber security	03
Smartphone possession	22	Use of big data and analytics	15	Software piracy	13
▷ Attitudes toward globalization	02	Knowledge transfer	05	Government cyber security capacity	34
		Entrepreneurial fear of failure	24	Privacy protection by law content	14

FRANCE

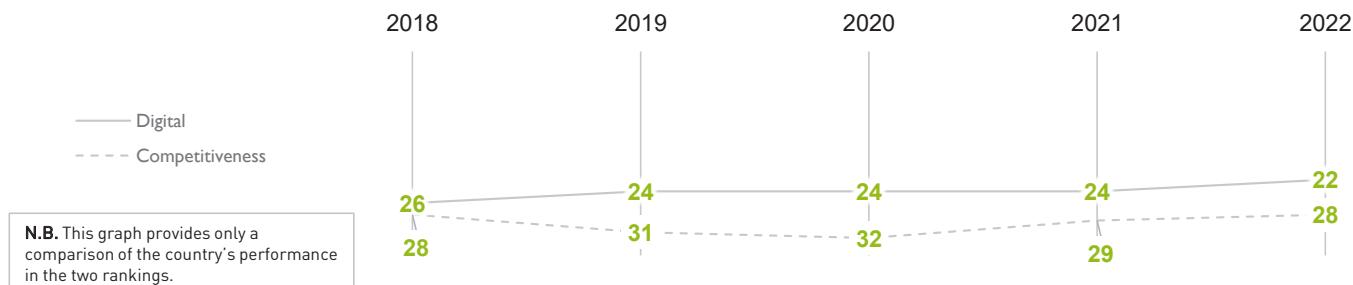
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	26	24	24	24	22
Knowledge	20	20	20	20	20
Technology	19	16	15	16	16
Future readiness	27	29	31	31	34

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS > 20 MILLION (27 countries)



FRANCE

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	21	24	25	23	23
Training & education	33	28	36	27	27
Scientific concentration	17	12	13	12	13

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	24	Employee training	17	Total expenditure on R&D (%)	15
International experience	42	Total public expenditure on education	20	Total R&D personnel per capita	20
Foreign highly-skilled personnel	24	Higher education achievement	21	▷ Female researchers	46
Management of cities	15	Pupil-teacher ratio (tertiary education)	39	R&D productivity by publication	17
Digital/Technological skills	28	Graduates in Sciences	25	Scientific and technical employment	15
Net flow of international students	19	Women with degrees	29	High-tech patent grants	15
				► Robots in Education and R&D	05

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	05	08	09	10	15
Capital	25	18	20	21	19
Technological framework	28	22	19	17	20

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	21	IT & media stock market capitalization	30	Communications technology	18
Enforcing contracts	15	Funding for technological development	29	Mobile Broadband subscribers	29
► Immigration laws	14	Banking and financial services	33	Wireless broadband	37
Development & application of tech.	36	Country credit rating	15	Internet users	27
Scientific research legislation	23	Venture capital	21	► Internet bandwidth speed	13
Intellectual property rights	16	Investment in Telecommunications	16	► High-tech exports (%)	13

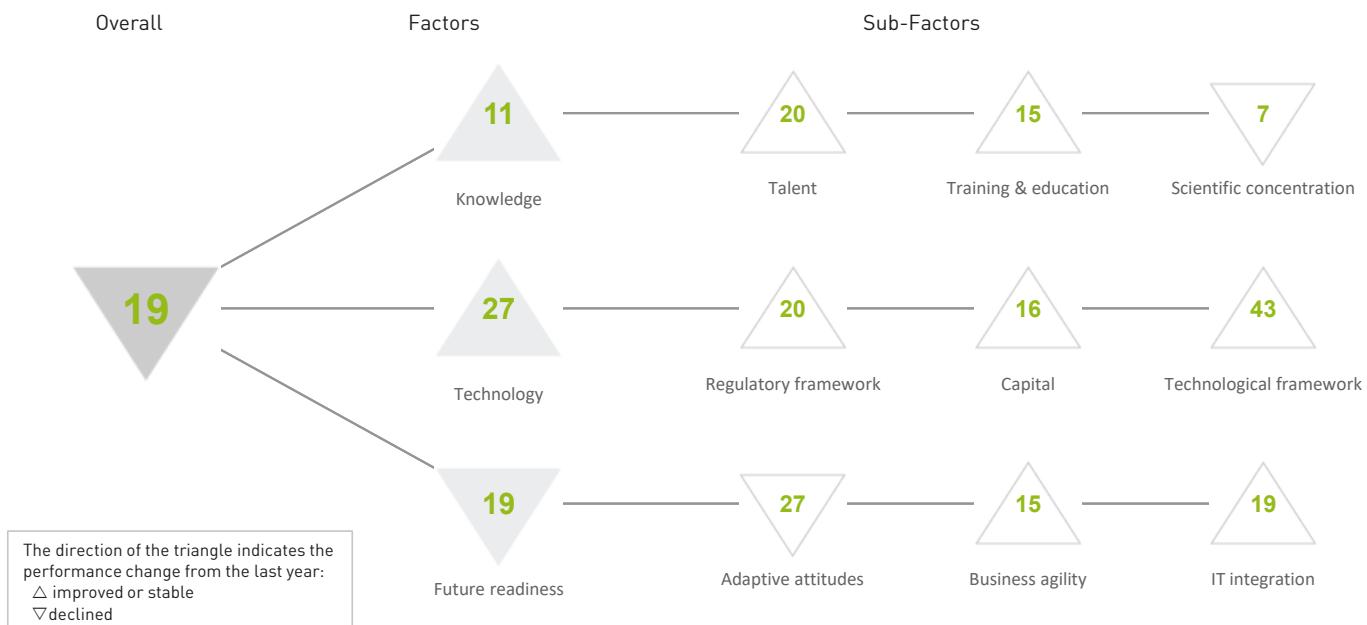
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	32	36	36	48	41
Business agility	36	39	36	33	38
IT integration	19	19	21	22	21

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	18	▷ Opportunities and threats	51	E-Government	19
Internet retailing	18	► World robots distribution	08	Public-private partnerships	27
► Tablet possession	48	▷ Agility of companies	49	Cyber security	34
Smartphone possession	20	Use of big data and analytics	43	Software piracy	20
► Attitudes toward globalization	63	Knowledge transfer	34	Government cyber security capacity	20
		Entrepreneurial fear of failure	23	Privacy protection by law content	30

GERMANY

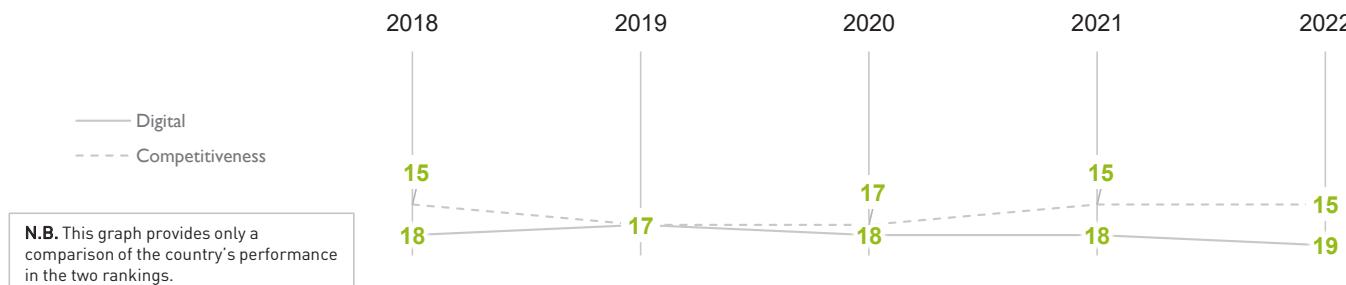
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	18	17	18	18	19
Knowledge	14	12	12	14	11
Technology	21	31	31	31	27
Future readiness	20	16	19	18	19

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS > 20 MILLION (27 countries)



GERMANY

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	22	25	22	21	20
Training & education	19	14	17	17	15
Scientific concentration	10	04	05	06	07

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	19	▶ Employee training	04	Total expenditure on R&D (%)	10
International experience	14	Total public expenditure on education	36	Total R&D personnel per capita	13
Foreign highly-skilled personnel	15	Higher education achievement	44	Female researchers	47
Management of cities	14	▶ Pupil-teacher ratio (tertiary education)	03	R&D productivity by publication	12
▷ Digital/Technological skills	52	▶ Graduates in Sciences	03	Scientific and technical employment	28
Net flow of international students	15	Women with degrees	43	High-tech patent grants	18
				▶ Robots in Education and R&D	02

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	23	27	28	25	20
Capital	16	17	16	23	16
Technological framework	27	40	45	43	43

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
▷ Starting a business	50	IT & media stock market capitalization	11	▷ Communications technology	51
Enforcing contracts	12	Funding for technological development	27	▷ Mobile Broadband subscribers	54
Immigration laws	23	Banking and financial services	27	Wireless broadband	45
Development & application of tech.	40	▶ Country credit rating	01	Internet users	16
Scientific research legislation	17	Venture capital	30	Internet bandwidth speed	28
Intellectual property rights	06	Investment in Telecommunications	38	High-tech exports (%)	27

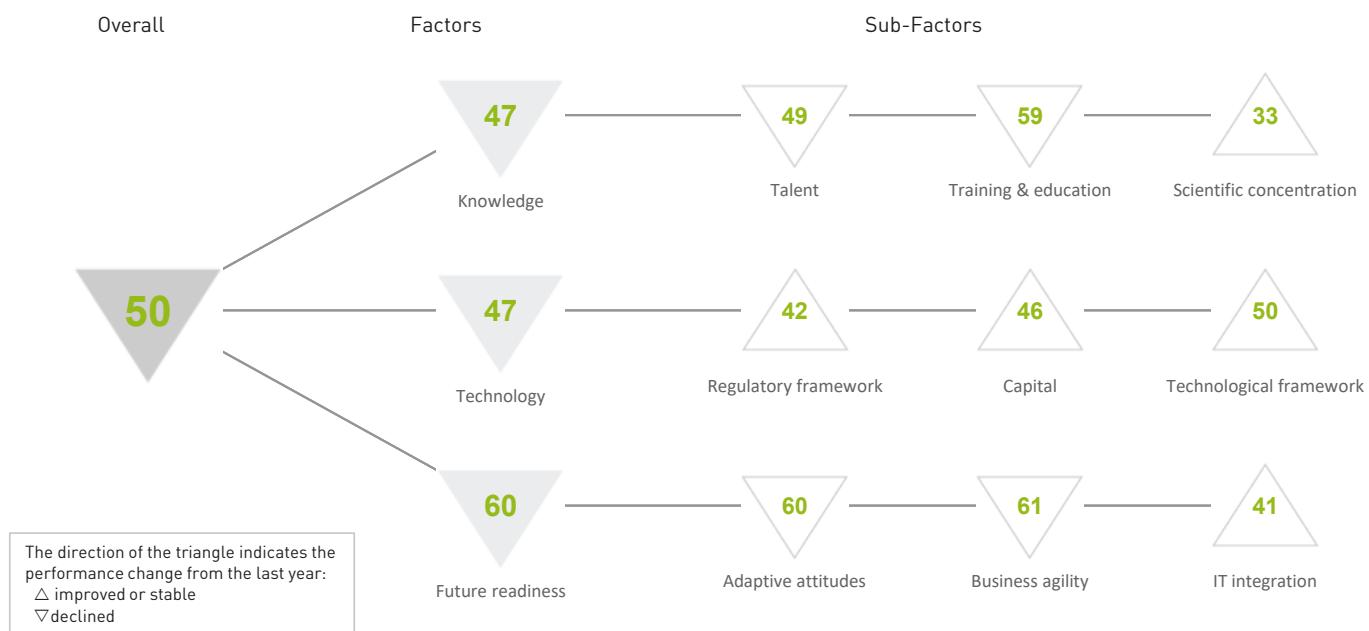
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	22	16	23	23	27
Business agility	20	11	15	15	15
IT integration	18	17	20	20	19

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	44	Opportunities and threats	37	E-Government	24
Internet retailing	14	World robots distribution	05	Public-private partnerships	43
Tablet possession	23	Agility of companies	34	Cyber security	21
Smartphone possession	47	▷ Use of big data and analytics	52	Software piracy	08
Attitudes toward globalization	29	Knowledge transfer	08	Government cyber security capacity	29
		Entrepreneurial fear of failure	13	Privacy protection by law content	18

GREECE

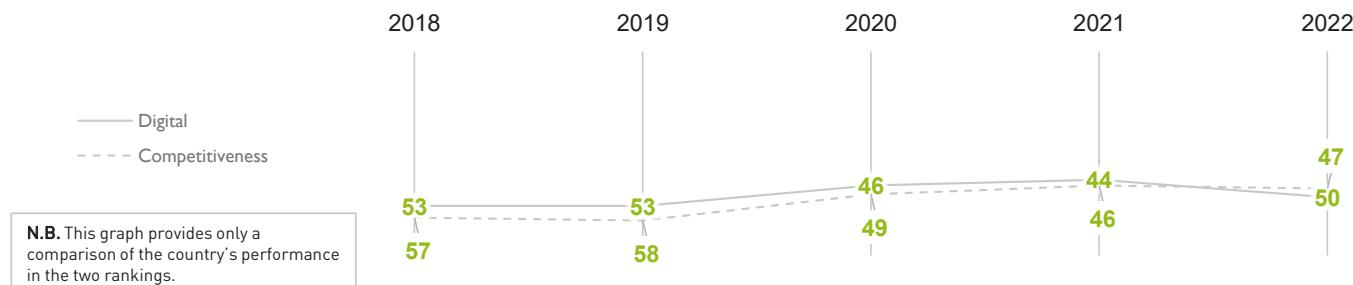
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	53	53	46	44	50
Knowledge	51	53	48	45	47
Technology	51	54	43	46	47
Future readiness	46	53	46	43	60

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



GREECE

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	50	53	50	42	49
Training & education	58	60	56	55	59
Scientific concentration	37	34	36	35	33

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	39	Employee training	54	Total expenditure on R&D (%)	28
International experience	39	Total public expenditure on education	43	Total R&D personnel per capita	26
▷ Foreign highly-skilled personnel	57	Higher education achievement	32	Female researchers	23
Management of cities	44	▷ Pupil-teacher ratio (tertiary education)	58	R&D productivity by publication	32
Digital/Technological skills	47	► Graduates in Sciences	18	► Scientific and technical employment	13
Net flow of international students	51	Women with degrees	36	High-tech patent grants	47
				Robots in Education and R&D	38

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	47	52	41	43	42
Capital	54	52	49	52	46
Technological framework	48	49	46	50	50

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
► Starting a business	06	► IT & media stock market capitalization	13	Communications technology	48
▷ Enforcing contracts	59	Funding for technological development	44	Mobile Broadband subscribers	47
Immigration laws	27	Banking and financial services	57	Wireless broadband	30
Development & application of tech.	45	Country credit rating	55	Internet users	50
Scientific research legislation	44	Venture capital	49	Internet bandwidth speed	51
Intellectual property rights	41	► Investment in Telecommunications	22	High-tech exports (%)	31

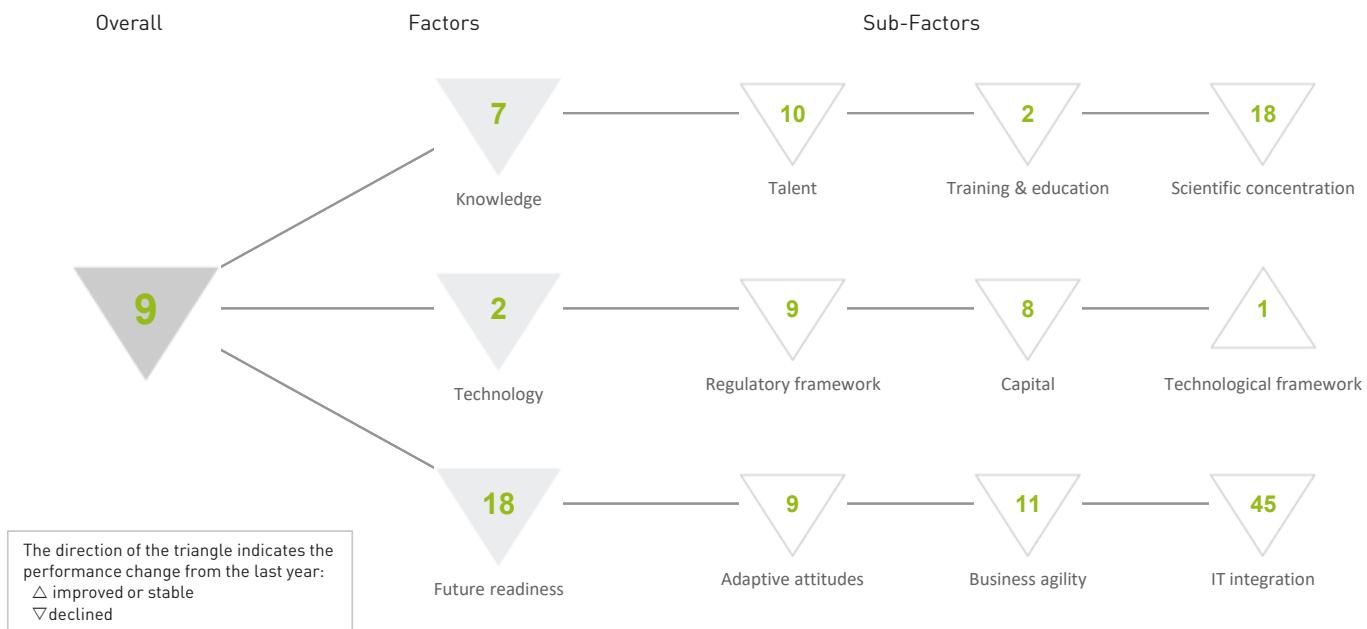
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	50	41	44	43	60
Business agility	49	60	55	51	61
IT integration	47	50	45	41	41

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	39	Opportunities and threats	48	E-Government	37
Internet retailing	33	World robots distribution	43	Public-private partnerships	39
Tablet possession	39	Agility of companies	52	Cyber security	48
▷ Smartphone possession	59	▷ Use of big data and analytics	62	Software piracy	53
Attitudes toward globalization	41	Knowledge transfer	54	Government cyber security capacity	35
		Entrepreneurial fear of failure	42	Privacy protection by law content	35

HONG KONG SAR

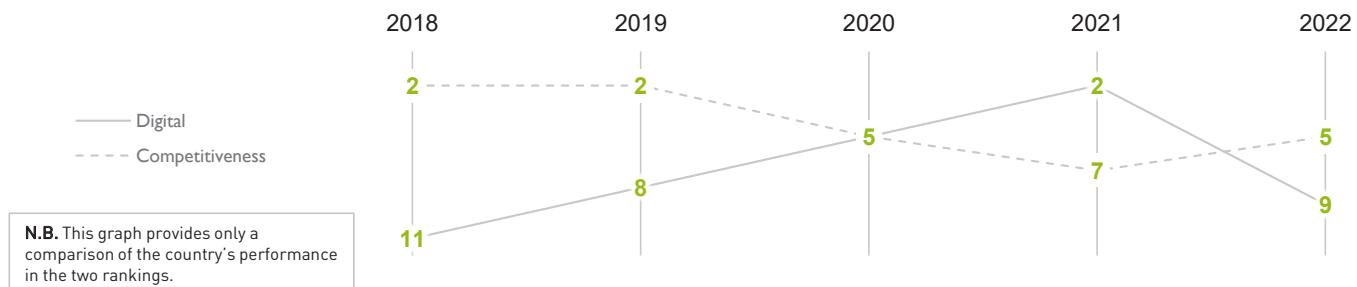
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	11	08	05	02	09
Knowledge	05	07	07	05	07
Technology	06	04	02	01	02
Future readiness	24	15	10	10	18

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (36 countries)



HONG KONG SAR

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	05	04	07	06	10
Training & education	13	12	05	01	02
Scientific concentration	05	16	17	14	18

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	03	Employee training	32	▷ Total expenditure on R&D (%)	41
International experience	10	Total public expenditure on education	37	Total R&D personnel per capita	30
Foreign highly-skilled personnel	33	Higher education achievement	07	Female researchers	-
Management of cities	12	Pupil-teacher ratio (tertiary education)	28	R&D productivity by publication	24
Digital/Technological skills	15	► Graduates in Sciences	01	Scientific and technical employment	08
Net flow of international students	30	Women with degrees	-	► High-tech patent grants	02
				▷ Robots in Education and R&D	53

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	14	12	07	06	09
Capital	06	06	12	07	08
Technological framework	11	03	02	01	01

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	04	IT & media stock market capitalization	05	Communications technology	10
Enforcing contracts	24	Funding for technological development	13	Mobile Broadband subscribers	18
Immigration laws	10	Banking and financial services	07	Wireless broadband	05
Development & application of tech.	14	Country credit rating	17	Internet users	22
Scientific research legislation	22	Venture capital	08	Internet bandwidth speed	07
Intellectual property rights	10	▷ Investment in Telecommunications	40	► High-tech exports (%)	01

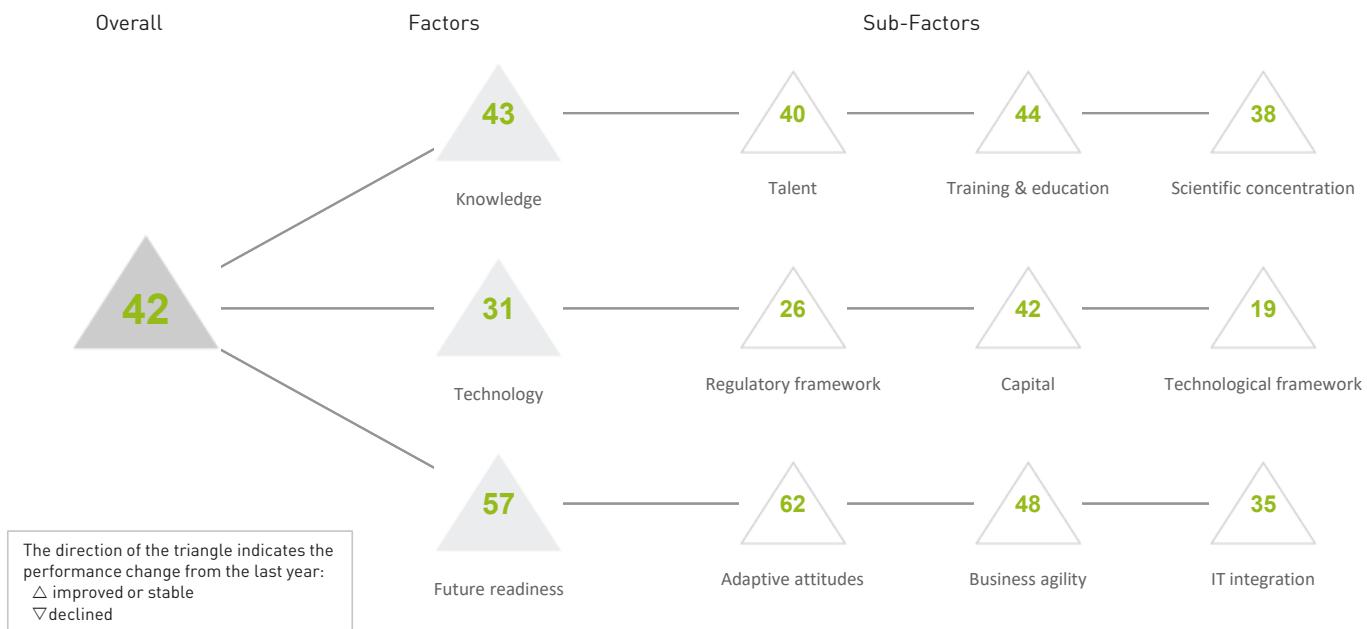
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	11	12	04	03	09
Business agility	26	08	14	09	11
IT integration	25	22	19	17	45

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	-	► Opportunities and threats	02	E-Government	-
Internet retailing	20	World robots distribution	37	Public-private partnerships	14
Tablet possession	10	Agility of companies	04	Cyber security	07
► Smartphone possession	01	Use of big data and analytics	12	Software piracy	28
Attitudes toward globalization	08	Knowledge transfer	17	▷ Government cyber security capacity	48
		Entrepreneurial fear of failure	-	▷ Privacy protection by law content	63

HUNGARY

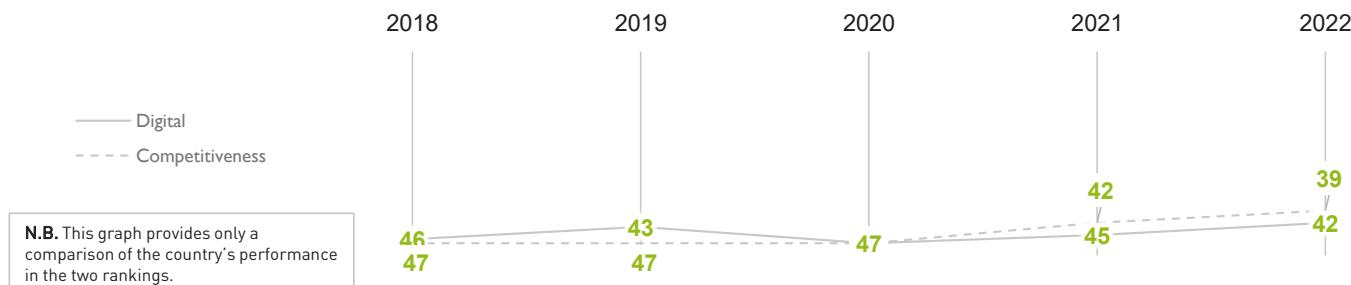
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	46	43	47	45	42
Knowledge	48	44	44	43	43
Technology	40	36	39	36	31
Future readiness	58	57	60	61	57

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



HUNGARY

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	46	47	44	43	40
Training & education	48	43	45	47	44
Scientific concentration	51	45	44	42	38

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	34	Employee training	52	Total expenditure on R&D (%)	26
International experience	41	Total public expenditure on education	34	Total R&D personnel per capita	24
Foreign highly-skilled personnel	50	Higher education achievement	49	Female researchers	44
Management of cities	36	► Pupil-teacher ratio (tertiary education)	16	R&D productivity by publication	46
Digital/Technological skills	54	Graduates in Sciences	33	Scientific and technical employment	31
Net flow of international students	17	Women with degrees	41	High-tech patent grants	39
				Robots in Education and R&D	28

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	35	35	39	36	26
Capital	51	46	46	45	42
Technological framework	46	19	24	21	19

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	37	IT & media stock market capitalization	39	Communications technology	29
Enforcing contracts	21	Funding for technological development	34	► Mobile Broadband subscribers	10
► Immigration laws	16	Banking and financial services	44	Wireless broadband	51
Development & application of tech.	30	Country credit rating	44	Internet users	34
Scientific research legislation	29	Venture capital	41	► Internet bandwidth speed	04
Intellectual property rights	28	Investment in Telecommunications	31	High-tech exports (%)	25

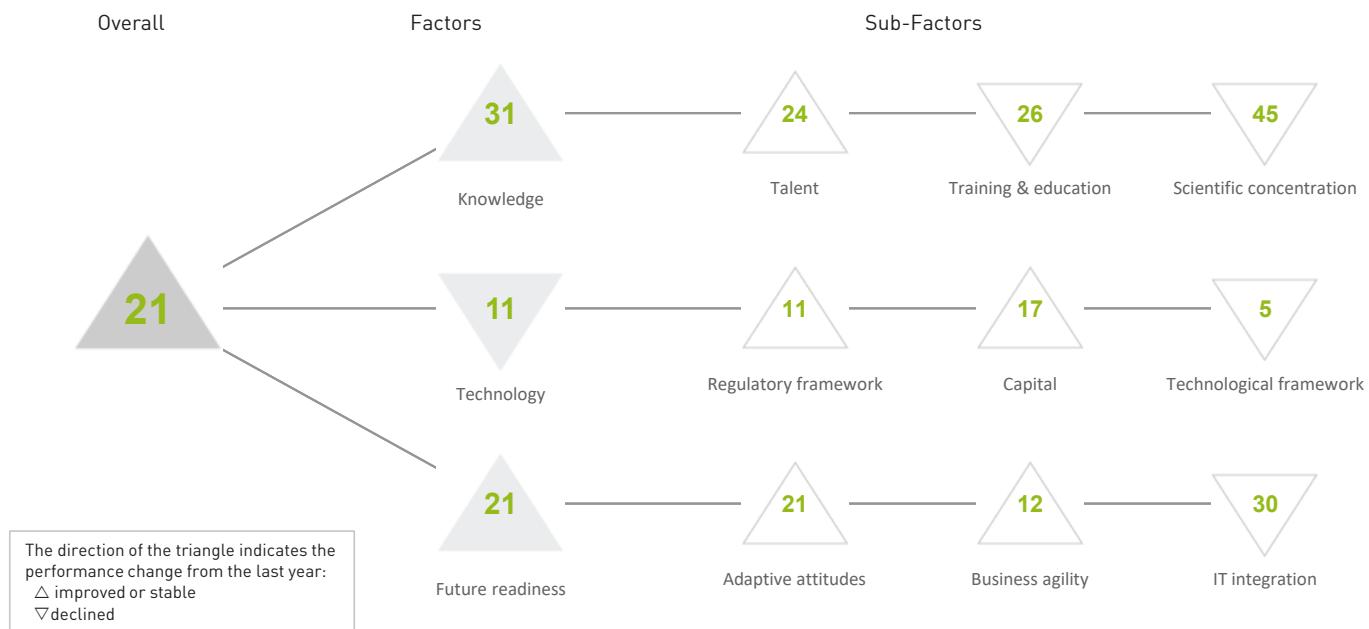
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	62	62	62	62	62
Business agility	56	53	59	62	48
IT integration	36	37	41	42	35

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	54	▷ Opportunities and threats	58	E-Government	44
Internet retailing	38	World robots distribution	26	Public-private partnerships	36
Tablet possession	50	▷ Agility of companies	55	Cyber security	47
► Smartphone possession	58	▷ Use of big data and analytics	57	Software piracy	27
▷ Attitudes toward globalization	62	Knowledge transfer	38	Government cyber security capacity	24
		► Entrepreneurial fear of failure	09	Privacy protection by law content	28

ICELAND

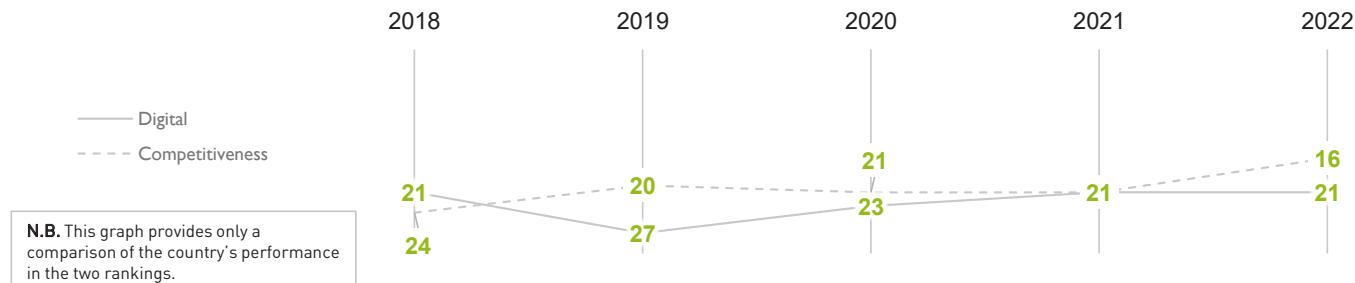
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	21	27	23	21	21
Knowledge	28	29	27	33	31
Technology	18	20	21	10	11
Future readiness	19	26	22	25	21

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



ICELAND

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	37	34	33	35	24
Training & education	18	18	15	22	26
Scientific concentration	35	39	46	39	45

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	25	Employee training	35	Total expenditure on R&D (%)	13
International experience	35	► Total public expenditure on education	04	Total R&D personnel per capita	06
Foreign highly-skilled personnel	34	Higher education achievement	41	Female researchers	13
Management of cities	22	Pupil-teacher ratio (tertiary education)	36	▷ R&D productivity by publication	61
► Digital/Technological skills	01	Graduates in Sciences	46	Scientific and technical employment	25
▷ Net flow of international students	56	Women with degrees	21	High-tech patent grants	49
				▷ Robots in Education and R&D	53

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	18	15	15	14	11
Capital	40	39	35	26	17
Technological framework	12	15	16	03	05

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	32	IT & media stock market capitalization	-	Communications technology	06
Enforcing contracts	25	Funding for technological development	12	Mobile Broadband subscribers	30
Immigration laws	06	Banking and financial services	12	Wireless broadband	09
Development & application of tech.	07	Country credit rating	32	► Internet users	03
Scientific research legislation	16	Venture capital	19	Internet bandwidth speed	05
Intellectual property rights	09	Investment in Telecommunications	28	High-tech exports (%)	10

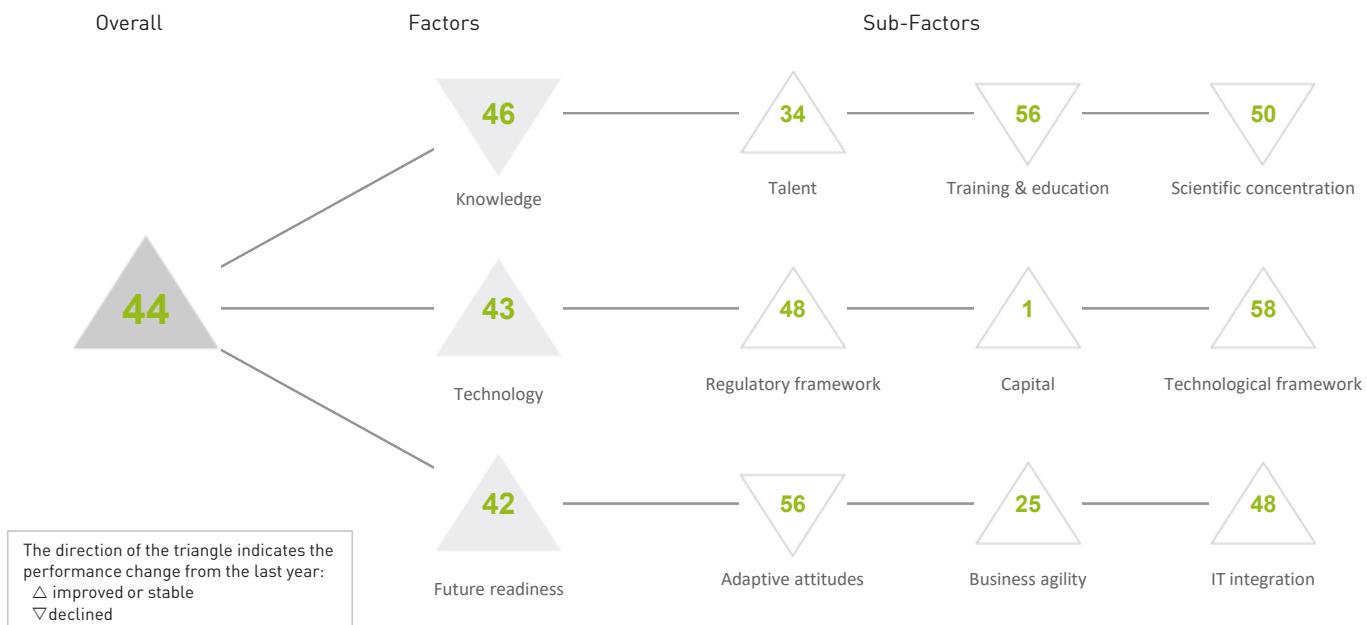
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	18	28	25	31	21
Business agility	11	24	19	16	12
IT integration	28	28	27	27	30

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	40	► Opportunities and threats	03	E-Government	12
Internet retailing	23	▷ World robots distribution	54	Public-private partnerships	32
Tablet possession	-	► Agility of companies	02	Cyber security	17
Smartphone possession	-	Use of big data and analytics	17	Software piracy	34
Attitudes toward globalization	04	Knowledge transfer	18	▷ Government cyber security capacity	52
		Entrepreneurial fear of failure	-	Privacy protection by law content	32

INDIA

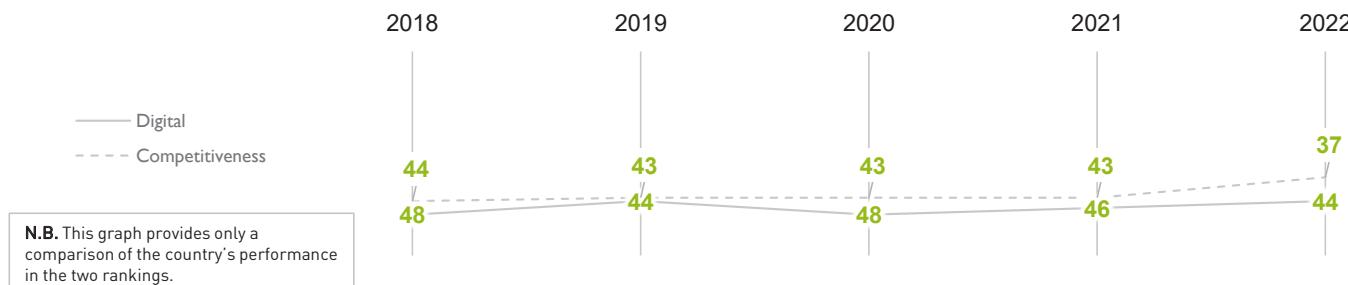
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	48	44	48	46	44
Knowledge	46	38	39	41	46
Technology	53	49	50	44	43
Future readiness	48	46	56	50	42

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



INDIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	43	38	41	38	34
Training & education	59	47	51	43	56
Scientific concentration	26	28	29	47	50

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	-	Employee training	27	Total expenditure on R&D (%)	48
International experience	25	Total public expenditure on education	44	Total R&D personnel per capita	52
Foreign highly-skilled personnel	41	Higher education achievement	58	Female researchers	-
Management of cities	52	Pupil-teacher ratio (tertiary education)	56	► R&D productivity by publication	02
Digital/Technological skills	17	► Graduates in Sciences	06	▷ Scientific and technical employment	59
Net flow of international students	44	Women with degrees	56	High-tech patent grants	50
				Robots in Education and R&D	23

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	56	55	53	52	48
Capital	03	03	07	04	01
Technological framework	62	62	62	62	58

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	56	► IT & media stock market capitalization	09	Communications technology	33
▷ Enforcing contracts	62	Funding for technological development	23	Mobile Broadband subscribers	49
Immigration laws	35	► Banking and financial services	11	► Wireless broadband	61
Development & application of tech.	22	Country credit rating	51	▷ Internet users	63
Scientific research legislation	29	Venture capital	16	Internet bandwidth speed	49
Intellectual property rights	40	► Investment in Telecommunications	01	High-tech exports (%)	40

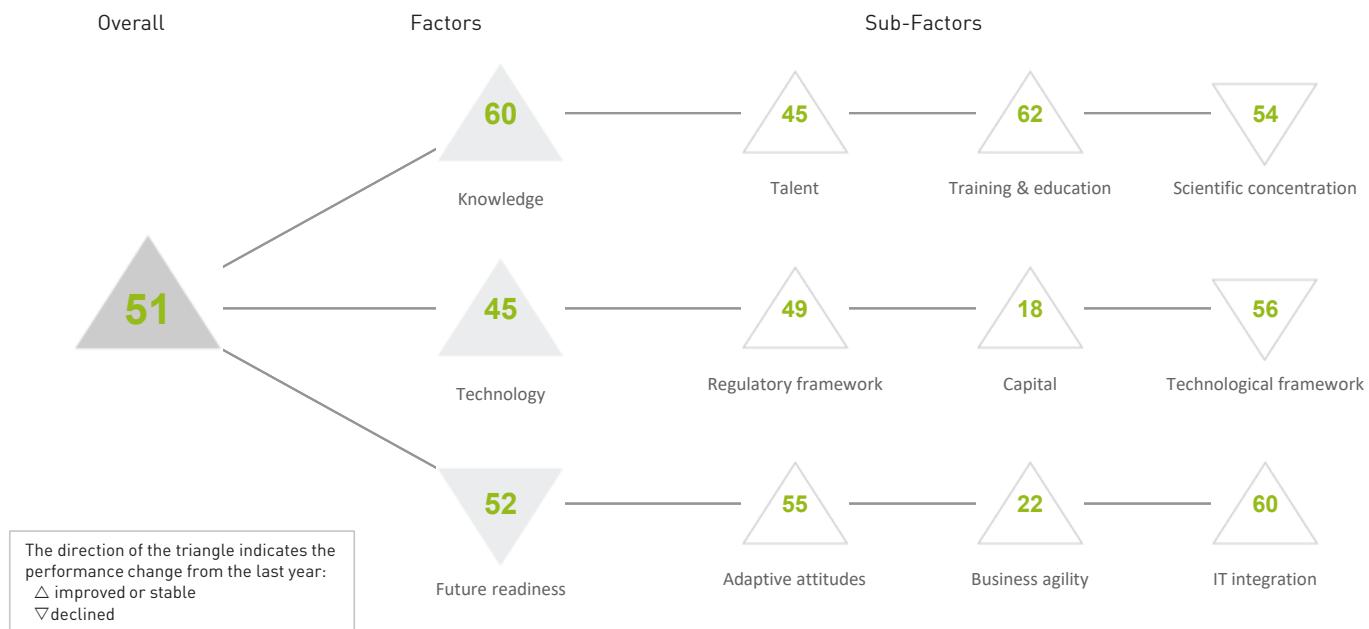
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	54	54	55	55	56
Business agility	33	29	52	36	25
IT integration	56	56	55	51	48

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	27	Opportunities and threats	12	E-Government	58
Internet retailing	58	World robots distribution	12	Public-private partnerships	19
▷ Tablet possession	59	Agility of companies	17	Cyber security	23
Smartphone possession	52	Use of big data and analytics	13	Software piracy	49
Attitudes toward globalization	16	Knowledge transfer	27	Government cyber security capacity	31
		Entrepreneurial fear of failure	48	Privacy protection by law content	48

INDONESIA

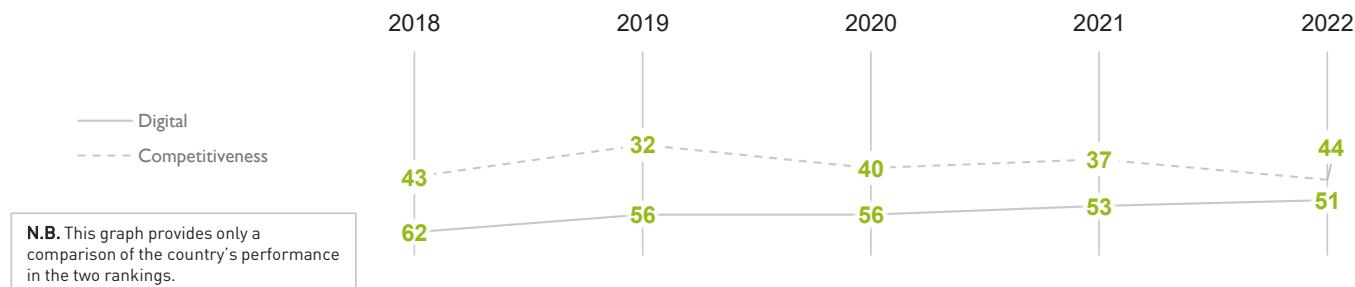
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	62	56	56	53	51
Knowledge	61	56	63	60	60
Technology	59	47	54	49	45
Future readiness	62	58	48	48	52

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



INDONESIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	51	42	43	48	45
Training & education	61	61	63	64	62
Scientific concentration	58	52	51	44	54

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	55	Employee training	18	Total expenditure on R&D (%)	57
International experience	29	Total public expenditure on education	56	Total R&D personnel per capita	53
Foreign highly-skilled personnel	19	Higher education achievement	59	▶ Female researchers	14
Management of cities	40	Pupil-teacher ratio (tertiary education)	57	▶ R&D productivity by publication	04
Digital/Technological skills	41	Graduates in Sciences	49	▷ Scientific and technical employment	60
Net flow of international students	41	Women with degrees	55	▷ High-tech patent grants	61
				Robots in Education and R&D	42

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	57	51	51	50	49
Capital	34	26	41	25	18
Technological framework	60	56	55	55	56

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	59	▶ IT & media stock market capitalization	15	Communications technology	45
Enforcing contracts	57	Funding for technological development	35	Mobile Broadband subscribers	43
Immigration laws	18	Banking and financial services	17	Wireless broadband	47
Development & application of tech.	33	Country credit rating	45	▷ Internet users	59
Scientific research legislation	48	Venture capital	26	▷ Internet bandwidth speed	61
Intellectual property rights	54	▶ Investment in Telecommunications	08	High-tech exports (%)	48

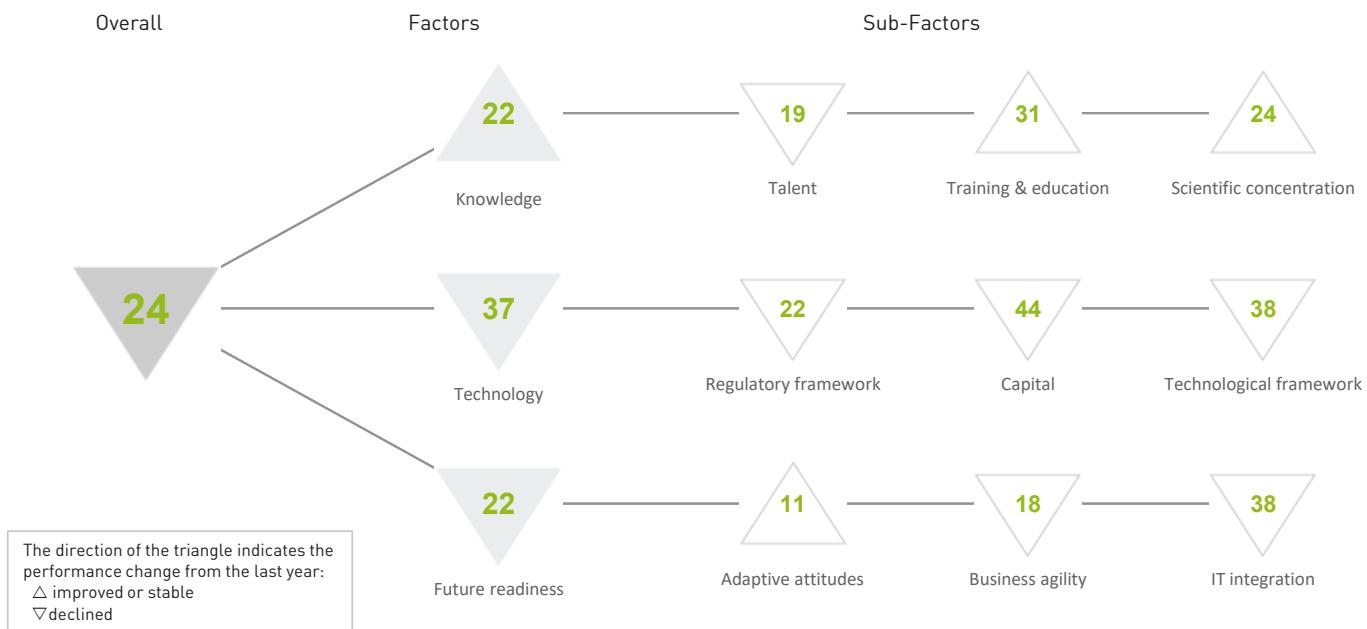
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	61	60	58	57	55
Business agility	46	21	24	26	22
IT integration	60	60	60	60	60

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	44	Opportunities and threats	29	E-Government	56
Internet retailing	51	World robots distribution	27	Public-private partnerships	22
Tablet possession	58	Agility of companies	33	Cyber security	46
Smartphone possession	46	Use of big data and analytics	26	▷ Software piracy	61
Attitudes toward globalization	18	Knowledge transfer	39	Government cyber security capacity	58
		▶ Entrepreneurial fear of failure	03	Privacy protection by law content	57

IRELAND

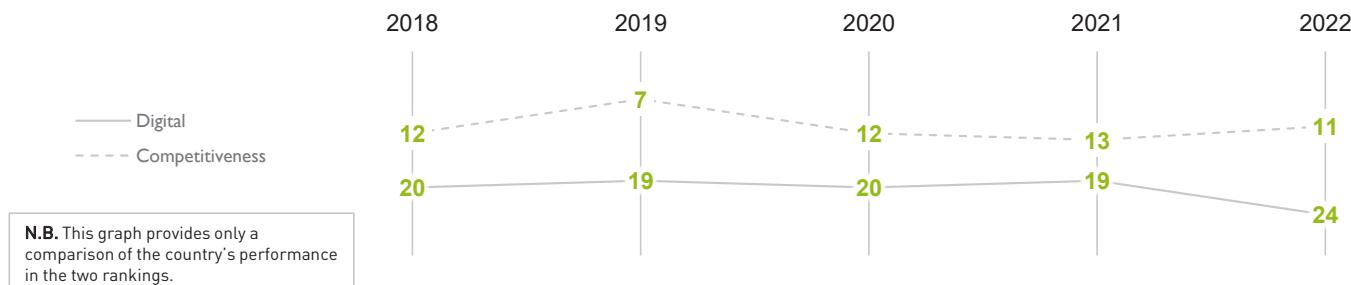
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	20	19	20	19	24
Knowledge	22	24	24	23	22
Technology	29	28	30	28	37
Future readiness	13	05	14	14	22

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



IRELAND

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	14	10	19	18	19
Training & education	34	30	35	32	31
Scientific concentration	24	29	25	26	24

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	20	Employee training	15	Total expenditure on R&D (%)	35
International experience	13	▷ Total public expenditure on education	58	Total R&D personnel per capita	21
▶ Foreign highly-skilled personnel	09	Higher education achievement	09	Female researchers	26
Management of cities	38	Pupil-teacher ratio (tertiary education)	48	R&D productivity by publication	36
Digital/Technological skills	34	Graduates in Sciences	27	Scientific and technical employment	17
Net flow of international students	20	▶ Women with degrees	09	High-tech patent grants	10
				Robots in Education and R&D	30

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	20	13	14	19	22
Capital	53	49	45	35	44
Technological framework	13	24	30	34	38

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	12	▷ IT & media stock market capitalization	55	Communications technology	50
Enforcing contracts	47	Funding for technological development	20	Mobile Broadband subscribers	45
Immigration laws	24	Banking and financial services	31	Wireless broadband	36
Development & application of tech.	18	Country credit rating	26	Internet users	20
Scientific research legislation	11	Venture capital	14	Internet bandwidth speed	36
Intellectual property rights	20	▷ Investment in Telecommunications	60	High-tech exports (%)	12

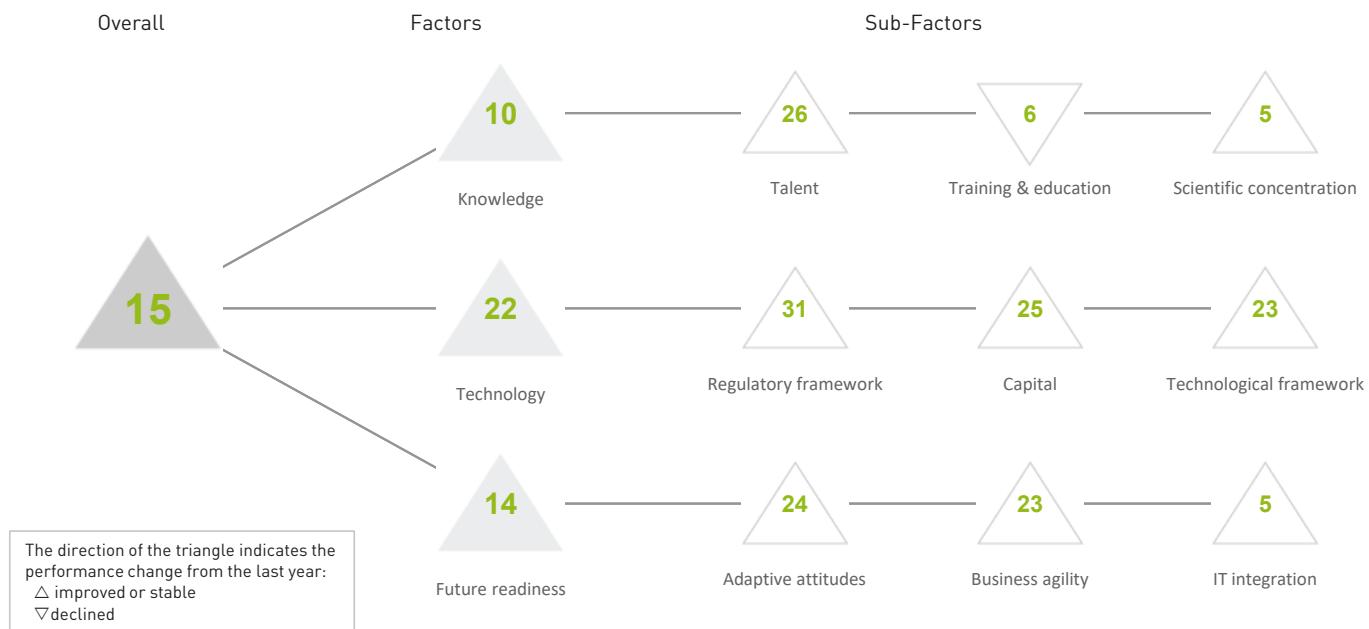
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	10	03	12	12	11
Business agility	03	09	09	14	18
IT integration	24	20	25	19	38

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	27	▷ Opportunities and threats	06	E-Government	25
▶ Internet retailing	09	World robots distribution	42	Public-private partnerships	29
Tablet possession	16	▷ Agility of companies	06	Cyber security	37
Smartphone possession	29	Use of big data and analytics	18	Software piracy	19
Attitudes toward globalization	10	Knowledge transfer	13	▷ Government cyber security capacity	56
		Entrepreneurial fear of failure	39	▷ Privacy protection by law content	51

ISRAEL

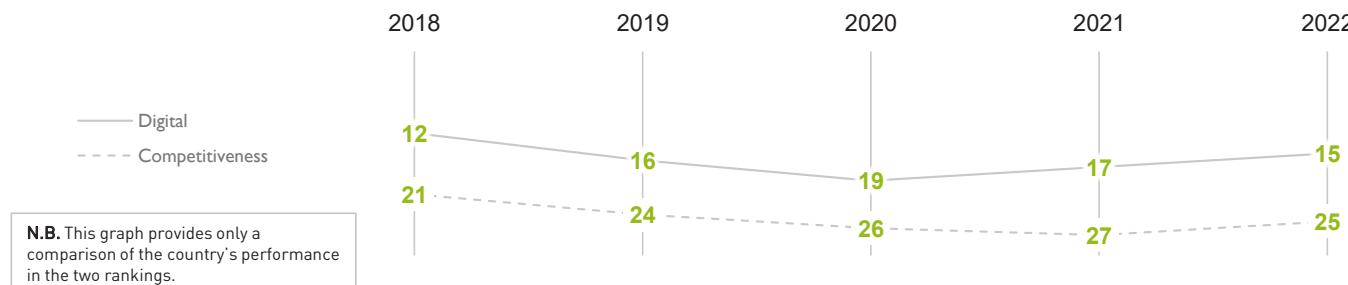
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	12	16	19	17	15
Knowledge	02	08	09	12	10
Technology	25	30	32	27	22
Future readiness	07	19	23	21	14

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



ISRAEL

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	19	27	28	27	26
Training & education	02	03	01	03	06
Scientific concentration	02	05	03	09	05

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	37	Employee training	36	► Total expenditure on R&D (%)	01
International experience	24	► Total public expenditure on education	06	Total R&D personnel per capita	-
Foreign highly-skilled personnel	27	Higher education achievement	25	Female researchers	-
Management of cities	27	Pupil-teacher ratio (tertiary education)	-	► R&D productivity by publication	52
Digital/Technological skills	19	Graduates in Sciences	-	► Scientific and technical employment	06
Net flow of international students	-	► Women with degrees	06	High-tech patent grants	19
				Robots in Education and R&D	38

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	30	32	32	31	31
Capital	20	20	26	28	25
Technological framework	20	35	36	26	23

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	17	IT & media stock market capitalization	12	► Communications technology	41
► Enforcing contracts	46	Funding for technological development	08	Mobile Broadband subscribers	24
Immigration laws	37	Banking and financial services	32	Wireless broadband	19
Development & application of tech.	13	Country credit rating	25	Internet users	37
Scientific research legislation	12	Venture capital	22	Internet bandwidth speed	31
Intellectual property rights	22	► Investment in Telecommunications	58	High-tech exports (%)	09

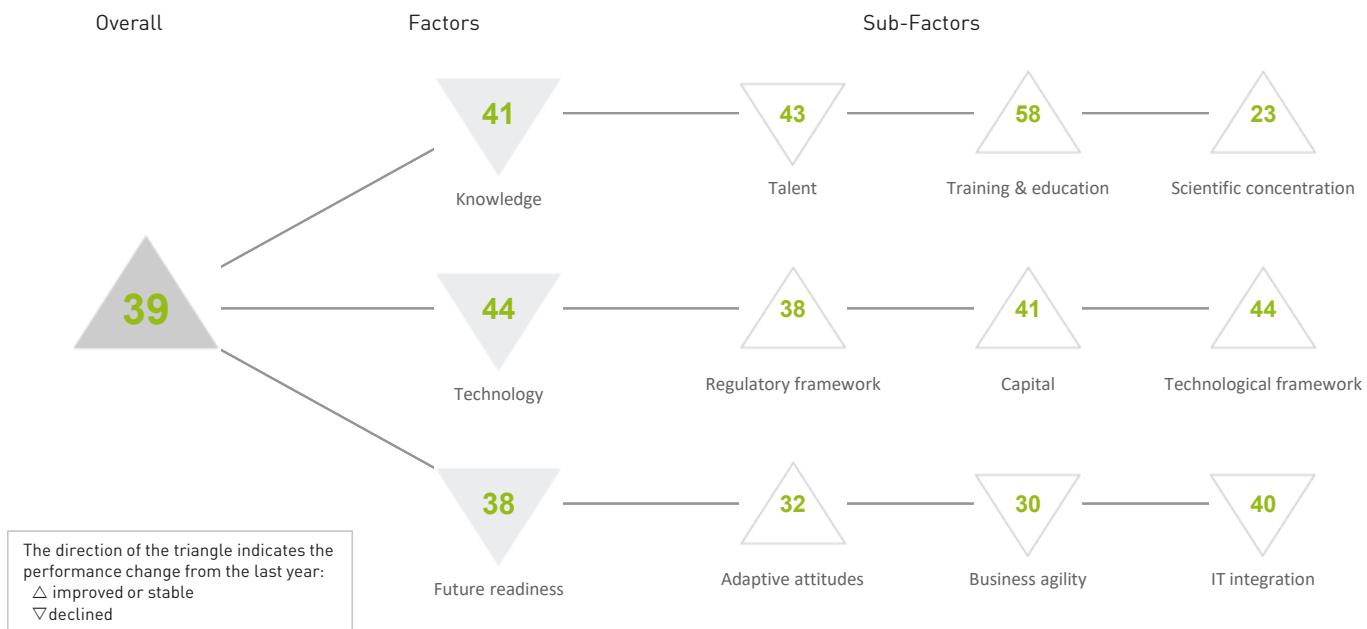
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	17	21	26	25	24
Business agility	02	19	29	31	23
IT integration	04	16	14	13	05

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
► E-Participation	50	Opportunities and threats	24	E-Government	28
Internet retailing	15	World robots distribution	38	Public-private partnerships	08
Tablet possession	21	Agility of companies	24	Cyber security	08
Smartphone possession	32	Use of big data and analytics	08	Software piracy	17
Attitudes toward globalization	20	Knowledge transfer	12	► Government cyber security capacity	01
		Entrepreneurial fear of failure	31	Privacy protection by law content	22

ITALY

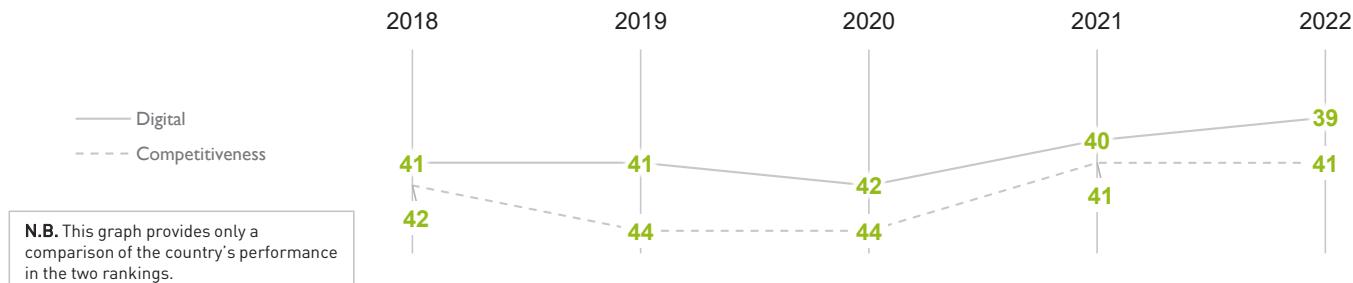
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	41	41	42	40	39
Knowledge	42	41	42	40	41
Technology	41	46	46	42	44
Future readiness	36	31	38	30	38

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS > 20 MILLION (27 countries)



ITALY

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	41	44	42	40	43
Training & education	56	57	58	60	58
Scientific concentration	28	23	22	25	23

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	29	Employee training	48	Total expenditure on R&D (%)	27
▷ International experience	50	Total public expenditure on education	46	Total R&D personnel per capita	25
Foreign highly-skilled personnel	46	▷ Higher education achievement	52	Female researchers	34
Management of cities	39	Pupil-teacher ratio (tertiary education)	47	► R&D productivity by publication	07
▷ Digital/Technological skills	49	Graduates in Sciences	31	Scientific and technical employment	16
Net flow of international students	35	▷ Women with degrees	50	High-tech patent grants	48
				► Robots in Education and R&D	11

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	41	44	48	42	38
Capital	49	53	54	48	41
Technological framework	44	46	43	44	44

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	41	IT & media stock market capitalization	41	Communications technology	43
▷ Enforcing contracts	55	Funding for technological development	39	Mobile Broadband subscribers	41
► Immigration laws	08	Banking and financial services	49	Wireless broadband	23
Development & application of tech.	44	Country credit rating	48	Internet users	43
Scientific research legislation	41	Venture capital	43	Internet bandwidth speed	43
Intellectual property rights	24	► Investment in Telecommunications	13	High-tech exports (%)	47

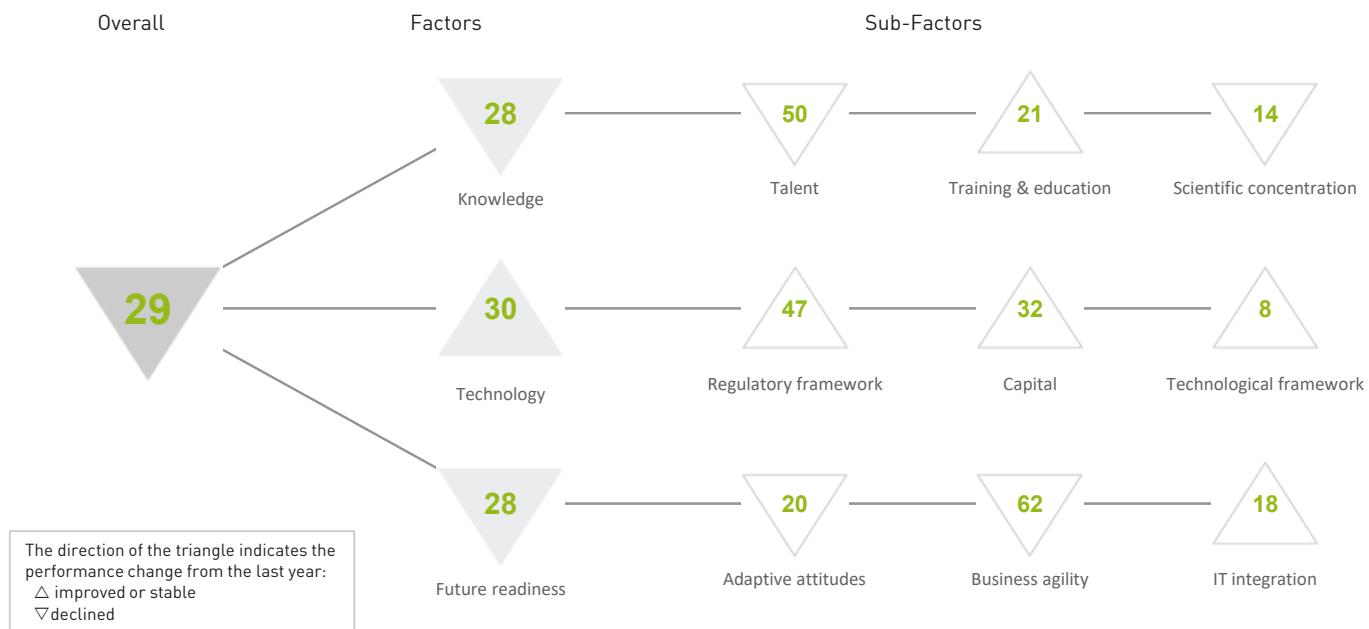
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	36	35	42	36	32
Business agility	32	31	23	19	30
IT integration	32	34	39	38	40

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	34	Opportunities and threats	30	E-Government	33
Internet retailing	29	▷ World robots distribution	06	Public-private partnerships	49
Tablet possession	42	Agility of companies	38	Cyber security	40
Smartphone possession	17	Use of big data and analytics	47	Software piracy	33
Attitudes toward globalization	36	Knowledge transfer	36	Government cyber security capacity	47
		Entrepreneurial fear of failure	28	Privacy protection by law content	34

JAPAN

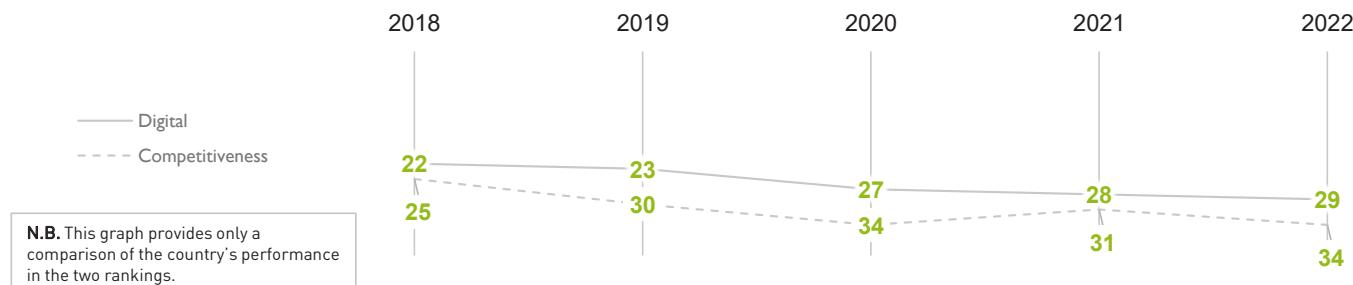
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	22	23	27	28	29
Knowledge	18	25	22	25	28
Technology	23	24	26	30	30
Future readiness	25	24	26	27	28

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



JAPAN

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	36	46	46	47	50
Training & education	14	19	18	21	21
Scientific concentration	12	11	11	13	14

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	05	Employee training	30	Total expenditure on R&D (%)	07
▷ International experience	63	Total public expenditure on education	54	Total R&D personnel per capita	18
Foreign highly-skilled personnel	54	Higher education achievement	08	Female researchers	55
Management of cities	16	► Pupil-teacher ratio (tertiary education)	01	R&D productivity by publication	16
▷ Digital/Technological skills	62	Graduates in Sciences	42	Scientific and technical employment	39
Net flow of international students	25	Women with degrees	08	High-tech patent grants	06
				► Robots in Education and R&D	04

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	40	42	44	48	47
Capital	33	37	33	37	32
Technological framework	04	02	05	08	08

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	43	IT & media stock market capitalization	10	Communications technology	42
Enforcing contracts	35	Funding for technological development	41	Mobile Broadband subscribers	22
Immigration laws	61	Banking and financial services	35	► Wireless broadband	02
Development & application of tech.	41	Country credit rating	28	Internet users	19
Scientific research legislation	49	Venture capital	34	Internet bandwidth speed	19
Intellectual property rights	34	Investment in Telecommunications	32	High-tech exports (%)	24

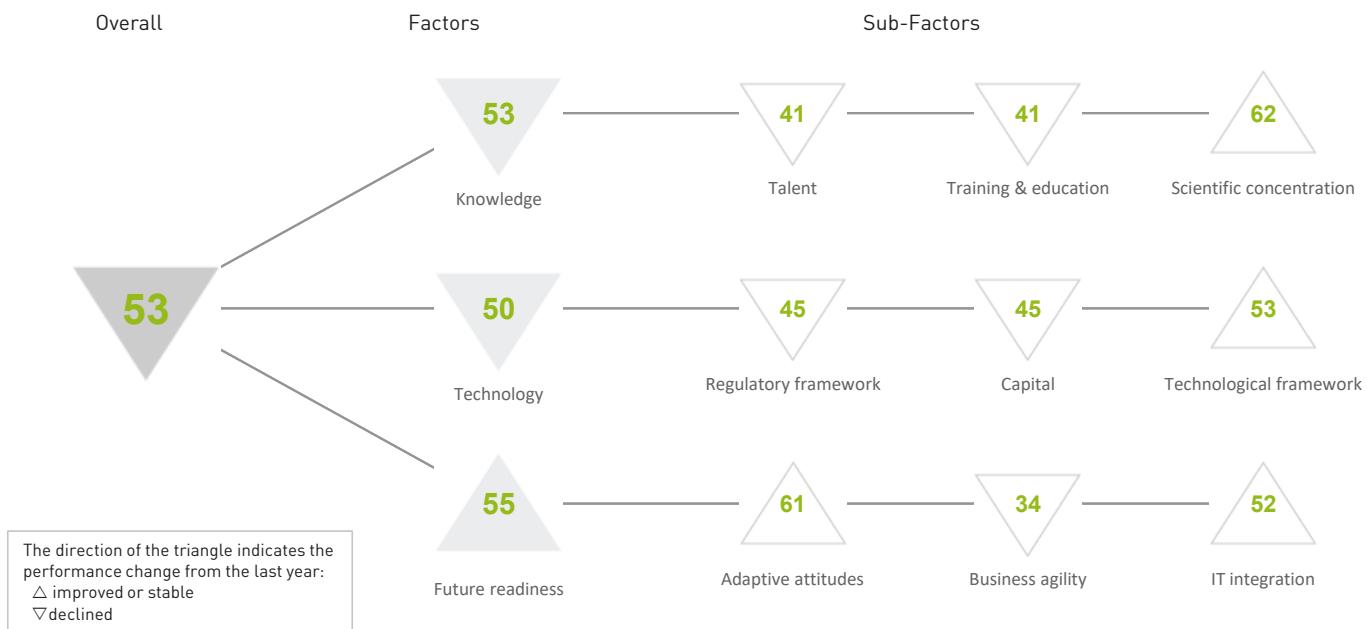
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	13	15	19	18	20
Business agility	55	41	56	53	62
IT integration	15	18	23	23	18

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	04	Opportunities and threats	63	E-Government	14
Internet retailing	16	► World robots distribution	02	Public-private partnerships	41
Tablet possession	24	Agility of companies	63	Cyber security	45
Smartphone possession	10	Use of big data and analytics	63	► Software piracy	02
Attitudes toward globalization	48	Knowledge transfer	49	Government cyber security capacity	23
		Entrepreneurial fear of failure	35	Privacy protection by law content	11

JORDAN

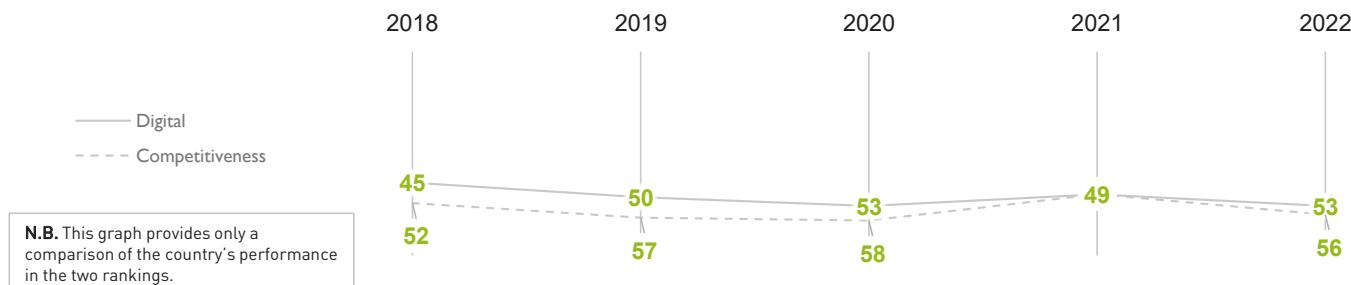
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	45	50	53	49	53
Knowledge	56	49	54	48	53
Technology	48	53	44	43	50
Future readiness	41	52	58	56	55

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



JORDAN

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	39	43	40	34	41
Training & education	41	32	33	33	41
Scientific concentration	63	63	63	62	62

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	51	Employee training	39	Total expenditure on R&D (%)	46
▶ International experience	16	▷ Total public expenditure on education	60	Total R&D personnel per capita	-
Foreign highly-skilled personnel	39	Higher education achievement	-	Female researchers	54
Management of cities	53	▶ Pupil-teacher ratio (tertiary education)	21	R&D productivity by publication	54
Digital/Technological skills	21	▶ Graduates in Sciences	12	Scientific and technical employment	43
Net flow of international students	27	Women with degrees	44	High-tech patent grants	51
				Robots in Education and R&D	-

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	43	47	42	38	45
Capital	39	41	38	41	45
Technological framework	54	55	53	53	53

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	49	IT & media stock market capitalization	51	Communications technology	46
Enforcing contracts	52	Funding for technological development	36	Mobile Broadband subscribers	40
Immigration laws	39	Banking and financial services	24	Wireless broadband	57
Development & application of tech.	34	Country credit rating	58	Internet users	51
Scientific research legislation	35	Venture capital	27	Internet bandwidth speed	48
Intellectual property rights	47	Investment in Telecommunications	24	▷ High-tech exports (%)	60

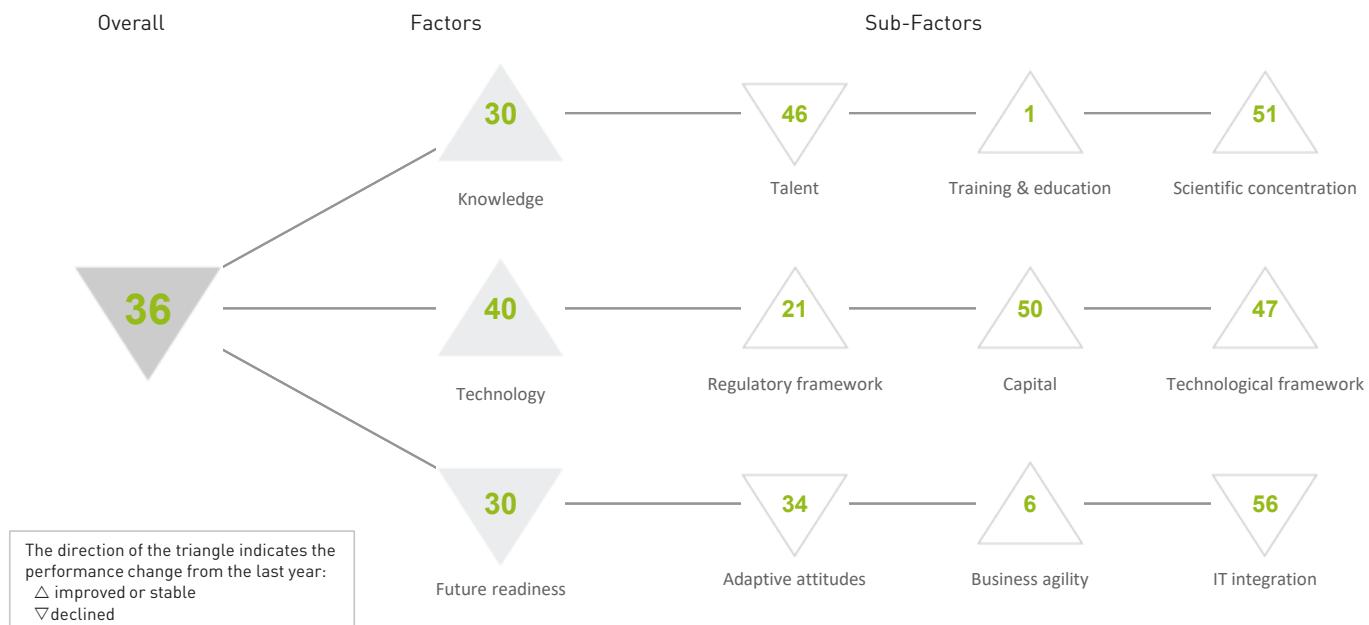
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	58	61	61	61	61
Business agility	23	22	37	28	34
IT integration	42	54	57	54	52

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
▷ E-Participation	60	Opportunities and threats	36	▷ E-Government	60
▷ Internet retailing	60	World robots distribution	-	Public-private partnerships	24
Tablet possession	53	Agility of companies	43	Cyber security	25
▶ Smartphone possession	08	▶ Use of big data and analytics	10	Software piracy	47
Attitudes toward globalization	44	Knowledge transfer	22	Government cyber security capacity	28
		Entrepreneurial fear of failure	49	Privacy protection by law content	45

KAZAKHSTAN

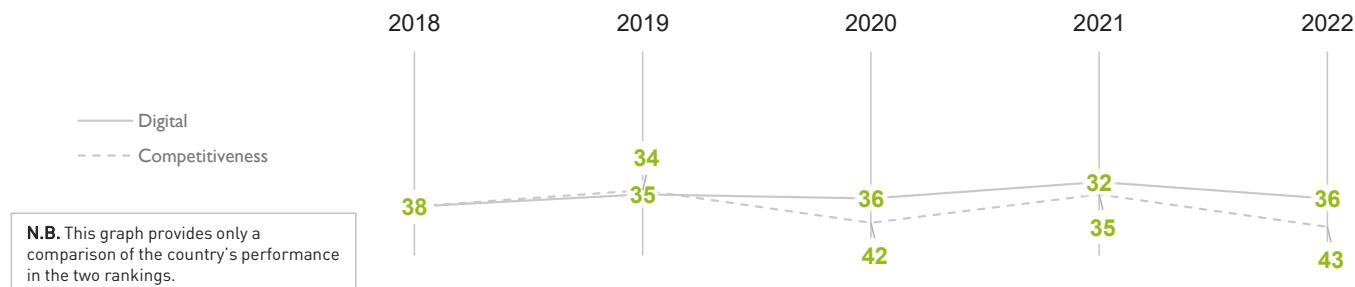
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	38	35	36	32	36
Knowledge	35	32	34	36	30
Technology	39	39	41	40	40
Future readiness	40	35	33	28	30

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



KAZAKHSTAN

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	44	39	49	45	46
Training & education	06	01	04	14	01
Scientific concentration	55	55	54	54	51

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	45	Employee training	13	▷ Total expenditure on R&D (%)	58
International experience	32	Total public expenditure on education	33	Total R&D personnel per capita	47
Foreign highly-skilled personnel	29	▶ Higher education achievement	01	▶ Female researchers	03
Management of cities	37	Pupil-teacher ratio (tertiary education)	33	R&D productivity by publication	19
Digital/Technological skills	43	Graduates in Sciences	29	Scientific and technical employment	53
▷ Net flow of international students	58	▶ Women with degrees	02	High-tech patent grants	52
				Robots in Education and R&D	-

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	22	16	23	22	21
Capital	59	54	55	51	50
Technological framework	42	43	48	47	47

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	11	IT & media stock market capitalization	-	Communications technology	44
▶ Enforcing contracts	04	Funding for technological development	26	Mobile Broadband subscribers	48
Immigration laws	28	Banking and financial services	39	Wireless broadband	56
Development & application of tech.	28	Country credit rating	49	Internet users	42
Scientific research legislation	38	Venture capital	36	Internet bandwidth speed	53
Intellectual property rights	42	▷ Investment in Telecommunications	61	High-tech exports (%)	07

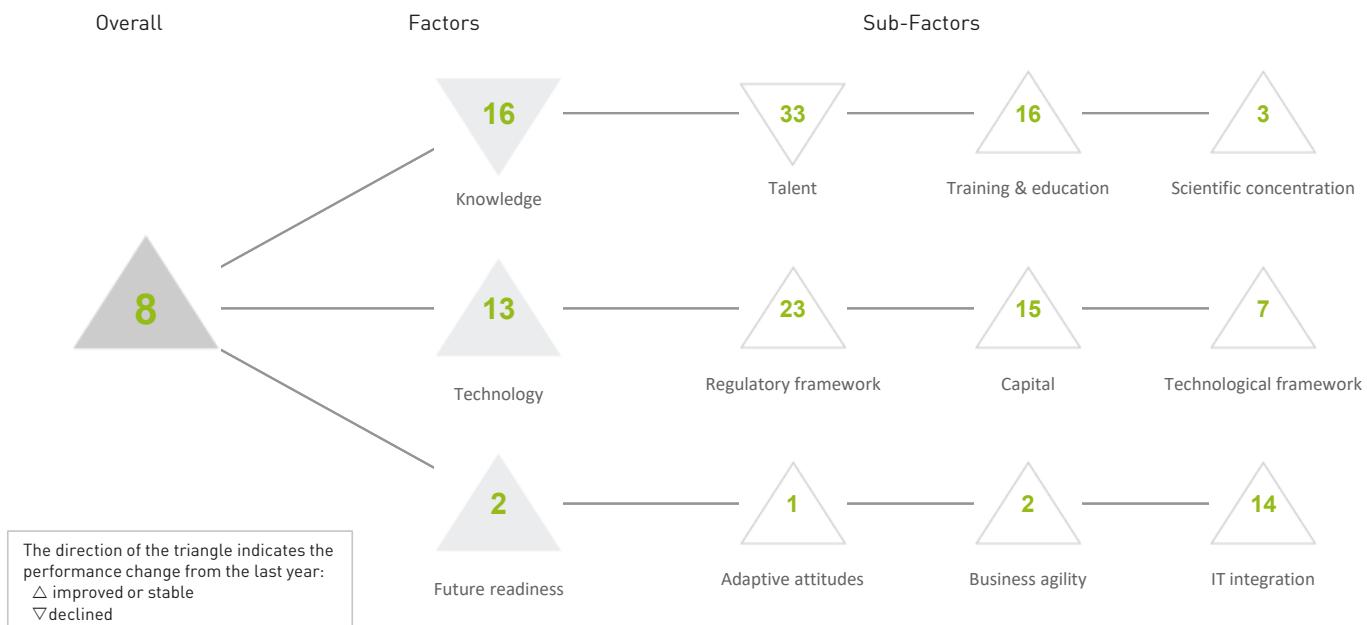
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	47	39	33	32	34
Business agility	43	15	13	06	06
IT integration	44	46	46	44	56

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	25	Opportunities and threats	21	E-Government	27
Internet retailing	49	World robots distribution	-	Public-private partnerships	33
Tablet possession	41	Agility of companies	35	Cyber security	41
Smartphone possession	34	Use of big data and analytics	09	▷ Software piracy	59
Attitudes toward globalization	30	Knowledge transfer	32	Government cyber security capacity	39
		▷ Entrepreneurial fear of failure	01	▷ Privacy protection by law content	58

KOREA REP.

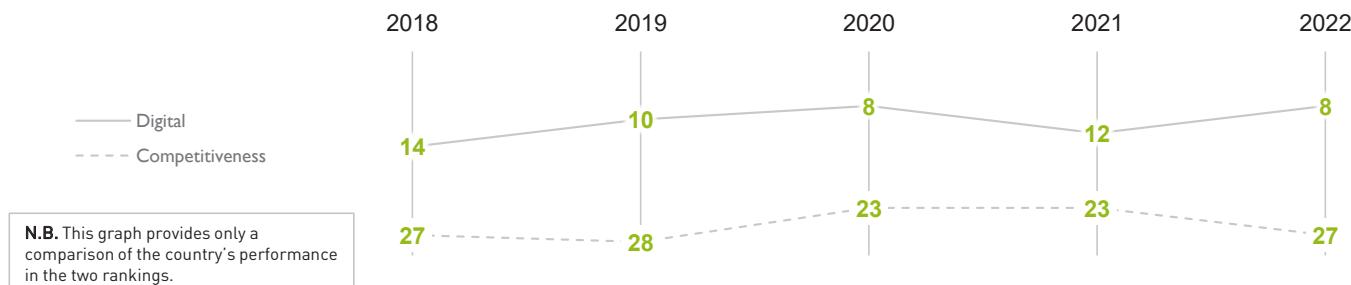
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	14	10	08	12	08
Knowledge	11	11	10	15	16
Technology	17	17	12	13	13
Future readiness	17	04	03	05	02

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



KOREA REP.

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	26	30	21	26	33
Training & education	08	05	11	16	16
Scientific concentration	07	06	04	03	03

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	06	Employee training	34	► Total expenditure on R&D (%)	02
▷ International experience	59	Total public expenditure on education	42	Total R&D personnel per capita	03
▷ Foreign highly-skilled personnel	49	Higher education achievement	04	▷ Female researchers	53
Management of cities	07	Pupil-teacher ratio (tertiary education)	30	R&D productivity by publication	26
Digital/Technological skills	46	Graduates in Sciences	11	Scientific and technical employment	33
Net flow of international students	38	Women with degrees	20	High-tech patent grants	04
				Robots in Education and R&D	07

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	27	26	26	23	23
Capital	44	29	25	16	15
Technological framework	02	07	03	07	07

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	19	IT & media stock market capitalization	04	Communications technology	12
► Enforcing contracts	02	Funding for technological development	30	Mobile Broadband subscribers	15
Immigration laws	29	▷ Banking and financial services	47	Wireless broadband	25
▷ Development & application of tech.	48	Country credit rating	17	Internet users	08
Scientific research legislation	31	Venture capital	35	Internet bandwidth speed	12
Intellectual property rights	37	Investment in Telecommunications	15	High-tech exports (%)	06

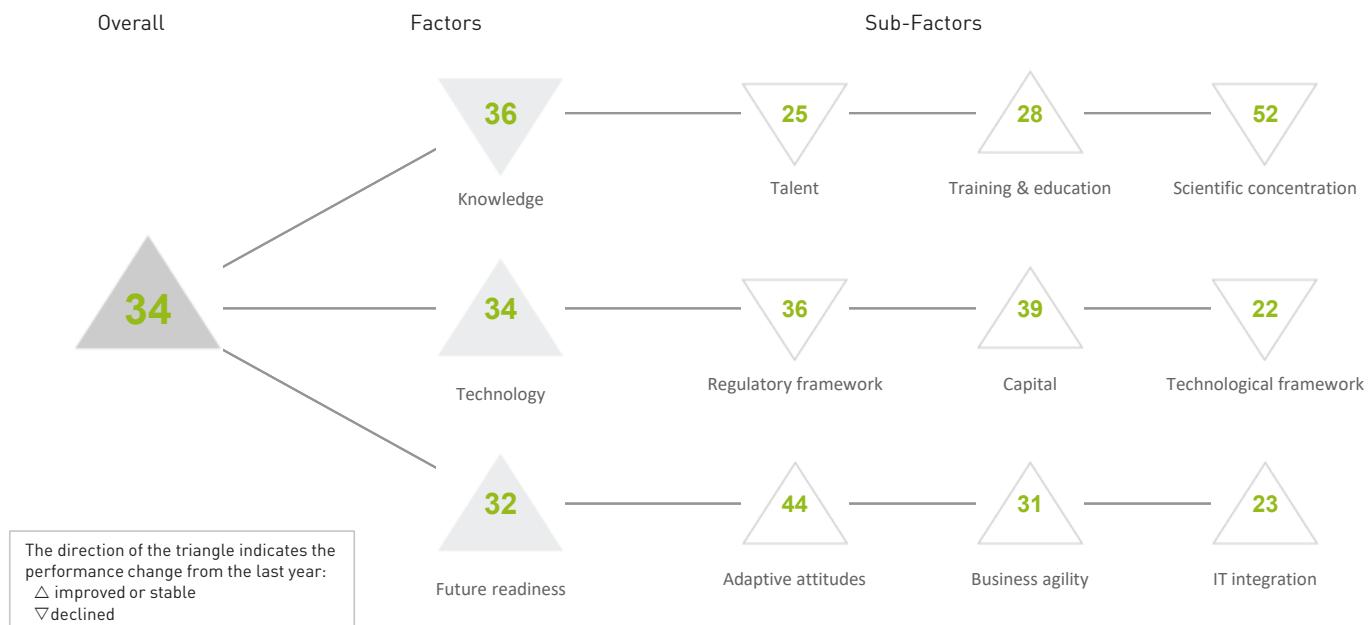
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	03	04	01	02	01
Business agility	47	05	03	05	02
IT integration	20	21	15	16	14

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
► E-Participation	01	Opportunities and threats	35	E-Government	02
► Internet retailing	01	World robots distribution	03	Public-private partnerships	46
Tablet possession	26	Agility of companies	16	Cyber security	28
Smartphone possession	04	Use of big data and analytics	34	Software piracy	20
Attitudes toward globalization	11	Knowledge transfer	30	Government cyber security capacity	06
		► Entrepreneurial fear of failure	02	Privacy protection by law content	33

LATVIA

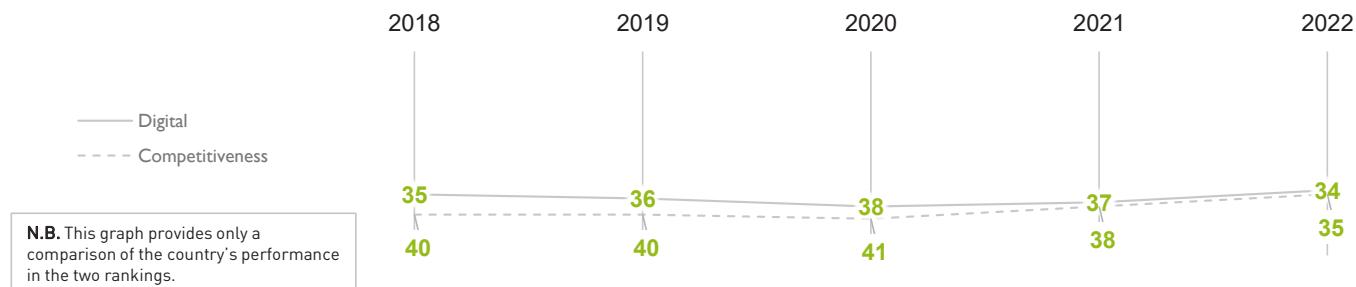
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	35	36	38	37	34
Knowledge	34	36	36	34	36
Technology	32	23	34	34	34
Future readiness	39	45	42	42	32

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	28	32	27	24	25
Training & education	28	27	27	30	28
Scientific concentration	46	47	49	51	52

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	23	Employee training	23	Total expenditure on R&D (%)	47
International experience	20	► Total public expenditure on education	12	Total R&D personnel per capita	37
Foreign highly-skilled personnel	38	Higher education achievement	30	► Female researchers	05
Management of cities	34	Pupil-teacher ratio (tertiary education)	17	▷ R&D productivity by publication	55
Digital/Technological skills	27	Graduates in Sciences	47	Scientific and technical employment	40
Net flow of international students	21	Women with degrees	23	High-tech patent grants	38
				Robots in Education and R&D	47

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	31	30	37	34	36
Capital	36	35	50	46	39
Technological framework	26	14	13	18	22

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	15	IT & media stock market capitalization	29	Communications technology	23
Enforcing contracts	14	Funding for technological development	33	Mobile Broadband subscribers	21
▷ Immigration laws	56	Banking and financial services	41	Wireless broadband	17
Development & application of tech.	32	Country credit rating	35	Internet users	28
Scientific research legislation	43	Venture capital	24	Internet bandwidth speed	32
Intellectual property rights	35	▷ Investment in Telecommunications	51	High-tech exports (%)	21

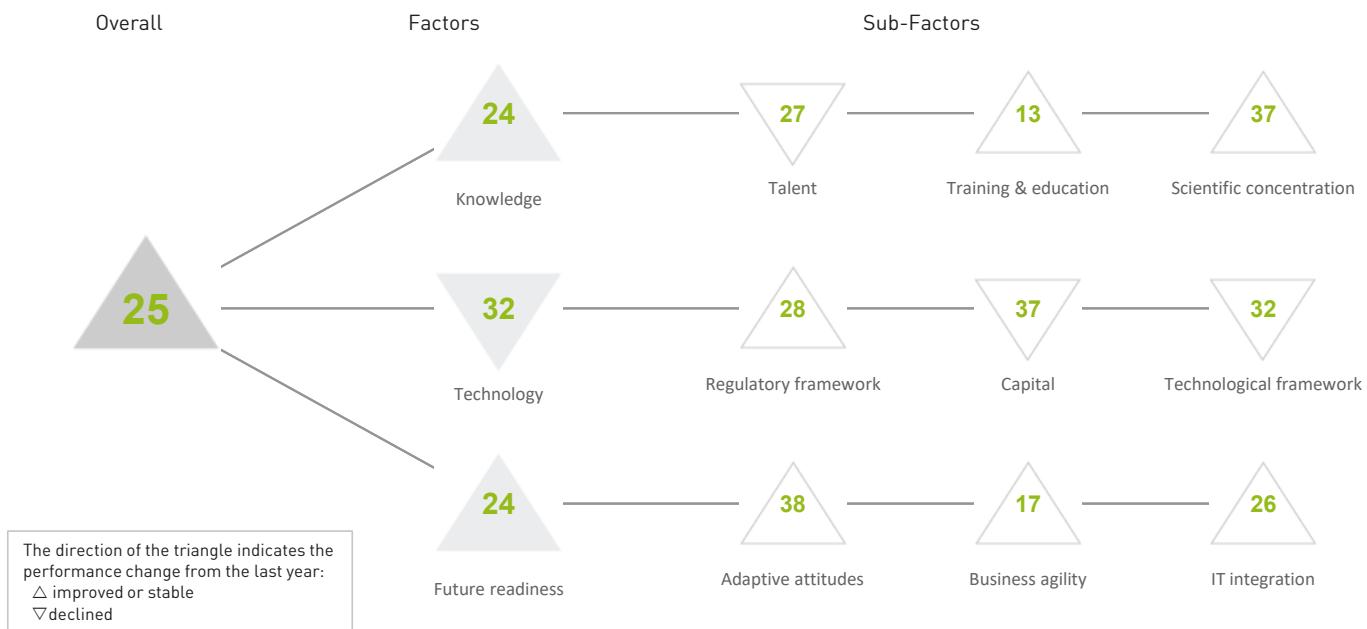
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	52	52	51	51	44
Business agility	41	47	45	48	31
IT integration	37	44	37	37	23

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
▷ E-Participation	58	Opportunities and threats	39	E-Government	43
Internet retailing	36	▷ World robots distribution	52	Public-private partnerships	35
Tablet possession	28	Agility of companies	44	Cyber security	30
Smartphone possession	14	Use of big data and analytics	24	Software piracy	40
Attitudes toward globalization	46	Knowledge transfer	31	▷ Government cyber security capacity	11
		▷ Entrepreneurial fear of failure	12	▷ Privacy protection by law content	02

LITHUANIA

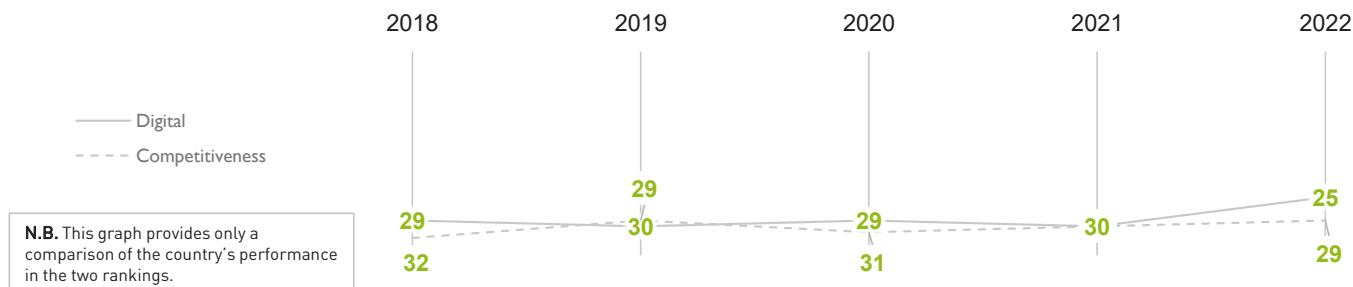
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	29	30	29	30	25
Knowledge	23	26	25	26	24
Technology	30	25	29	29	32
Future readiness	33	32	30	33	24

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



LITHUANIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	27	23	23	25	27
Training & education	16	13	16	15	13
Scientific concentration	31	41	40	37	37

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	33	Employee training	21	Total expenditure on R&D (%)	36
International experience	17	Total public expenditure on education	27	Total R&D personnel per capita	27
Foreign highly-skilled personnel	37	Higher education achievement	13	Female researchers	08
Management of cities	43	Pupil-teacher ratio (tertiary education)	10	▷ R&D productivity by publication	53
▶ Digital/Technological skills	02	Graduates in Sciences	21	Scientific and technical employment	32
▷ Net flow of international students	53	Women with degrees	17	High-tech patent grants	25
				Robots in Education and R&D	46

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	28	24	27	32	28
Capital	35	36	42	30	37
Technological framework	22	21	18	30	32

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	20	IT & media stock market capitalization	08	▶ Communications technology	05
▶ Enforcing contracts	07	Funding for technological development	25	▷ Mobile Broadband subscribers	50
▷ Immigration laws	57	Banking and financial services	42	Wireless broadband	16
Development & application of tech.	26	Country credit rating	29	Internet users	32
Scientific research legislation	26	Venture capital	29	Internet bandwidth speed	21
Intellectual property rights	30	▷ Investment in Telecommunications	59	High-tech exports (%)	36

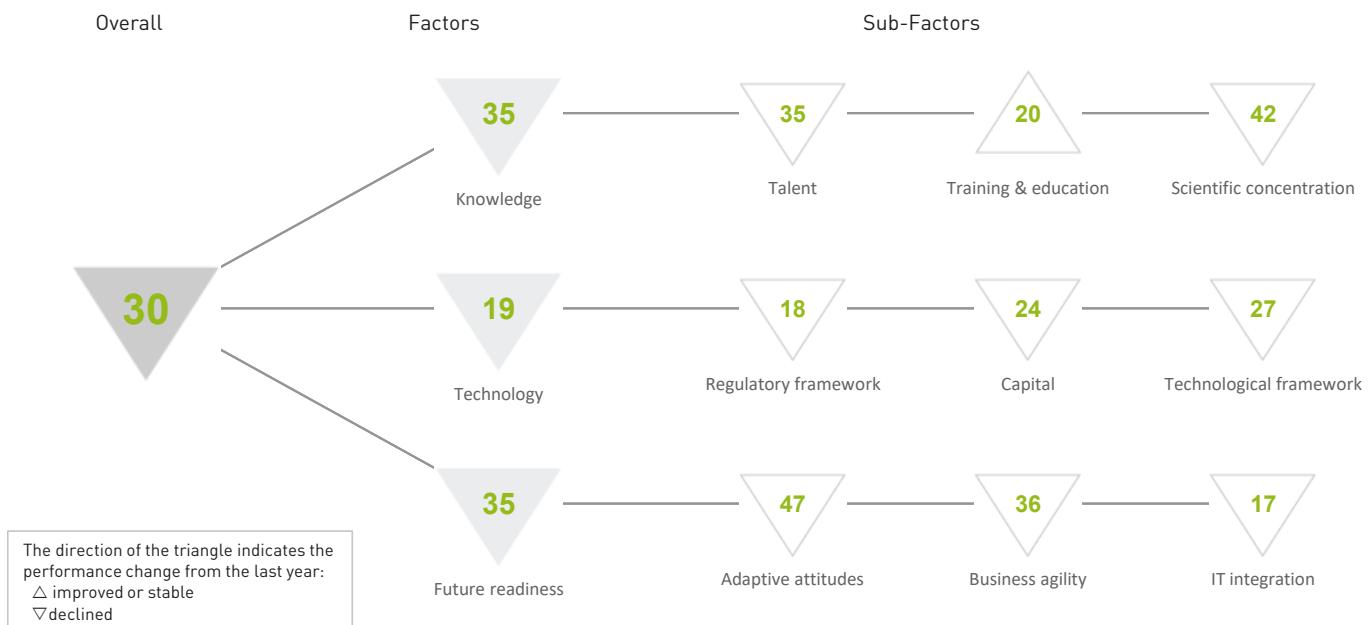
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	41	45	47	47	38
Business agility	24	18	18	24	17
IT integration	31	32	32	34	26

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	48	▶ Opportunities and threats	04	E-Government	20
Internet retailing	30	World robots distribution	45	Public-private partnerships	34
Tablet possession	36	▶ Agility of companies	05	Cyber security	19
Smartphone possession	42	Use of big data and analytics	21	Software piracy	43
Attitudes toward globalization	26	Knowledge transfer	37	Government cyber security capacity	32
		Entrepreneurial fear of failure	-	Privacy protection by law content	08

LUXEMBOURG

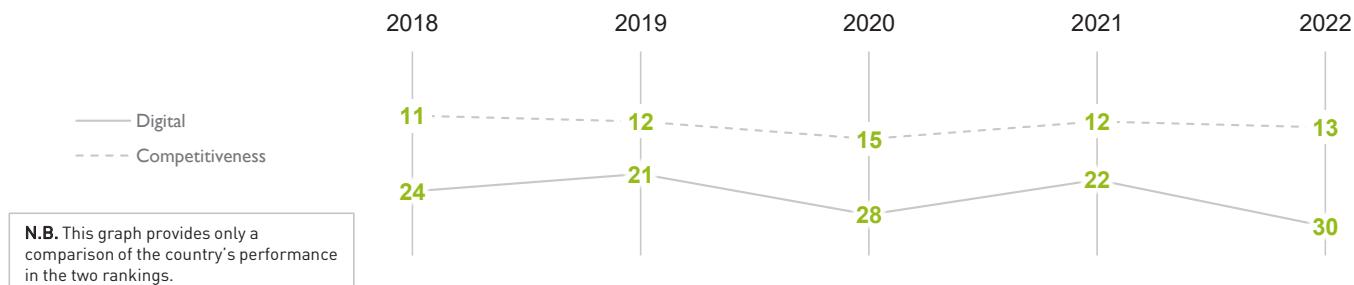
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	24	21	28	22	30
Knowledge	32	34	35	29	35
Technology	15	12	17	14	19
Future readiness	21	17	27	24	35

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



LUXEMBOURG

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	33	31	39	33	35
Training & education	26	24	23	20	20
Scientific concentration	44	42	41	38	42

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	31	Employee training	29	Total expenditure on R&D (%)	38
International experience	08	Total public expenditure on education	31	Total R&D personnel per capita	11
Foreign highly-skilled personnel	07	Higher education achievement	10	Female researchers	50
Management of cities	13	Pupil-teacher ratio (tertiary education)	09	▷ R&D productivity by publication	60
Digital/Technological skills	38	Graduates in Sciences	51	Scientific and technical employment	19
▷ Net flow of international students	59	Women with degrees	11	High-tech patent grants	24
				Robots in Education and R&D	-

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	09	04	08	08	18
Capital	04	09	15	08	24
Technological framework	35	34	35	25	27

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	34	▶ IT & media stock market capitalization	02	Communications technology	19
Enforcing contracts	17	Funding for technological development	32	▷ Mobile Broadband subscribers	53
Immigration laws	11	Banking and financial services	46	Wireless broadband	29
Development & application of tech.	20	▶ Country credit rating	01	▷ Internet users	05
Scientific research legislation	20	Venture capital	40	Internet bandwidth speed	06
Intellectual property rights	15	▷ Investment in Telecommunications	62	▷ High-tech exports (%)	54

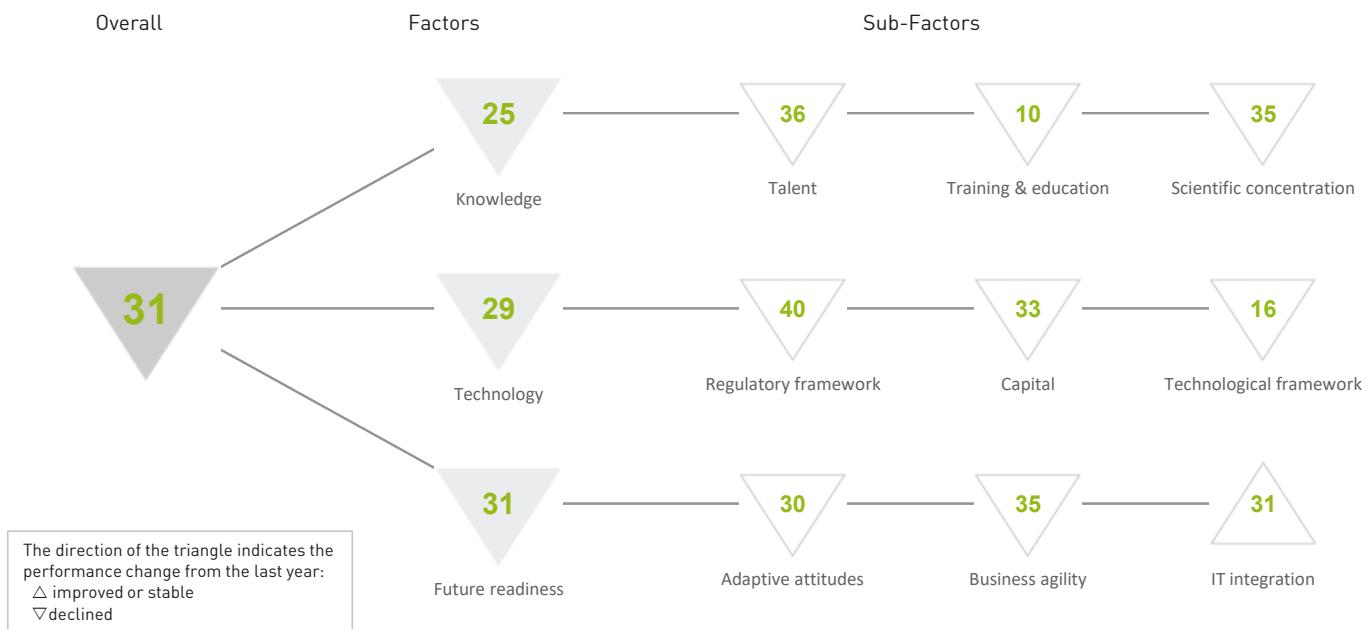
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	29	22	48	38	47
Business agility	17	20	34	22	36
IT integration	13	06	16	12	17

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	52	Opportunities and threats	50	E-Government	30
Internet retailing	-	World robots distribution	-	Public-private partnerships	28
Tablet possession	-	Agility of companies	30	Cyber security	24
Smartphone possession	-	Use of big data and analytics	46	▶ Software piracy	04
Attitudes toward globalization	38	Knowledge transfer	24	Government cyber security capacity	36
		Entrepreneurial fear of failure	20	▷ Privacy protection by law content	04

MALAYSIA

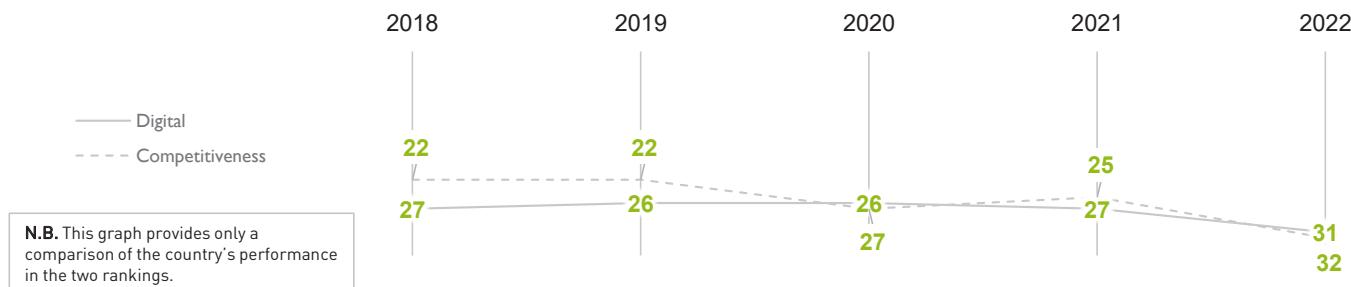
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	27	26	26	27	31
Knowledge	17	19	19	22	25
Technology	22	19	20	26	29
Future readiness	29	28	32	29	31

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



MALAYSIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	24	22	30	30	36
Training & education	10	11	08	09	10
Scientific concentration	30	27	26	32	35

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	41	Employee training	40	Total expenditure on R&D (%)	40
International experience	31	Total public expenditure on education	41	Total R&D personnel per capita	38
Foreign highly-skilled personnel	31	Higher education achievement	40	▶ Female researchers	07
Management of cities	33	Pupil-teacher ratio (tertiary education)	26	R&D productivity by publication	22
Digital/Technological skills	37	► Graduates in Sciences	02	▷ Scientific and technical employment	46
Net flow of international students	33	► Women with degrees	04	High-tech patent grants	45

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	29	29	35	35	40
Capital	12	14	18	31	33
Technological framework	32	20	15	15	16

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
▷ Starting a business	51	IT & media stock market capitalization	18	▷ Communications technology	49
Enforcing contracts	27	Funding for technological development	31	Mobile Broadband subscribers	26
Immigration laws	46	Banking and financial services	36	Wireless broadband	22
Development & application of tech.	31	Country credit rating	38	Internet users	26
Scientific research legislation	34	Venture capital	33	Internet bandwidth speed	35
Intellectual property rights	44	Investment in Telecommunications	27	► High-tech exports (%)	05

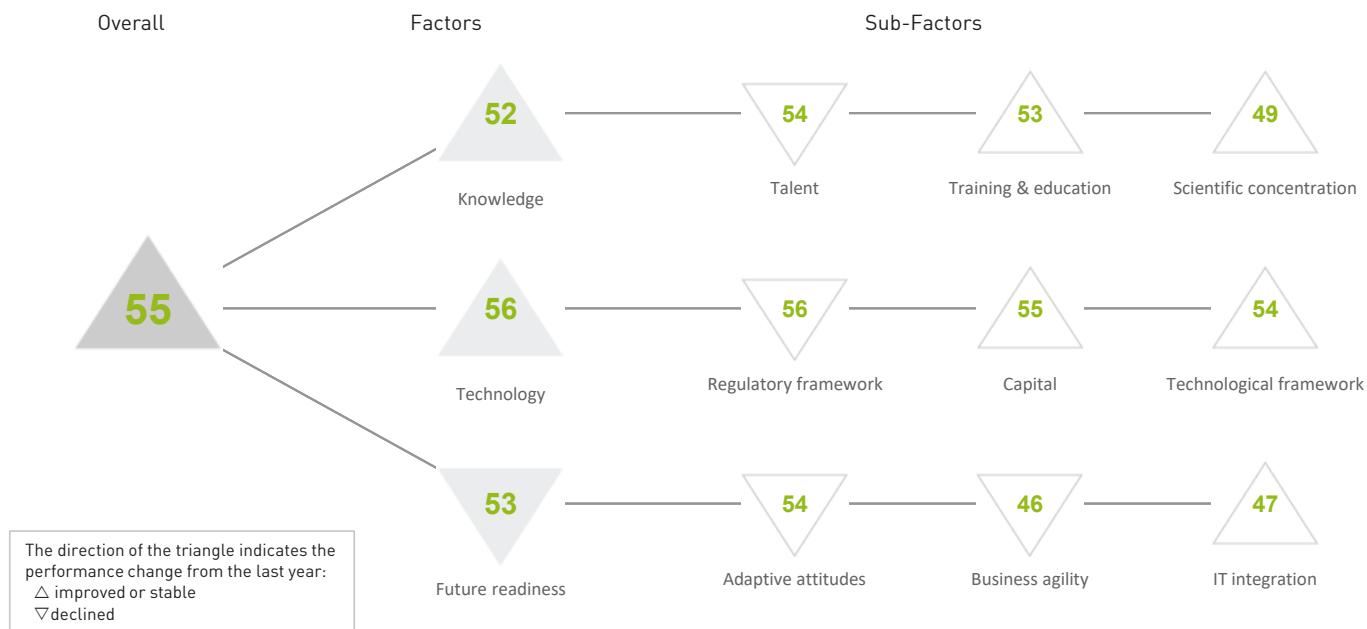
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	30	30	30	29	30
Business agility	15	17	30	27	35
IT integration	35	33	33	31	31

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	27	Opportunities and threats	40	E-Government	41
▷ Internet retailing	46	World robots distribution	22	Public-private partnerships	20
Tablet possession	30	Agility of companies	42	Cyber security	33
Smartphone possession	08	Use of big data and analytics	29	Software piracy	45
Attitudes toward globalization	37	Knowledge transfer	27	► Government cyber security capacity	05
		Entrepreneurial fear of failure	26	▷ Privacy protection by law content	55

MEXICO

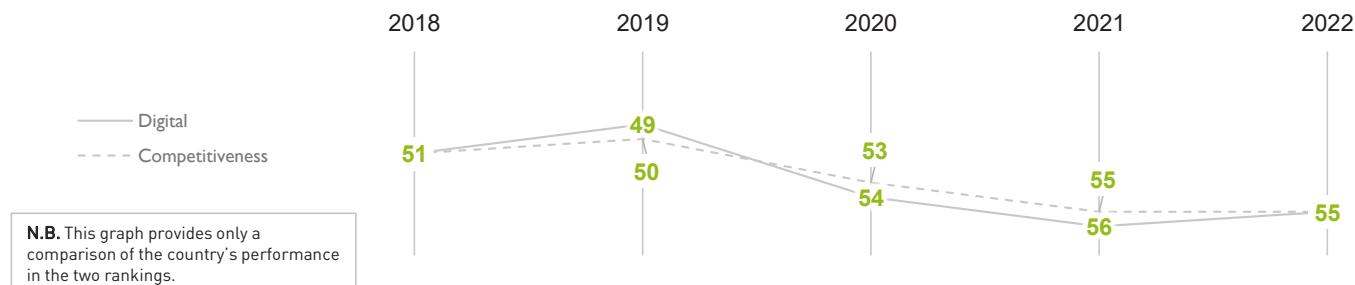
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

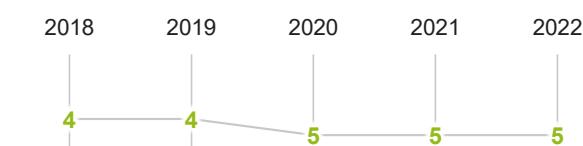
	2018	2019	2020	2021	2022
OVERALL	51	49	54	56	55
Knowledge	54	52	52	54	52
Technology	46	52	56	57	56
Future readiness	50	49	52	51	53

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



MEXICO

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	52	55	45	51	54
Training & education	51	53	57	57	53
Scientific concentration	53	40	43	50	49

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	49	Employee training	43	Total expenditure on R&D (%)	55
International experience	36	Total public expenditure on education	55	Total R&D personnel per capita	50
Foreign highly-skilled personnel	47	Higher education achievement	54	Female researchers	41
Management of cities	57	► Pupil-teacher ratio (tertiary education)	15	► R&D productivity by publication	05
Digital/Technological skills	48	Graduates in Sciences	24	Scientific and technical employment	44
Net flow of international students	37	Women with degrees	53	High-tech patent grants	54
				► Robots in Education and R&D	12

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	45	48	50	54	56
Capital	42	47	53	57	55
Technological framework	50	53	54	54	54

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	44	IT & media stock market capitalization	20	Communications technology	56
Enforcing contracts	32	► Funding for technological development	61	Mobile Broadband subscribers	42
Immigration laws	49	► Banking and financial services	58	Wireless broadband	55
► Development & application of tech.	58	Country credit rating	47	Internet users	54
► Scientific research legislation	61	Venture capital	58	Internet bandwidth speed	52
Intellectual property rights	57	Investment in Telecommunications	29	► High-tech exports (%)	18

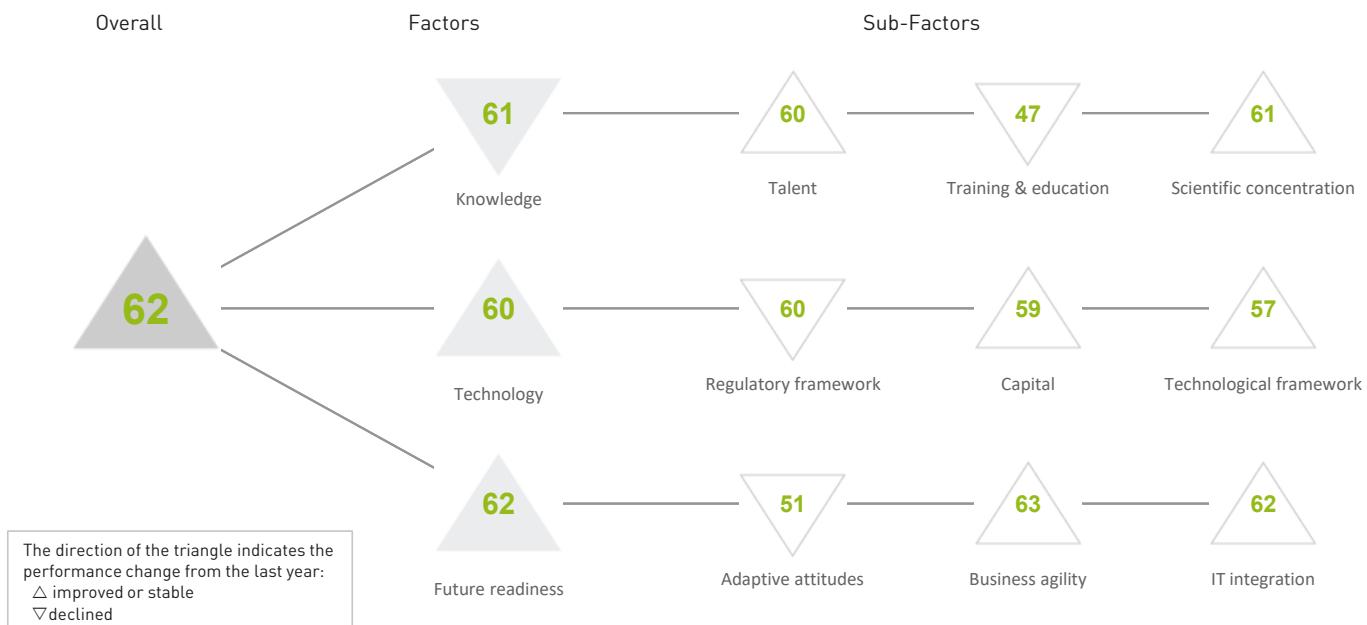
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	40	47	52	52	54
Business agility	57	51	50	41	46
IT integration	53	53	53	52	47

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	34	Opportunities and threats	46	E-Government	50
Internet retailing	44	► World robots distribution	09	Public-private partnerships	53
Tablet possession	49	Agility of companies	47	► Cyber security	60
Smartphone possession	57	Use of big data and analytics	56	Software piracy	42
Attitudes toward globalization	25	Knowledge transfer	50	Government cyber security capacity	37
		Entrepreneurial fear of failure	34	Privacy protection by law content	20

MONGOLIA

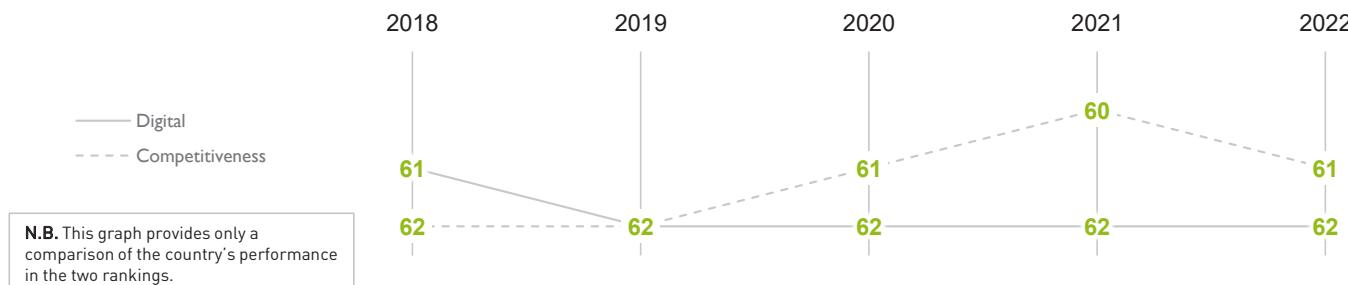
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	61	62	62	62	62
Knowledge	53	62	58	58	61
Technology	62	62	60	61	60
Future readiness	59	61	59	62	62

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (36 countries)



MONGOLIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	60	60	60	60	60
Training & education	24	45	41	39	47
Scientific concentration	60	60	61	61	61

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	-	► Employee training	16	Total expenditure on R&D (%)	60
International experience	61	Total public expenditure on education	45	Total R&D personnel per capita	42
Foreign highly-skilled personnel	58	Higher education achievement	51	► Female researchers	09
Management of cities	62	Pupil-teacher ratio (tertiary education)	53	R&D productivity by publication	58
Digital/Technological skills	58	Graduates in Sciences	35	Scientific and technical employment	56
Net flow of international students	57	Women with degrees	31	High-tech patent grants	61
				Robots in Education and R&D	-

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	58	62	58	58	60
Capital	55	58	60	62	59
Technological framework	61	58	60	60	57

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	42	IT & media stock market capitalization	-	Communications technology	52
Enforcing contracts	43	Funding for technological development	60	► Mobile Broadband subscribers	62
Immigration laws	51	Banking and financial services	61	Wireless broadband	45
Development & application of tech.	61	Country credit rating	61	Internet users	52
Scientific research legislation	62	Venture capital	61	Internet bandwidth speed	59
▷ Intellectual property rights	62	► Investment in Telecommunications	02	► High-tech exports (%)	23

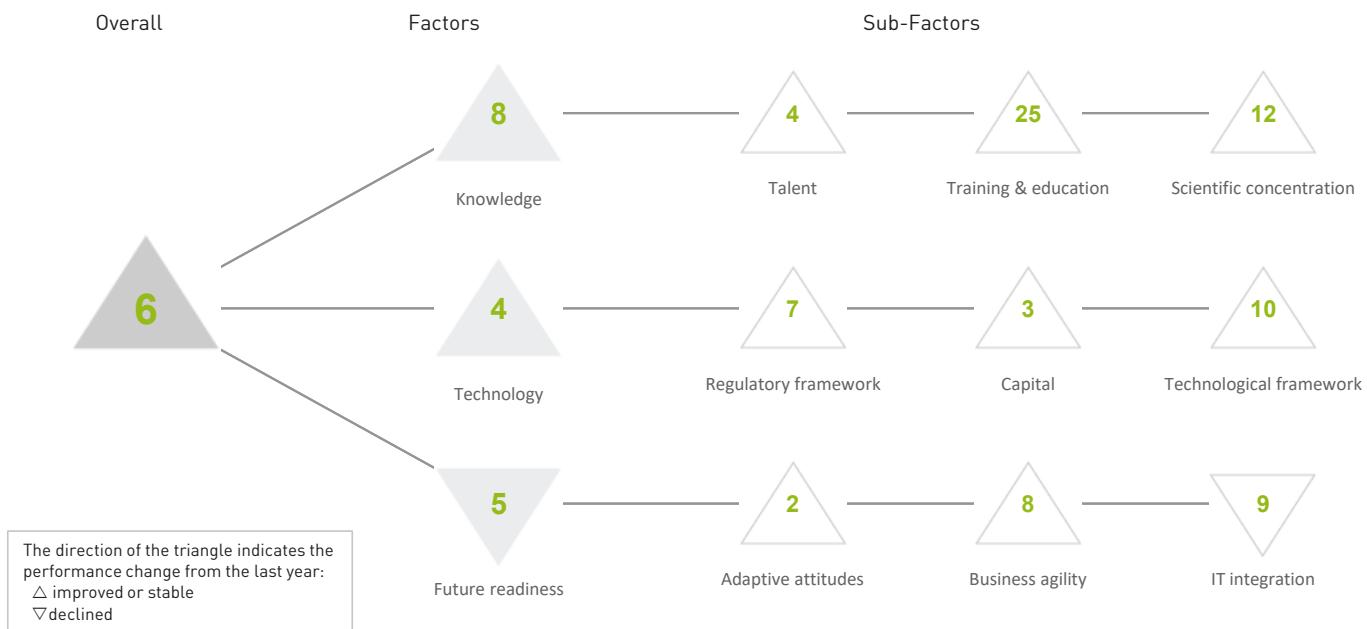
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	31	31	40	37	51
Business agility	61	63	61	63	63
IT integration	62	62	61	62	62

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	57	Opportunities and threats	62	E-Government	57
Internet retailing	59	World robots distribution	-	► Public-private partnerships	63
Tablet possession	-	Agility of companies	58	► Cyber security	62
► Smartphone possession	02	Use of big data and analytics	59	Software piracy	-
Attitudes toward globalization	56	▷ Knowledge transfer	63	Government cyber security capacity	55
		Entrepreneurial fear of failure	-	Privacy protection by law content	44

NETHERLANDS

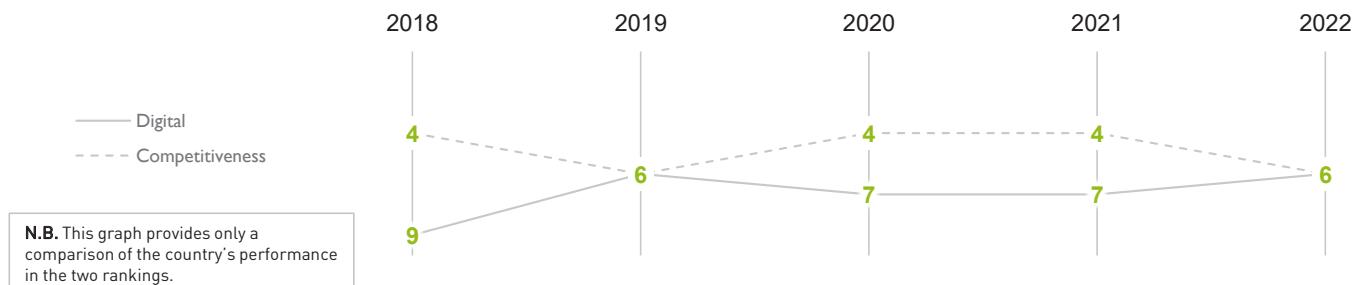
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	09	06	07	07	06
Knowledge	12	13	14	11	08
Technology	08	06	08	07	04
Future readiness	04	03	04	04	05

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



NETHERLANDS

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	03	03	03	04	04
Training & education	31	36	29	28	25
Scientific concentration	16	19	16	16	12

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	08	Employee training	05	Total expenditure on R&D (%)	16
International experience	06	Total public expenditure on education	25	Total R&D personnel per capita	07
▶ Foreign highly-skilled personnel	02	Higher education achievement	18	▷ Female researchers	48
Management of cities	09	Pupil-teacher ratio (tertiary education)	23	R&D productivity by publication	27
Digital/Technological skills	06	▷ Graduates in Sciences	53	Scientific and technical employment	03
Net flow of international students	08	Women with degrees	25	High-tech patent grants	12
				Robots in Education and R&D	21

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	10	06	11	07	07
Capital	07	05	02	03	03
Technological framework	14	10	12	10	10

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	13	▶ IT & media stock market capitalization	03	▶ Communications technology	02
▷ Enforcing contracts	44	Funding for technological development	06	Mobile Broadband subscribers	14
Immigration laws	03	Banking and financial services	15	Wireless broadband	35
Development & application of tech.	06	▶ Country credit rating	01	Internet users	13
Scientific research legislation	06	Venture capital	04	Internet bandwidth speed	11
Intellectual property rights	05	▷ Investment in Telecommunications	47	High-tech exports (%)	14

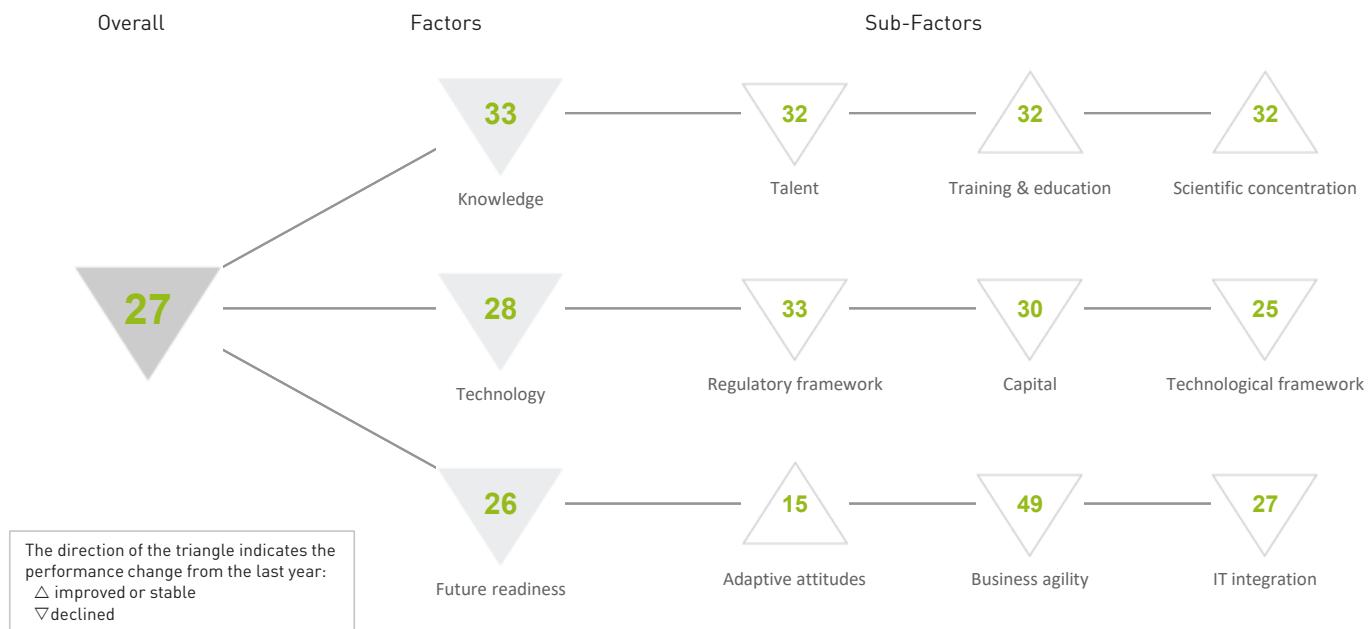
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	07	09	06	06	02
Business agility	12	07	07	08	08
IT integration	07	03	05	06	09

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	09	Opportunities and threats	09	E-Government	10
Internet retailing	07	World robots distribution	20	Public-private partnerships	05
Tablet possession	15	Agility of companies	12	Cyber security	20
Smartphone possession	25	Use of big data and analytics	16	Software piracy	13
Attitudes toward globalization	06	▶ Knowledge transfer	02	▷ Government cyber security capacity	40
		Entrepreneurial fear of failure	11	Privacy protection by law content	07

NEW ZEALAND

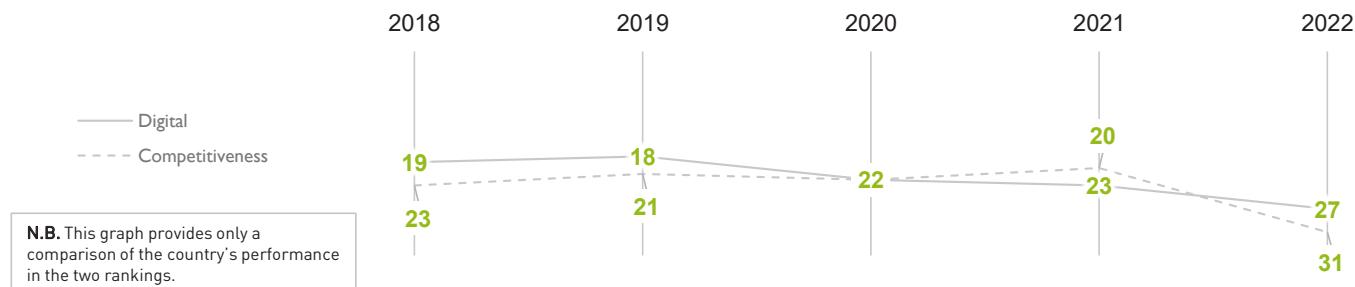
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	19	18	22	23	27
Knowledge	21	21	28	28	33
Technology	16	15	18	21	28
Future readiness	18	20	21	19	26

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (36 countries)



NEW ZEALAND

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	16	11	17	14	32
Training & education	37	34	37	36	32
Scientific concentration	15	26	34	33	32

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	26	Employee training	42	Total expenditure on R&D (%)	30
▷ International experience	58	Total public expenditure on education	13	Total R&D personnel per capita	15
Foreign highly-skilled personnel	28	Higher education achievement	31	Female researchers	-
▷ Management of cities	54	Pupil-teacher ratio (tertiary education)	35	R&D productivity by publication	40
Digital/Technological skills	51	Graduates in Sciences	36	Scientific and technical employment	12
▶ Net flow of international students	03	Women with degrees	26	High-tech patent grants	43
				Robots in Education and R&D	44

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	13	11	21	24	33
Capital	14	15	24	22	30
Technological framework	25	25	21	23	25

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
▶ Starting a business	01	IT & media stock market capitalization	33	Communications technology	31
Enforcing contracts	19	Funding for technological development	45	Mobile Broadband subscribers	44
▷ Immigration laws	63	Banking and financial services	30	Wireless broadband	15
Development & application of tech.	37	Country credit rating	12	Internet users	23
Scientific research legislation	32	Venture capital	37	Internet bandwidth speed	17
Intellectual property rights	17	Investment in Telecommunications	21	High-tech exports (%)	41

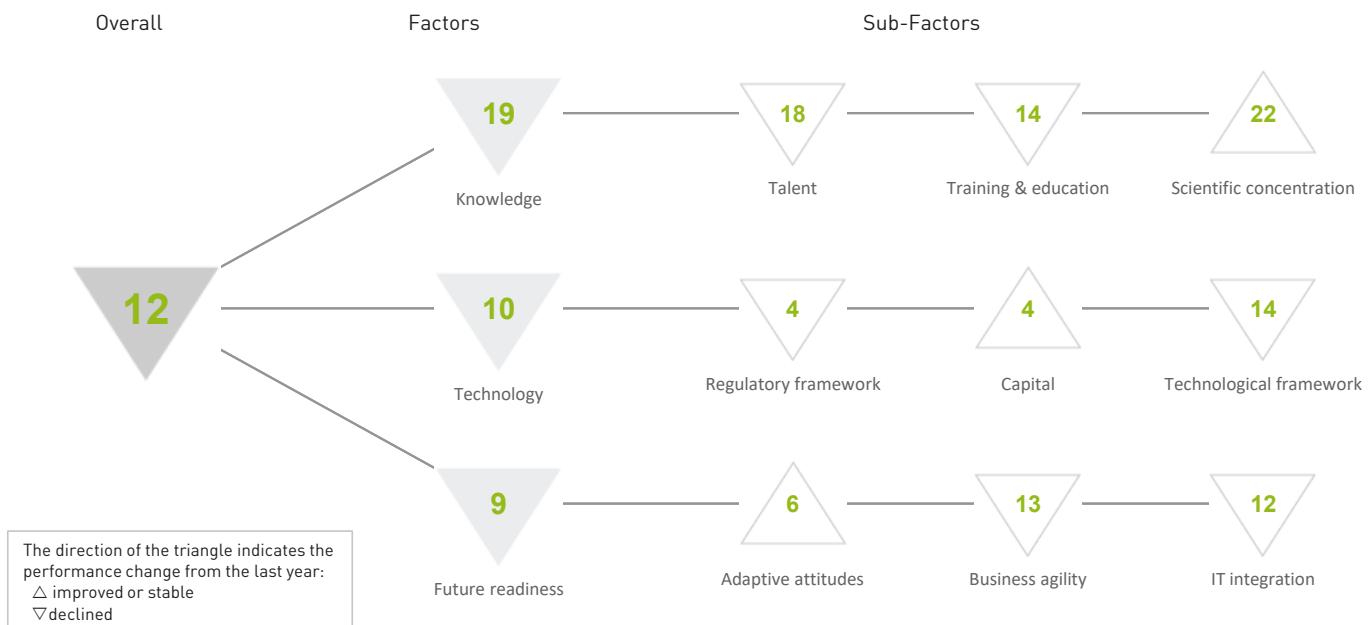
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	14	13	13	16	15
Business agility	35	32	46	30	49
IT integration	17	10	18	18	27

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
▶ E-Participation	04	Opportunities and threats	38	▷ E-Government	08
Internet retailing	19	World robots distribution	41	▷ Public-private partnerships	54
Tablet possession	14	Agility of companies	48	▷ Cyber security	52
Smartphone possession	35	Use of big data and analytics	39	▶ Software piracy	02
Attitudes toward globalization	21	Knowledge transfer	40	Government cyber security capacity	19
		Entrepreneurial fear of failure	-	Privacy protection by law content	39

NORWAY

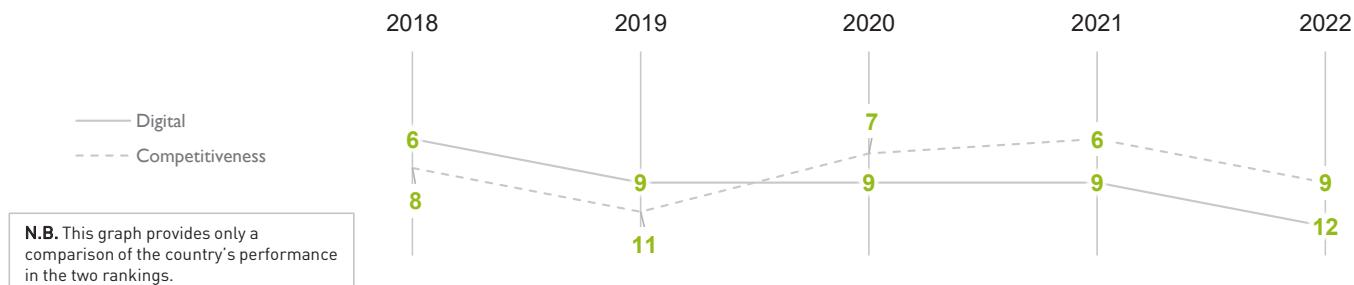
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	06	09	09	09	12
Knowledge	16	16	16	17	19
Technology	02	03	03	06	10
Future readiness	06	08	06	08	09

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



NORWAY

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	20	16	16	16	18
Training & education	11	17	10	11	14
Scientific concentration	20	21	23	22	22

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	18	Employee training	12	Total expenditure on R&D (%)	17
International experience	21	Total public expenditure on education	14	Total R&D personnel per capita	10
Foreign highly-skilled personnel	14	Higher education achievement	20	Female researchers	25
Management of cities	24	Pupil-teacher ratio (tertiary education)	05	▷ R&D productivity by publication	42
Digital/Technological skills	08	▷ Graduates in Sciences	43	Scientific and technical employment	22
▷ Net flow of international students	48	Women with degrees	16	High-tech patent grants	29
				Robots in Education and R&D	31

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	01	03	02	01	04
Capital	02	07	09	06	04
Technological framework	03	06	09	12	14

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	14	IT & media stock market capitalization	23	Communications technology	25
▷ Enforcing contracts	03	Funding for technological development	10	Mobile Broadband subscribers	20
Immigration laws	12	▷ Banking and financial services	04	Wireless broadband	34
Development & application of tech.	19	▷ Country credit rating	01	Internet users	06
Scientific research legislation	18	Venture capital	05	Internet bandwidth speed	16
Intellectual property rights	11	Investment in Telecommunications	33	High-tech exports (%)	17

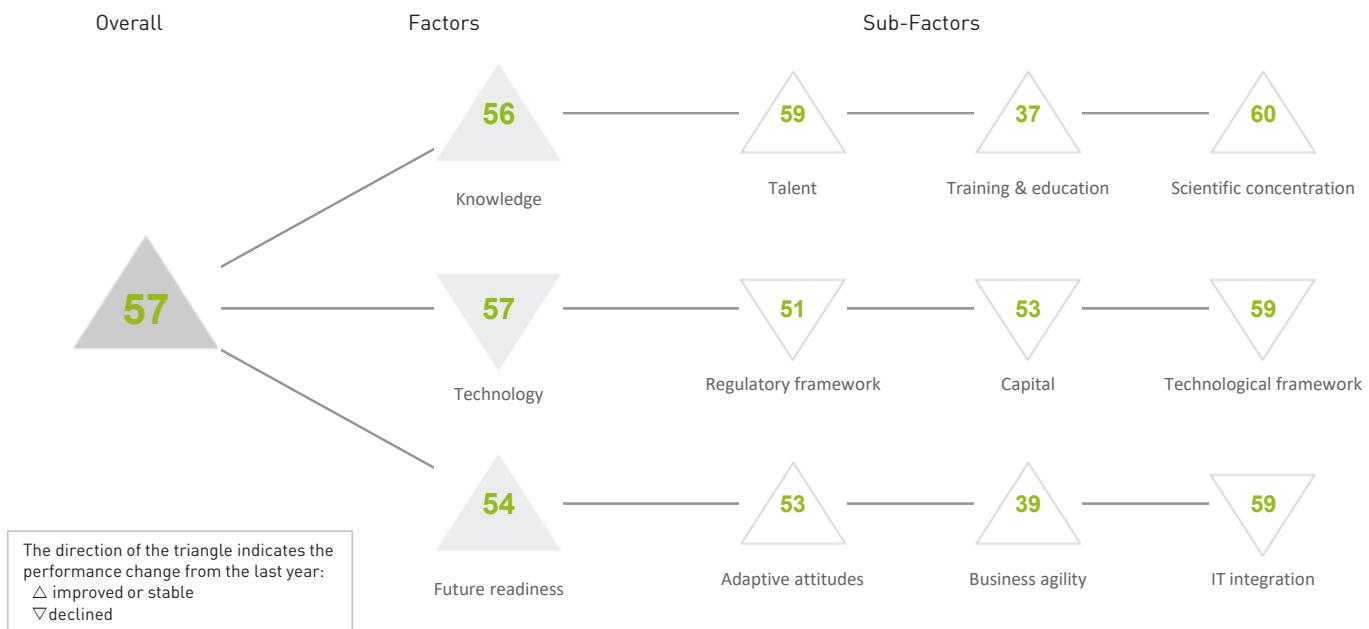
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	08	05	07	08	06
Business agility	14	23	08	11	13
IT integration	09	09	06	08	12

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	18	Opportunities and threats	10	E-Government	13
Internet retailing	06	▷ World robots distribution	40	Public-private partnerships	16
▷ Tablet possession	03	Agility of companies	13	Cyber security	18
Smartphone possession	12	Use of big data and analytics	07	Software piracy	10
Attitudes toward globalization	31	Knowledge transfer	09	▷ Government cyber security capacity	44
		Entrepreneurial fear of failure	15	▷ Privacy protection by law content	05

PERU

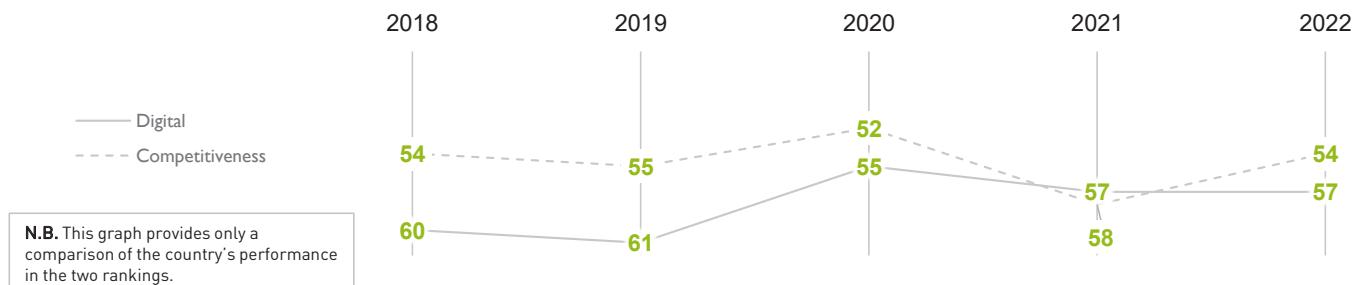
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	60	61	55	57	57
Knowledge	60	61	55	59	56
Technology	57	58	58	56	57
Future readiness	60	59	55	54	54

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	58	59	58	59	59
Training & education	43	42	39	41	37
Scientific concentration	62	62	59	60	60

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	50	Employee training	53	▷ Total expenditure on R&D (%)	59
International experience	38	Total public expenditure on education	47	Total R&D personnel per capita	-
Foreign highly-skilled personnel	40	▶ Higher education achievement	06	Female researchers	45
▷ Management of cities	59	Pupil-teacher ratio (tertiary education)	51	R&D productivity by publication	28
Digital/Technological skills	59	▶ Graduates in Sciences	10	Scientific and technical employment	52
Net flow of international students	-	Women with degrees	38	High-tech patent grants	57
				Robots in Education and R&D	41

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	49	50	49	49	51
Capital	47	45	37	43	53
Technological framework	59	61	59	58	59

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	54	IT & media stock market capitalization	56	▷ Communications technology	61
Enforcing contracts	45	Funding for technological development	56	Mobile Broadband subscribers	56
▶ Immigration laws	19	Banking and financial services	53	▷ Wireless broadband	60
Development & application of tech.	55	Country credit rating	40	Internet users	57
Scientific research legislation	56	Venture capital	47	Internet bandwidth speed	56
Intellectual property rights	58	▶ Investment in Telecommunications	09	High-tech exports (%)	57

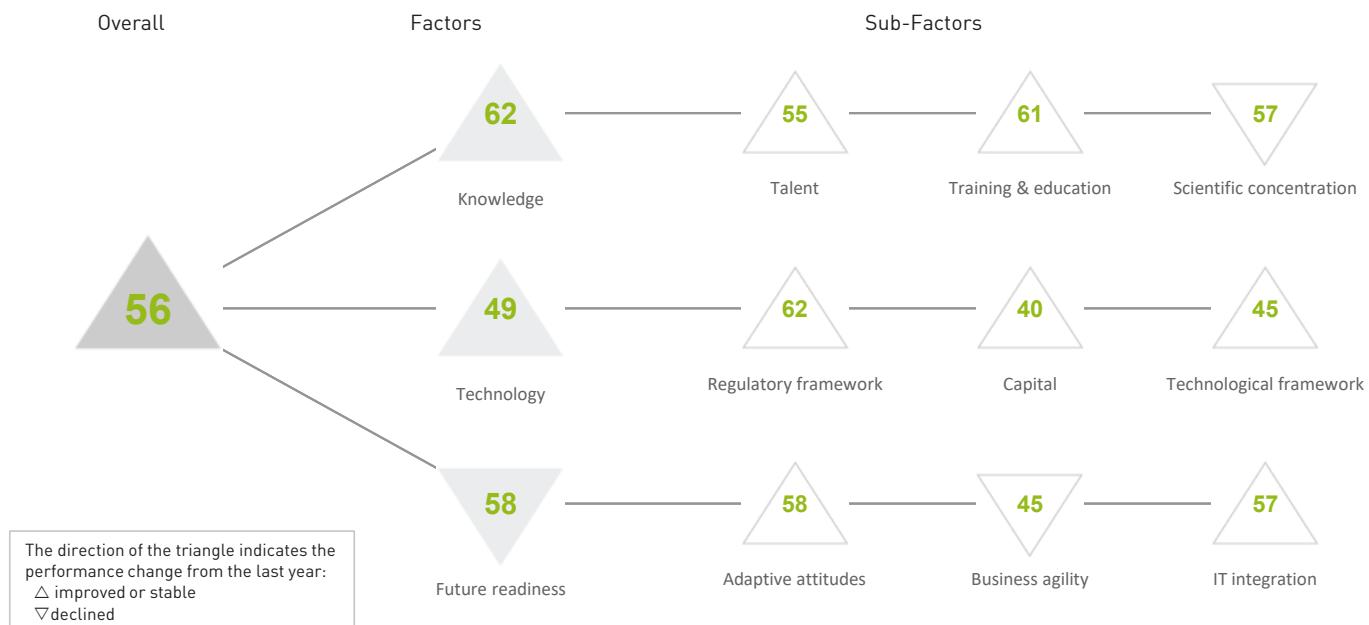
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	59	49	54	54	53
Business agility	50	59	47	39	39
IT integration	59	59	58	56	59

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	43	Opportunities and threats	45	E-Government	53
Internet retailing	53	World robots distribution	53	Public-private partnerships	45
Tablet possession	54	Agility of companies	51	Cyber security	58
Smartphone possession	37	Use of big data and analytics	53	Software piracy	54
Attitudes toward globalization	32	Knowledge transfer	45	▷ Government cyber security capacity	62
		▶ Entrepreneurial fear of failure	04	Privacy protection by law content	53

PHILIPPINES

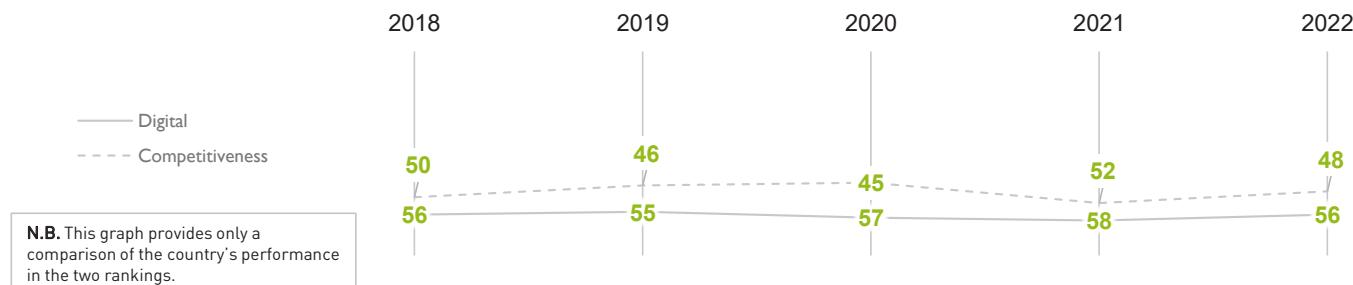
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	56	55	57	58	56
Knowledge	50	51	62	63	62
Technology	58	55	53	54	49
Future readiness	52	54	54	57	58

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



PHILIPPINES

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	48	41	55	55	55
Training & education	52	54	59	61	61
Scientific concentration	50	54	56	56	57

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	57	Employee training	38	Total expenditure on R&D (%)	54
International experience	30	▷ Total public expenditure on education	59	Total R&D personnel per capita	51
Foreign highly-skilled personnel	45	Higher education achievement	57	▶ Female researchers	04
Management of cities	41	Pupil-teacher ratio (tertiary education)	54	R&D productivity by publication	37
Digital/Technological skills	42	▶ Graduates in Sciences	14	▷ Scientific and technical employment	58
Net flow of international students	39	Women with degrees	57	High-tech patent grants	37

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	61	60	62	62	62
Capital	43	40	39	40	40
Technological framework	52	51	49	49	45

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
▷ Starting a business	62	IT & media stock market capitalization	28	▷ Communications technology	60
▷ Enforcing contracts	61	Funding for technological development	50	Mobile Broadband subscribers	51
Immigration laws	31	Banking and financial services	34	Wireless broadband	31
Development & application of tech.	46	Country credit rating	43	Internet users	58
Scientific research legislation	51	Venture capital	53	Internet bandwidth speed	58
Intellectual property rights	53	▶ Investment in Telecommunications	10	▶ High-tech exports (%)	02

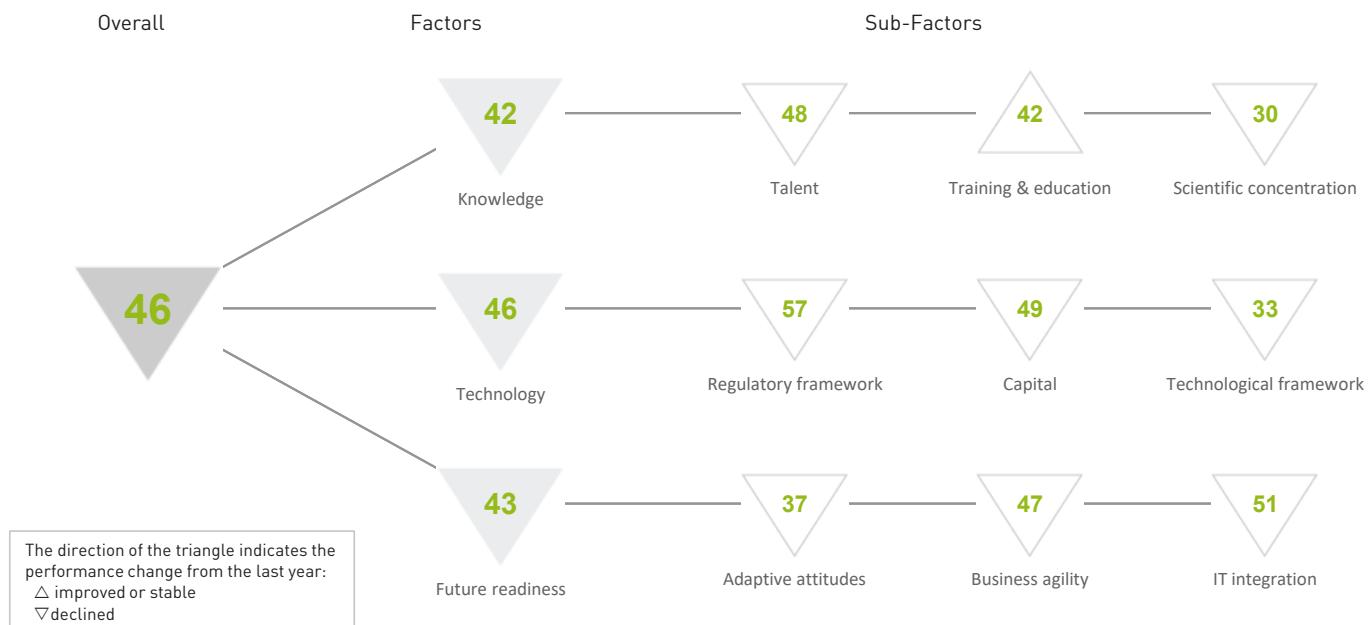
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	60	53	57	60	58
Business agility	31	42	32	37	45
IT integration	57	58	56	57	57

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	44	Opportunities and threats	31	E-Government	54
Internet retailing	55	World robots distribution	39	Public-private partnerships	31
Tablet possession	55	Agility of companies	40	Cyber security	54
Smartphone possession	54	Use of big data and analytics	38	Software piracy	55
▶ Attitudes toward globalization	27	Knowledge transfer	47	Government cyber security capacity	53
		Entrepreneurial fear of failure	-	Privacy protection by law content	42

POLAND

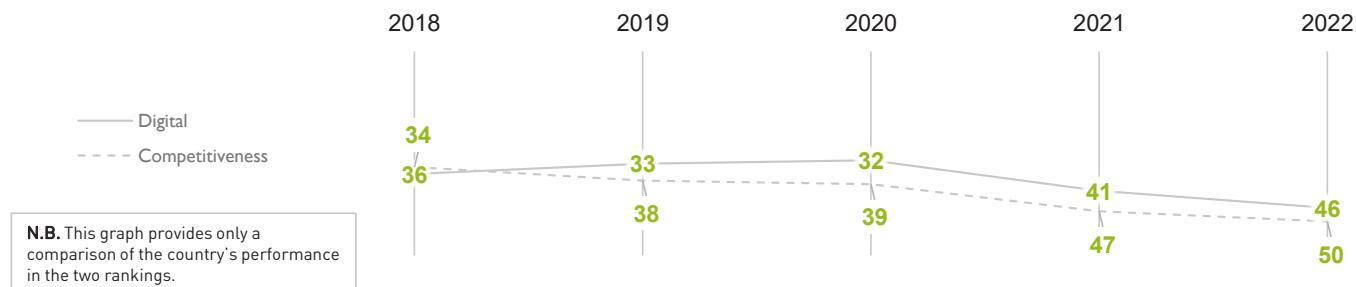
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	36	33	32	41	46
Knowledge	33	33	30	38	42
Technology	37	37	37	41	46
Future readiness	37	33	35	39	43

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS > 20 MILLION (27 countries)



POLAND

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	30	28	29	41	48
Training & education	35	35	32	44	42
Scientific concentration	38	31	28	28	30

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
▶ Educational assessment PISA - Math	09	▷ Employee training	60	Total expenditure on R&D (%)	32
International experience	54	Total public expenditure on education	26	Total R&D personnel per capita	31
Foreign highly-skilled personnel	53	Higher education achievement	35	Female researchers	28
Management of cities	47	Pupil-teacher ratio (tertiary education)	27	R&D productivity by publication	18
▷ Digital/Technological skills	61	Graduates in Sciences	44	Scientific and technical employment	36
Net flow of international students	32	Women with degrees	33	High-tech patent grants	42
				▶ Robots in Education and R&D	14

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	46	45	46	53	57
Capital	32	38	36	47	49
Technological framework	37	30	23	31	33

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	53	IT & media stock market capitalization	34	Communications technology	54
Enforcing contracts	38	Funding for technological development	54	Mobile Broadband subscribers	27
▷ Immigration laws	59	Banking and financial services	55	▶ Wireless broadband	03
▷ Development & application of tech.	60	Country credit rating	36	Internet users	45
Scientific research legislation	55	Venture capital	48	Internet bandwidth speed	23
Intellectual property rights	52	Investment in Telecommunications	39	High-tech exports (%)	45

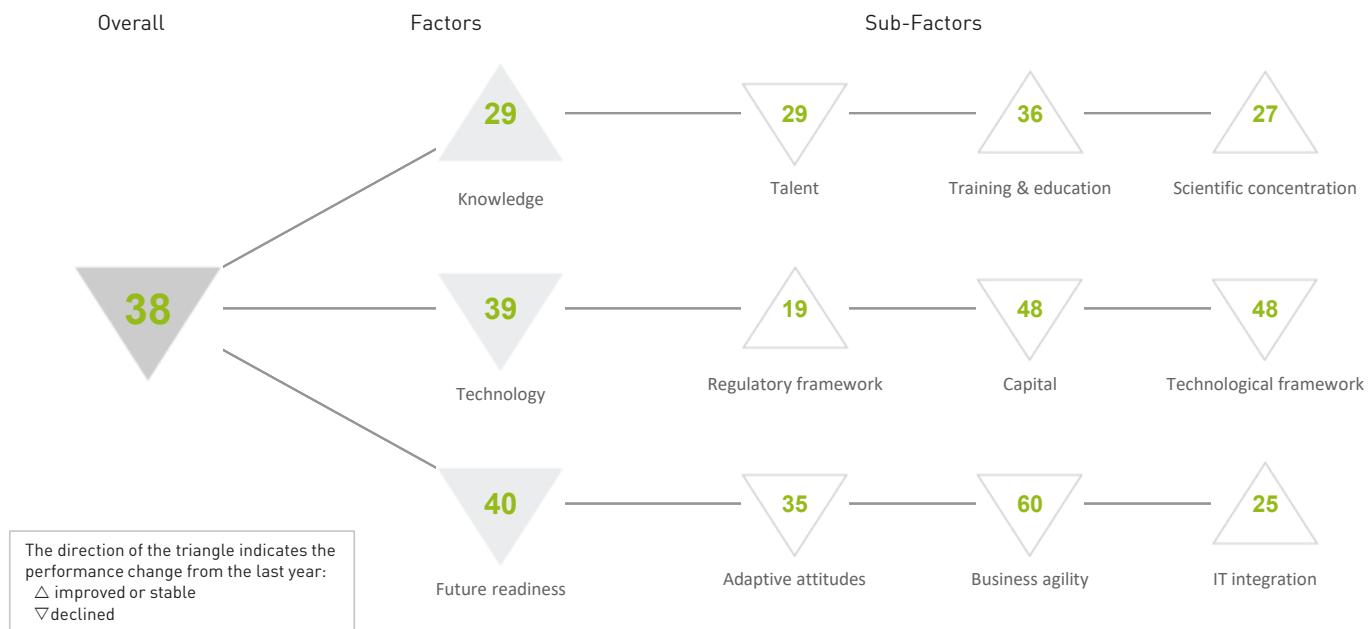
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	33	37	29	28	37
Business agility	40	28	33	44	47
IT integration	40	36	38	45	51

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
▶ E-Participation	09	Opportunities and threats	43	E-Government	23
Internet retailing	27	World robots distribution	17	▷ Public-private partnerships	61
▶ Tablet possession	13	Agility of companies	36	Cyber security	55
Smartphone possession	56	Use of big data and analytics	50	Software piracy	36
Attitudes toward globalization	58	Knowledge transfer	55	Government cyber security capacity	49
		Entrepreneurial fear of failure	21	Privacy protection by law content	41

PORTUGAL

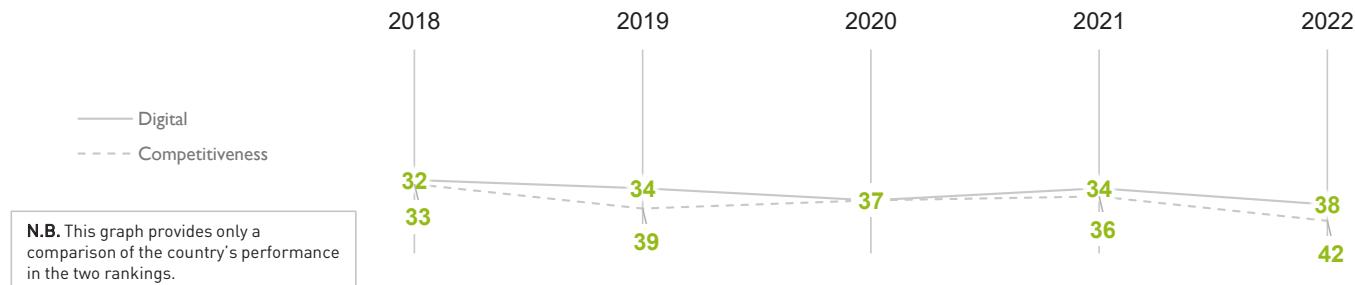
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	32	34	37	34	38
Knowledge	27	31	33	32	29
Technology	36	38	38	38	39
Future readiness	32	34	41	38	40

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



PORTUGAL

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	23	26	24	22	29
Training & education	27	39	38	38	36
Scientific concentration	34	32	30	27	27

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	27	▷ Employee training	61	Total expenditure on R&D (%)	25
International experience	48	Total public expenditure on education	30	Total R&D personnel per capita	23
Foreign highly-skilled personnel	32	Higher education achievement	36	Female researchers	17
Management of cities	23	► Pupil-teacher ratio (tertiary education)	11	R&D productivity by publication	29
Digital/Technological skills	20	► Graduates in Sciences	15	Scientific and technical employment	26
Net flow of international students	23	Women with degrees	39	High-tech patent grants	35
				Robots in Education and R&D	34

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	19	21	20	21	19
Capital	45	48	44	44	48
Technological framework	39	45	42	46	48

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	31	IT & media stock market capitalization	42	► Communications technology	08
Enforcing contracts	29	Funding for technological development	42	▷ Mobile Broadband subscribers	58
► Immigration laws	02	Banking and financial services	43	▷ Wireless broadband	52
Development & application of tech.	29	Country credit rating	46	Internet users	47
Scientific research legislation	28	Venture capital	46	Internet bandwidth speed	22
Intellectual property rights	29	Investment in Telecommunications	44	High-tech exports (%)	51

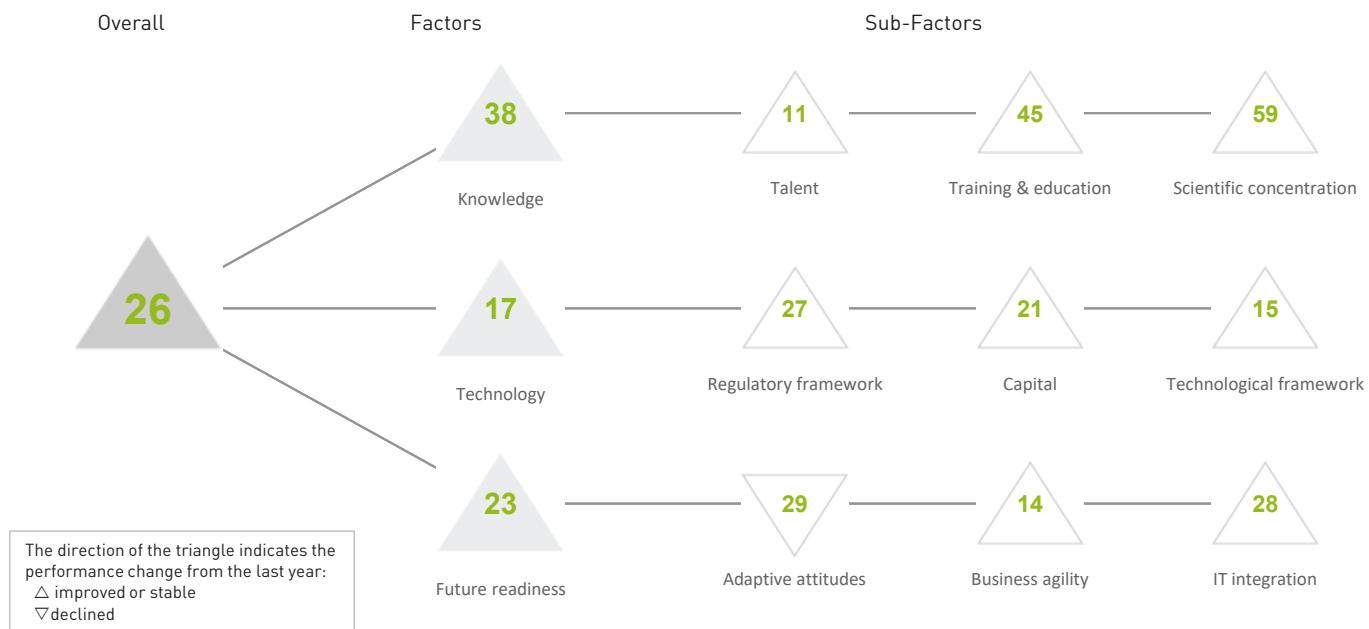
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	35	32	31	30	35
Business agility	27	52	57	58	60
IT integration	30	29	34	30	25

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	34	Opportunities and threats	52	E-Government	32
Internet retailing	35	World robots distribution	31	Public-private partnerships	39
Tablet possession	32	▷ Agility of companies	59	Cyber security	50
Smartphone possession	51	▷ Use of big data and analytics	61	Software piracy	28
Attitudes toward globalization	22	Knowledge transfer	41	Government cyber security capacity	16
		Entrepreneurial fear of failure	44	► Privacy protection by law content	01

QATAR

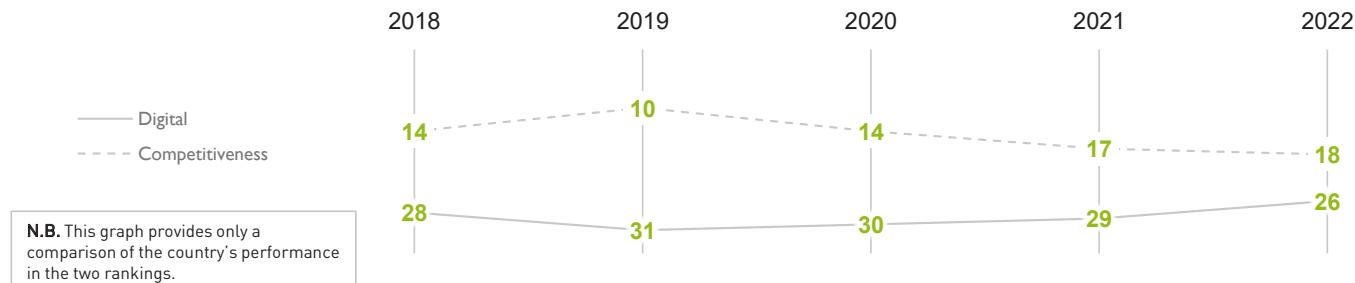
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	28	31	30	29	26
Knowledge	37	45	45	44	38
Technology	27	33	25	19	17
Future readiness	16	22	24	23	23

COMPETITIVENESS & DIGITAL RANKINGS

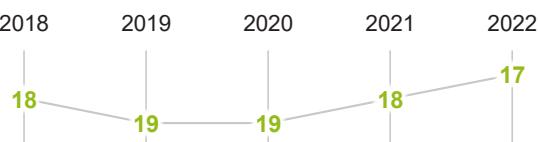


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



QATAR

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	15	15	15	19	11
Training & education	38	48	53	54	45
Scientific concentration	59	61	60	59	59

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	48	Employee training	19	Total expenditure on R&D (%)	49
▶ International experience	02	▷ Total public expenditure on education	57	Total R&D personnel per capita	45
Foreign highly-skilled personnel	04	Higher education achievement	53	Female researchers	35
Management of cities	06	Pupil-teacher ratio (tertiary education)	29	R&D productivity by publication	51
Digital/Technological skills	11	Graduates in Sciences	32	▷ Scientific and technical employment	57
Net flow of international students	24	Women with degrees	-	High-tech patent grants	11
				Robots in Education and R&D	51

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	32	28	29	27	27
Capital	24	23	19	24	21
Technological framework	30	38	31	16	15

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	45	IT & media stock market capitalization	44	Communications technology	16
▷ Enforcing contracts	54	Funding for technological development	07	▶ Mobile Broadband subscribers	02
Immigration laws	13	Banking and financial services	08	Wireless broadband	06
Development & application of tech.	11	Country credit rating	22	▶ Internet users	02
Scientific research legislation	09	Venture capital	12	Internet bandwidth speed	39
Intellectual property rights	18	Investment in Telecommunications	46	High-tech exports (%)	52

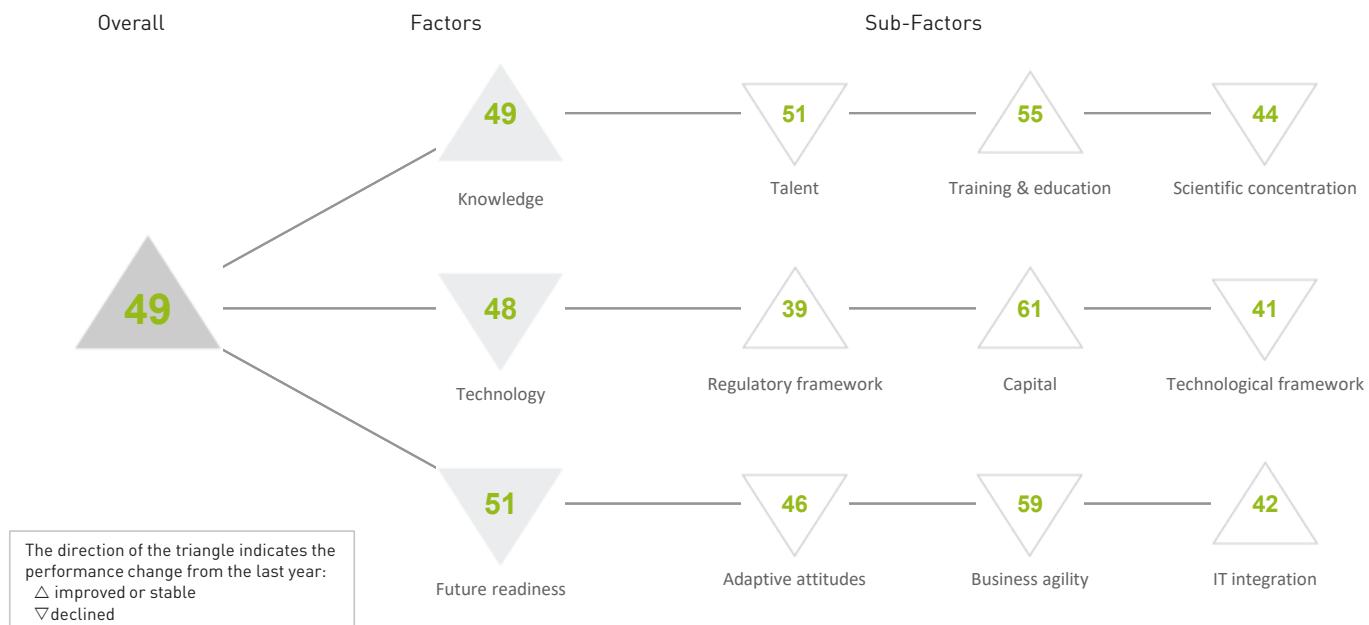
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	16	18	27	26	29
Business agility	08	12	17	17	14
IT integration	26	27	28	28	28

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
▷ E-Participation	55	Opportunities and threats	11	E-Government	51
Internet retailing	52	▷ World robots distribution	56	Public-private partnerships	12
Tablet possession	05	Agility of companies	23	▶ Cyber security	01
Smartphone possession	03	▶ Use of big data and analytics	03	Software piracy	38
Attitudes toward globalization	17	Knowledge transfer	11	Government cyber security capacity	13
		Entrepreneurial fear of failure	14	Privacy protection by law content	47

ROMANIA

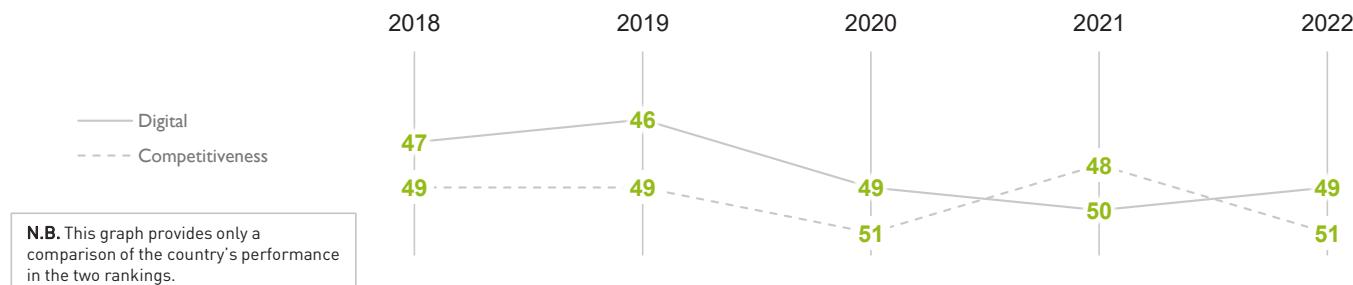
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

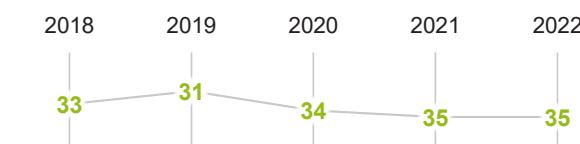
	2018	2019	2020	2021	2022
OVERALL	47	46	49	50	49
Knowledge	45	47	53	52	49
Technology	44	45	48	47	48
Future readiness	57	51	49	49	51

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



ROMANIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	45	48	51	50	51
Training & education	50	51	54	59	55
Scientific concentration	43	38	39	43	44

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	44	Employee training	47	Total expenditure on R&D (%)	51
International experience	55	Total public expenditure on education	51	Total R&D personnel per capita	44
Foreign highly-skilled personnel	51	Higher education achievement	55	► Female researchers	12
Management of cities	56	Pupil-teacher ratio (tertiary education)	46	R&D productivity by publication	21
Digital/Technological skills	22	► Graduates in Sciences	09	Scientific and technical employment	47
Net flow of international students	42	Women with degrees	52	High-tech patent grants	30
				Robots in Education and R&D	35

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	39	41	43	40	39
Capital	62	59	61	61	61
Technological framework	31	36	37	40	41

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	38	IT & media stock market capitalization	52	Communications technology	20
► Enforcing contracts	18	Funding for technological development	53	Mobile Broadband subscribers	55
Immigration laws	25	► Banking and financial services	60	Wireless broadband	39
Development & application of tech.	50	Country credit rating	52	Internet users	48
Scientific research legislation	52	► Venture capital	59	► Internet bandwidth speed	08
Intellectual property rights	49	Investment in Telecommunications	54	High-tech exports (%)	37

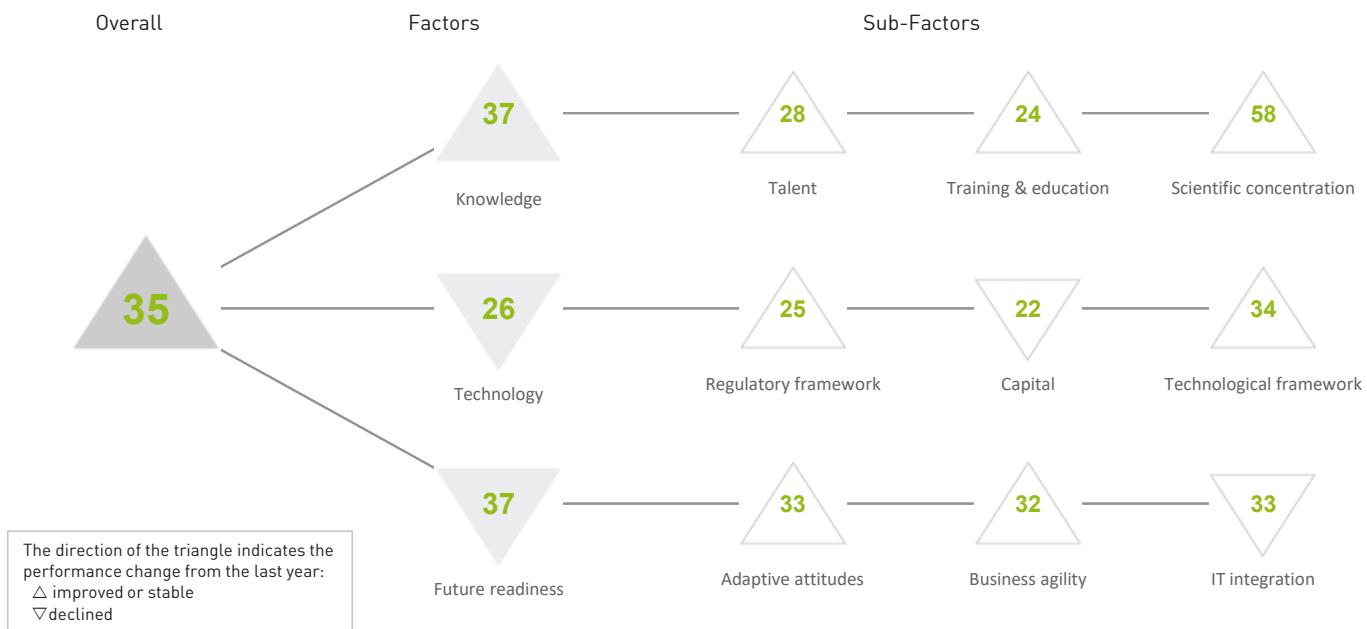
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	46	48	45	42	46
Business agility	60	46	53	57	59
IT integration	58	55	54	50	42

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	38	► Opportunities and threats	57	E-Government	48
Internet retailing	40	World robots distribution	35	► Public-private partnerships	60
Tablet possession	37	Agility of companies	56	Cyber security	32
Smartphone possession	49	Use of big data and analytics	37	Software piracy	52
Attitudes toward globalization	52	► Knowledge transfer	58	► Government cyber security capacity	14
		Entrepreneurial fear of failure	36	Privacy protection by law content	38

SAUDI ARABIA

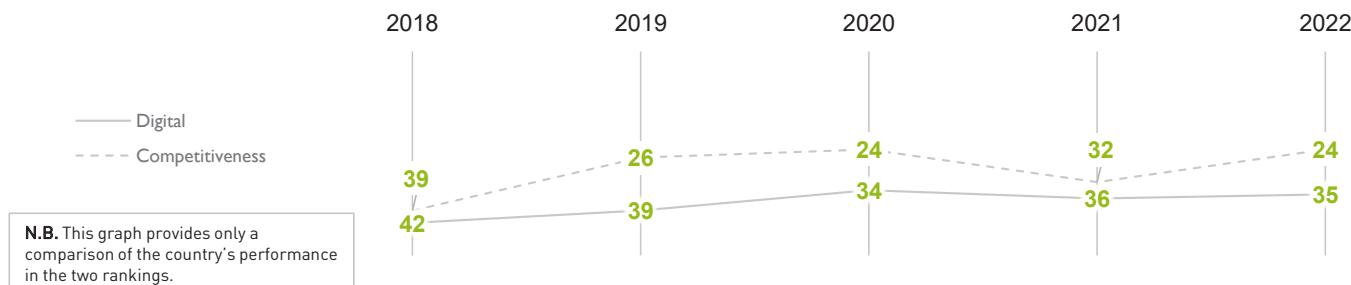
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	42	39	34	36	35
Knowledge	40	39	46	50	37
Technology	50	40	24	24	26
Future readiness	38	38	28	32	37

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS > 20 MILLION (27 countries)



SAUDI ARABIA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	38	20	34	32	28
Training & education	39	38	34	34	24
Scientific concentration	49	59	62	64	58

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
▷ Educational assessment PISA - Math	56	Employee training	14	Total expenditure on R&D (%)	50
► International experience	08	► Total public expenditure on education	03	Total R&D personnel per capita	-
Foreign highly-skilled personnel	10	Higher education achievement	28	Female researchers	-
Management of cities	26	Pupil-teacher ratio (tertiary education)	43	R&D productivity by publication	13
► Digital/Technological skills	07	Graduates in Sciences	40	▷ Scientific and technical employment	54
Net flow of international students	36	Women with degrees	34	High-tech patent grants	46
				▷ Robots in Education and R&D	53

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	50	39	25	30	25
Capital	31	13	05	15	22
Technological framework	56	54	47	35	34

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	22	IT & media stock market capitalization	50	Communications technology	13
Enforcing contracts	36	Funding for technological development	14	Mobile Broadband subscribers	31
Immigration laws	38	Banking and financial services	20	Wireless broadband	18
Development & application of tech.	10	Country credit rating	34	Internet users	10
Scientific research legislation	25	Venture capital	09	Internet bandwidth speed	46
Intellectual property rights	26	Investment in Telecommunications	19	▷ High-tech exports (%)	61

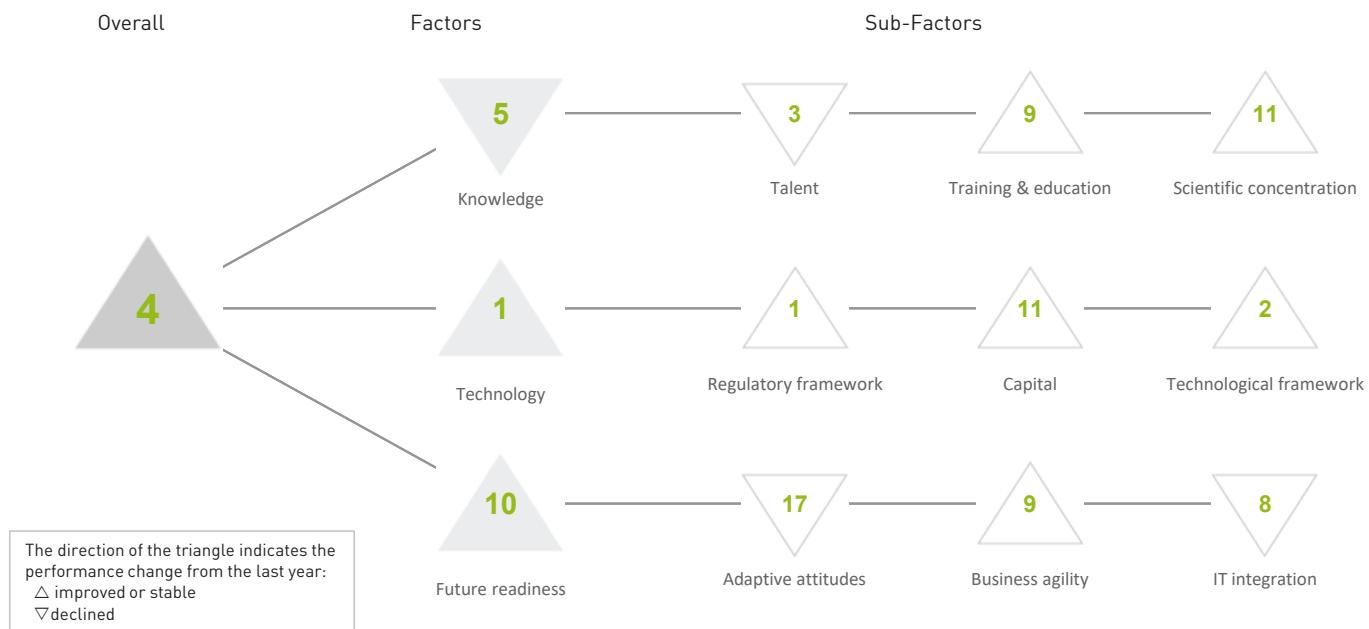
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	43	50	37	46	33
Business agility	48	36	28	35	32
IT integration	33	30	24	24	33

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	50	Opportunities and threats	20	E-Government	38
Internet retailing	48	World robots distribution	50	► Public-private partnerships	09
Tablet possession	31	Agility of companies	20	► Cyber security	02
Smartphone possession	20	Use of big data and analytics	23	Software piracy	38
Attitudes toward globalization	15	Knowledge transfer	23	Government cyber security capacity	21
		Entrepreneurial fear of failure	46	▷ Privacy protection by law content	61

SINGAPORE

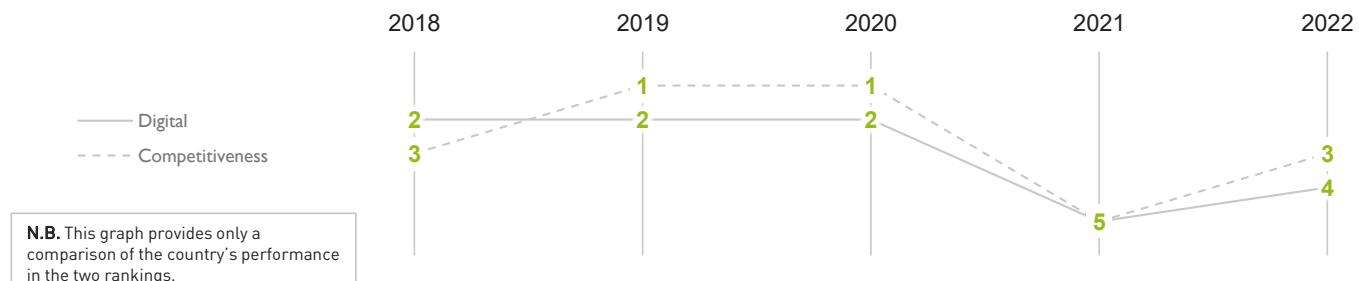
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	02	02	02	05	04
Knowledge	01	03	02	04	05
Technology	01	01	01	03	01
Future readiness	15	11	12	11	10

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (36 countries)



SINGAPORE

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	01	01	01	02	03
Training & education	01	04	07	13	09
Scientific concentration	19	22	10	11	11

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	02	Employee training	24	Total expenditure on R&D (%)	20
International experience	05	▷ Total public expenditure on education	62	Total R&D personnel per capita	14
Foreign highly-skilled personnel	05	▶ Higher education achievement	02	▷ Female researchers	42
Management of cities	04	Pupil-teacher ratio (tertiary education)	25	R&D productivity by publication	39
Digital/Technological skills	09	Graduates in Sciences	04	Scientific and technical employment	27
Net flow of international students	07	Women with degrees	-	▶ High-tech patent grants	01
				Robots in Education and R&D	29

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	02	02	01	05	01
Capital	08	08	11	14	11
Technological framework	01	01	01	02	02

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	03	IT & media stock market capitalization	31	Communications technology	09
▶ Enforcing contracts	01	Funding for technological development	02	Mobile Broadband subscribers	19
▷ Immigration laws	43	Banking and financial services	05	Wireless broadband	12
Development & application of tech.	08	▶ Country credit rating	01	Internet users	24
Scientific research legislation	04	Venture capital	06	▶ Internet bandwidth speed	01
Intellectual property rights	07	▷ Investment in Telecommunications	55	High-tech exports (%)	04

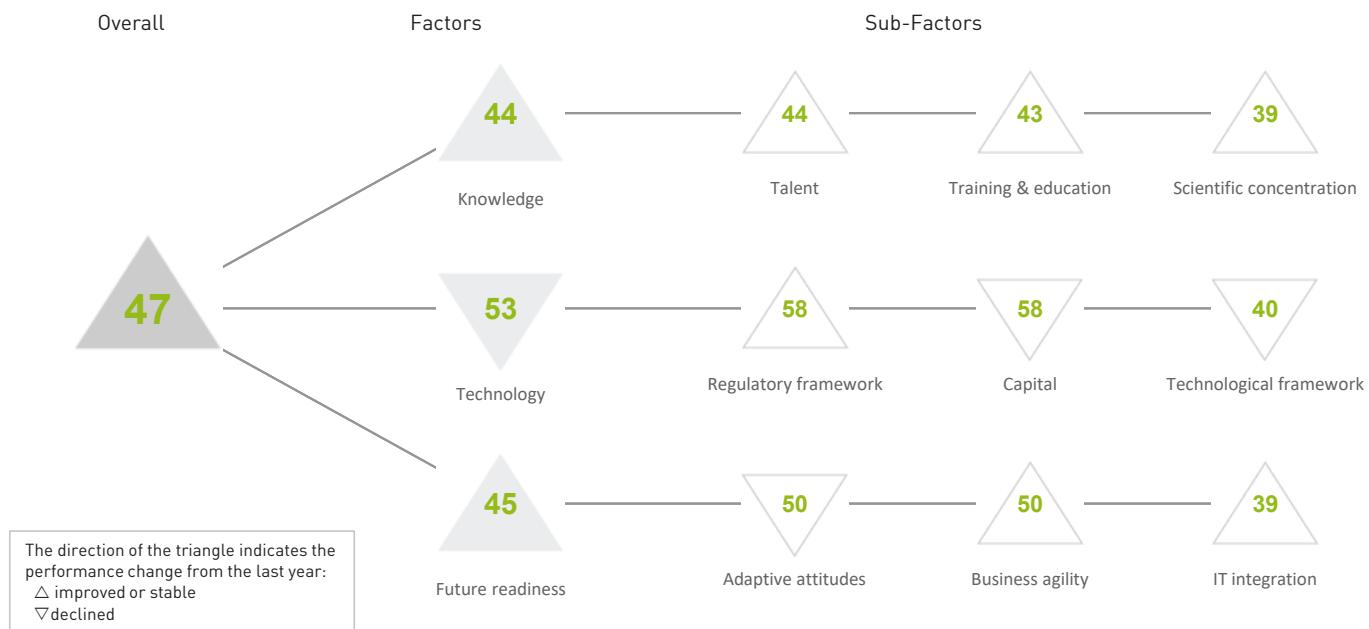
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	20	19	20	11	17
Business agility	18	06	11	12	09
IT integration	03	04	03	07	08

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	06	Opportunities and threats	15	E-Government	11
Internet retailing	26	World robots distribution	14	Public-private partnerships	02
Tablet possession	20	Agility of companies	10	Cyber security	06
Smartphone possession	26	Use of big data and analytics	11	Software piracy	17
Attitudes toward globalization	07	Knowledge transfer	06	Government cyber security capacity	10
		Entrepreneurial fear of failure	-	▷ Privacy protection by law content	50

SLOVAK REPUBLIC

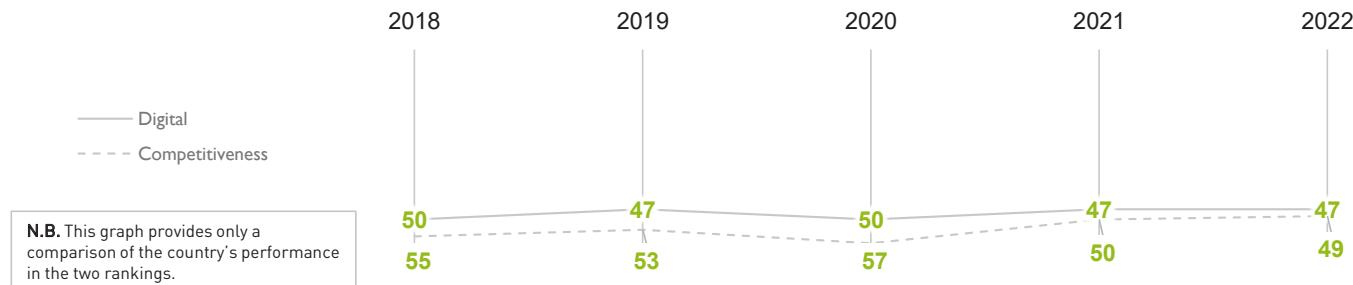
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	50	47	50	47	47
Knowledge	49	48	51	46	44
Technology	47	44	51	45	53
Future readiness	53	47	51	46	45

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



SLOVAK REPUBLIC

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	56	54	53	52	44
Training & education	47	52	52	49	43
Scientific concentration	42	36	38	40	39

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	30	Employee training	46	Total expenditure on R&D (%)	42
International experience	40	Total public expenditure on education	39	Total R&D personnel per capita	33
Foreign highly-skilled personnel	56	Higher education achievement	39	► Female researchers	22
Management of cities	46	► Pupil-teacher ratio (tertiary education)	24	R&D productivity by publication	41
Digital/Technological skills	35	Graduates in Sciences	41	Scientific and technical employment	42
Net flow of international students	54	Women with degrees	40	High-tech patent grants	28
				Robots in Education and R&D	32

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	60	58	61	60	58
Capital	46	43	47	42	58
Technological framework	34	37	38	39	40

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	48	► IT & media stock market capitalization	58	Communications technology	38
Enforcing contracts	34	Funding for technological development	57	Mobile Broadband subscribers	35
► Immigration laws	62	Banking and financial services	48	Wireless broadband	38
► Development & application of tech.	59	Country credit rating	31	Internet users	31
Scientific research legislation	57	Venture capital	56	Internet bandwidth speed	40
Intellectual property rights	56	► Investment in Telecommunications	26	High-tech exports (%)	42

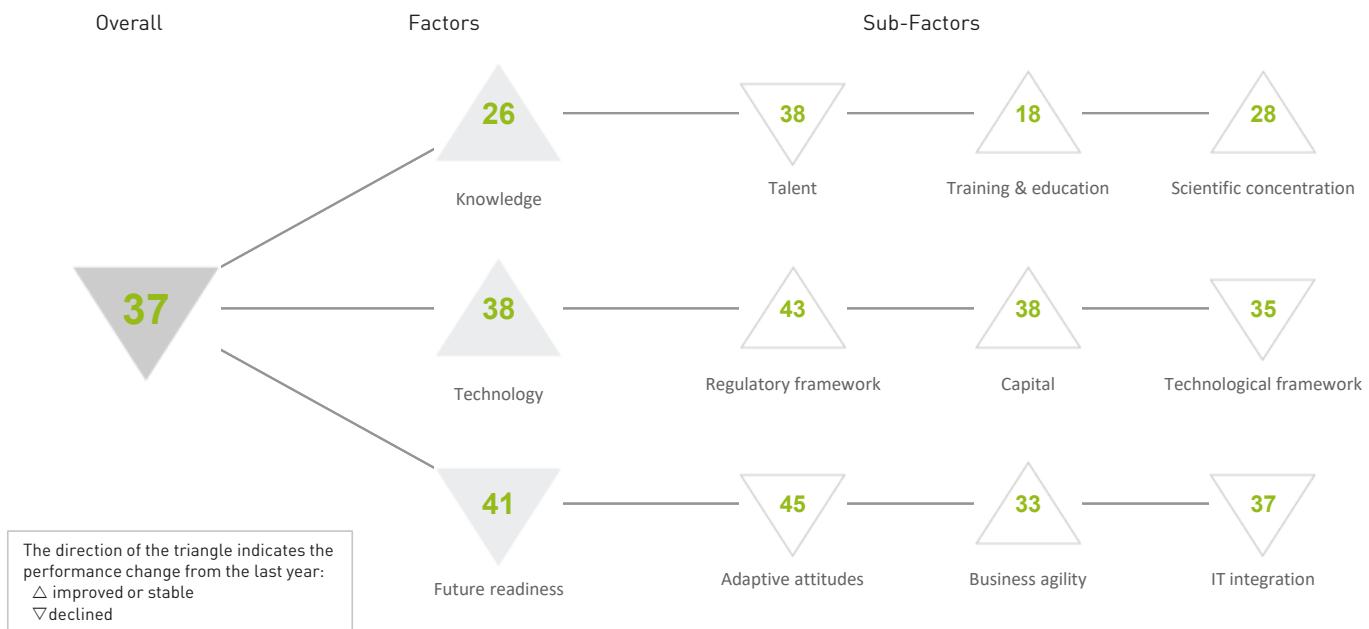
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	51	42	50	49	50
Business agility	58	61	62	60	50
IT integration	45	40	44	40	39

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	52	Opportunities and threats	56	E-Government	42
Internet retailing	32	World robots distribution	28	Public-private partnerships	47
Tablet possession	33	Agility of companies	28	Cyber security	43
Smartphone possession	48	Use of big data and analytics	42	► Software piracy	26
► Attitudes toward globalization	60	► Knowledge transfer	60	Government cyber security capacity	54
		Entrepreneurial fear of failure	30	► Privacy protection by law content	19

SLOVENIA

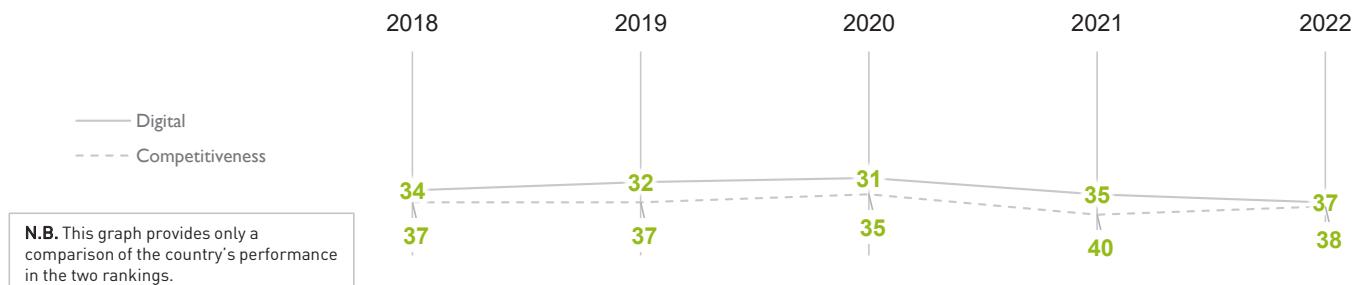
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	34	32	31	35	37
Knowledge	26	27	29	30	26
Technology	38	35	35	39	38
Future readiness	35	36	37	40	41

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



SLOVENIA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	35	33	35	37	38
Training & education	23	22	22	23	18
Scientific concentration	25	25	33	31	28

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
▶ Educational assessment PISA - Math	13	Employee training	26	Total expenditure on R&D (%)	18
International experience	44	Total public expenditure on education	18	Total R&D personnel per capita	17
▷ Foreign highly-skilled personnel	55	Higher education achievement	27	Female researchers	38
Management of cities	30	▶ Pupil-teacher ratio (tertiary education)	12	▷ R&D productivity by publication	57
Digital/Technological skills	25	▶ Graduates in Sciences	16	▶ Scientific and technical employment	10
▷ Net flow of international students	55	Women with degrees	27	High-tech patent grants	23
				Robots in Education and R&D	33

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	42	37	38	45	43
Capital	29	31	28	39	38
Technological framework	45	33	34	33	35

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	24	IT & media stock market capitalization	46	Communications technology	39
Enforcing contracts	53	Funding for technological development	38	▶ Mobile Broadband subscribers	06
▷ Immigration laws	54	Banking and financial services	29	Wireless broadband	40
Development & application of tech.	43	Country credit rating	29	Internet users	40
Scientific research legislation	37	Venture capital	44	Internet bandwidth speed	26
Intellectual property rights	32	Investment in Telecommunications	20	High-tech exports (%)	49

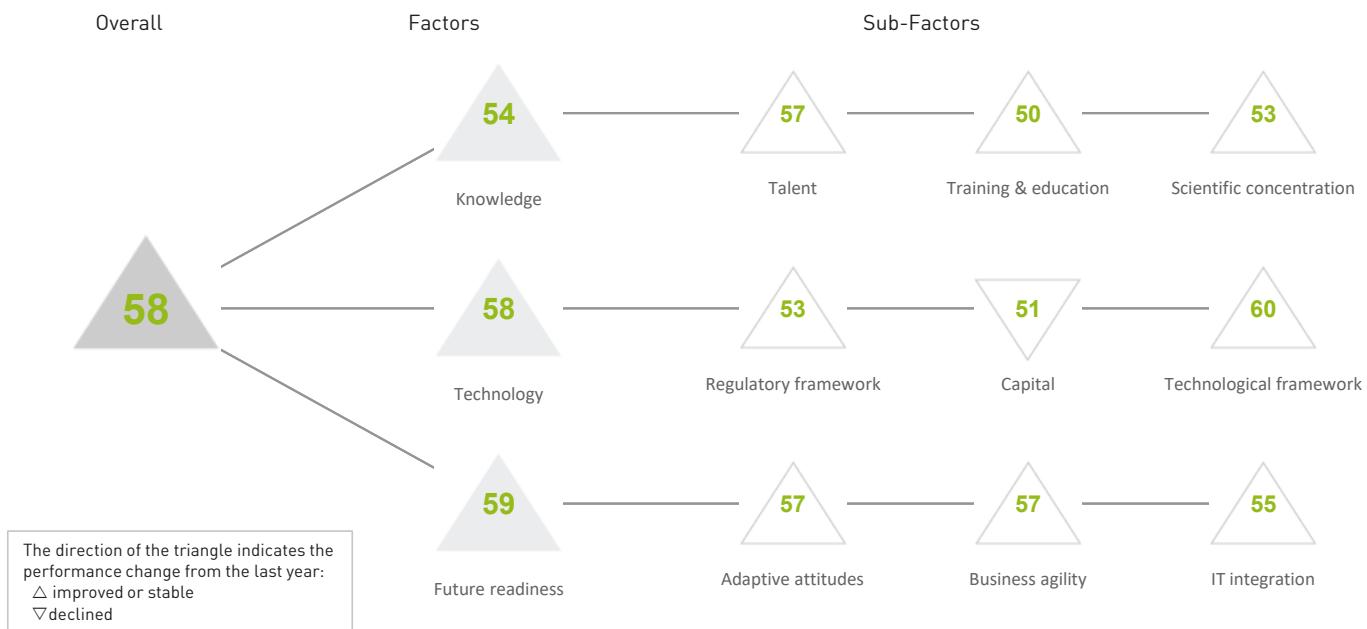
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	44	44	38	41	45
Business agility	30	34	31	40	33
IT integration	29	31	31	35	37

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	27	Opportunities and threats	26	E-Government	22
Internet retailing	37	World robots distribution	34	Public-private partnerships	52
Tablet possession	29	Agility of companies	27	Cyber security	26
Smartphone possession	53	Use of big data and analytics	35	Software piracy	30
Attitudes toward globalization	51	Knowledge transfer	42	▷ Government cyber security capacity	60
		Entrepreneurial fear of failure	19	Privacy protection by law content	17

SOUTH AFRICA

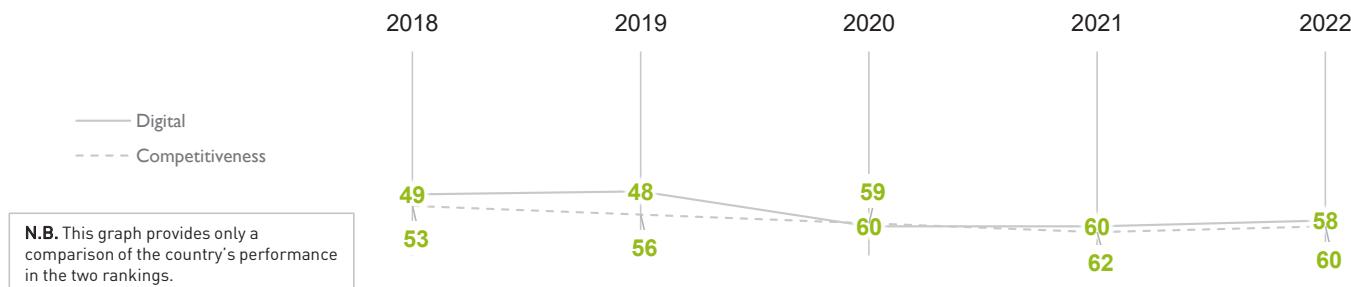
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

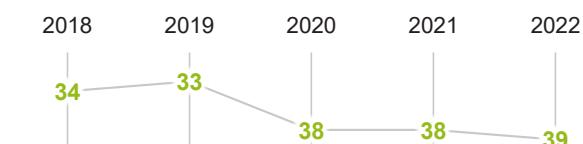
	2018	2019	2020	2021	2022
OVERALL	49	48	60	60	58
Knowledge	52	54	60	62	54
Technology	52	51	55	59	58
Future readiness	43	44	57	59	59

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS > 20 MILLION (27 countries)



SOUTH AFRICA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	54	49	59	58	57
Training & education	54	58	60	62	50
Scientific concentration	47	48	53	53	53

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	-	Employee training	55	Total expenditure on R&D (%)	44
International experience	53	► Total public expenditure on education	02	Total R&D personnel per capita	49
Foreign highly-skilled personnel	44	▷ Higher education achievement	60	► Female researchers	15
▷ Management of cities	61	Pupil-teacher ratio (tertiary education)	37	► R&D productivity by publication	25
Digital/Technological skills	56	Graduates in Sciences	56	Scientific and technical employment	-
Net flow of international students	34	Women with degrees	54	High-tech patent grants	56
				Robots in Education and R&D	40

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	53	53	56	59	53
Capital	27	30	32	36	51
Technological framework	58	59	57	61	60

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	58	► IT & media stock market capitalization	07	Communications technology	59
Enforcing contracts	50	Funding for technological development	58	▷ Mobile Broadband subscribers	61
Immigration laws	55	Banking and financial services	54	Wireless broadband	42
Development & application of tech.	54	Country credit rating	56	▷ Internet users	61
Scientific research legislation	40	Venture capital	60	Internet bandwidth speed	54
Intellectual property rights	45	Investment in Telecommunications	30	High-tech exports (%)	55

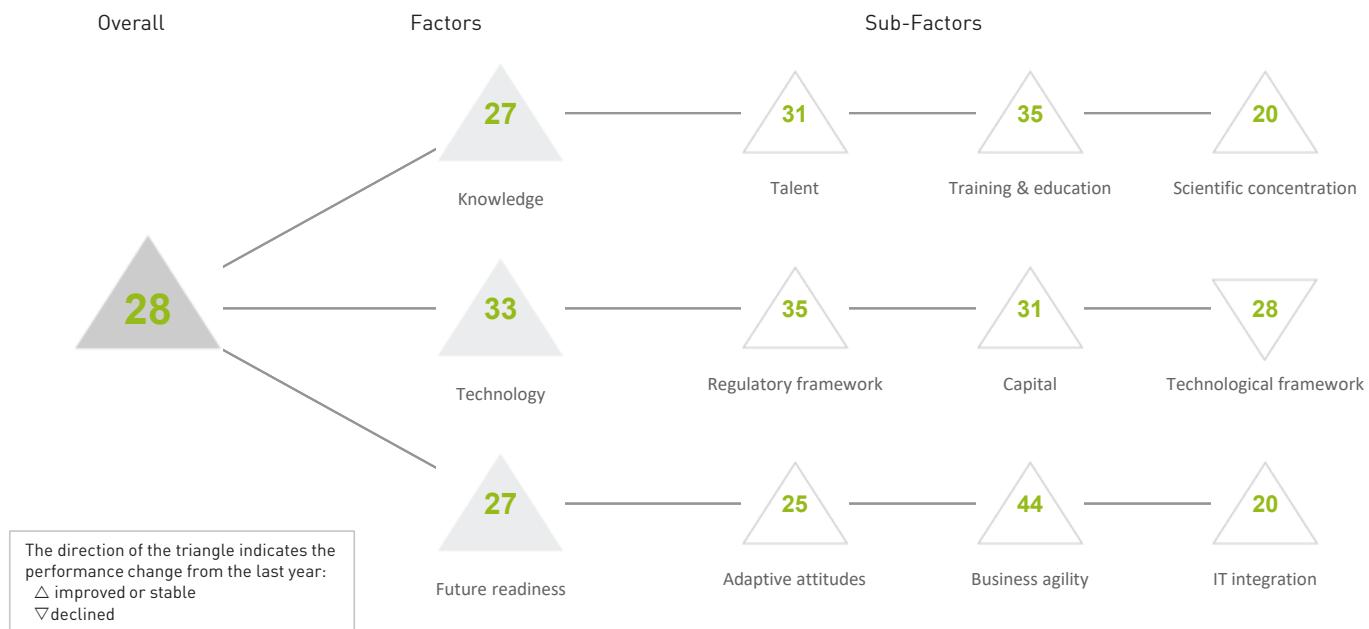
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	56	55	59	59	57
Business agility	38	40	58	59	57
IT integration	39	42	50	55	55

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	44	Opportunities and threats	55	E-Government	55
Internet retailing	56	World robots distribution	32	Public-private partnerships	59
Tablet possession	56	▷ Agility of companies	61	Cyber security	56
Smartphone possession	37	Use of big data and analytics	27	► Software piracy	20
Attitudes toward globalization	47	Knowledge transfer	48	Government cyber security capacity	46
		Entrepreneurial fear of failure	45	Privacy protection by law content	49

SPAIN

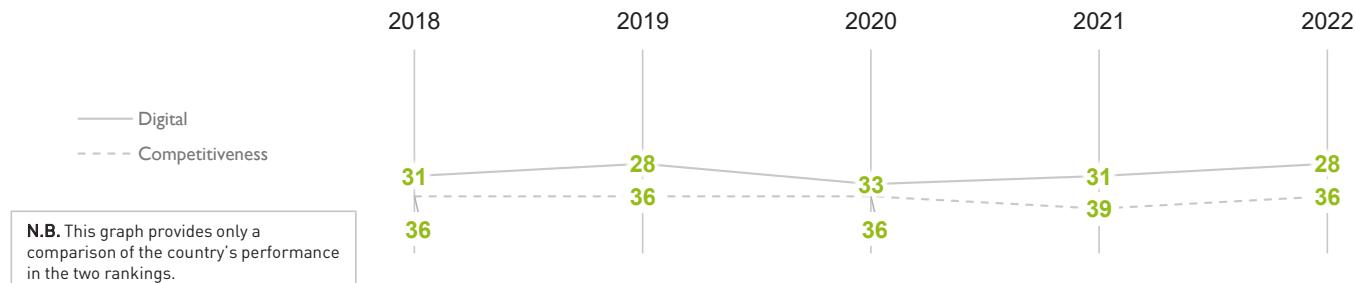
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	31	28	33	31	28
Knowledge	31	28	32	31	27
Technology	33	29	33	33	33
Future readiness	30	27	40	35	27

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS > 20 MILLION (27 countries)



SPAIN

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	32	29	32	31	31
Training & education	40	40	42	40	35
Scientific concentration	27	20	20	23	20

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	32	Employee training	50	Total expenditure on R&D (%)	31
▷ International experience	46	Total public expenditure on education	38	Total R&D personnel per capita	28
Foreign highly-skilled personnel	23	Higher education achievement	24	Female researchers	21
Management of cities	25	Pupil-teacher ratio (tertiary education)	19	► R&D productivity by publication	09
Digital/Technological skills	30	Graduates in Sciences	39	Scientific and technical employment	23
Net flow of international students	31	Women with degrees	28	High-tech patent grants	40
				► Robots in Education and R&D	09

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	36	34	36	37	35
Capital	37	33	34	34	31
Technological framework	29	23	27	24	28

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	40	IT & media stock market capitalization	21	Communications technology	17
Enforcing contracts	22	Funding for technological development	43	Mobile Broadband subscribers	38
Immigration laws	20	Banking and financial services	38	Wireless broadband	33
Development & application of tech.	35	Country credit rating	37	Internet users	17
▷ Scientific research legislation	54	Venture capital	28	Internet bandwidth speed	15
Intellectual property rights	31	Investment in Telecommunications	17	▷ High-tech exports (%)	50

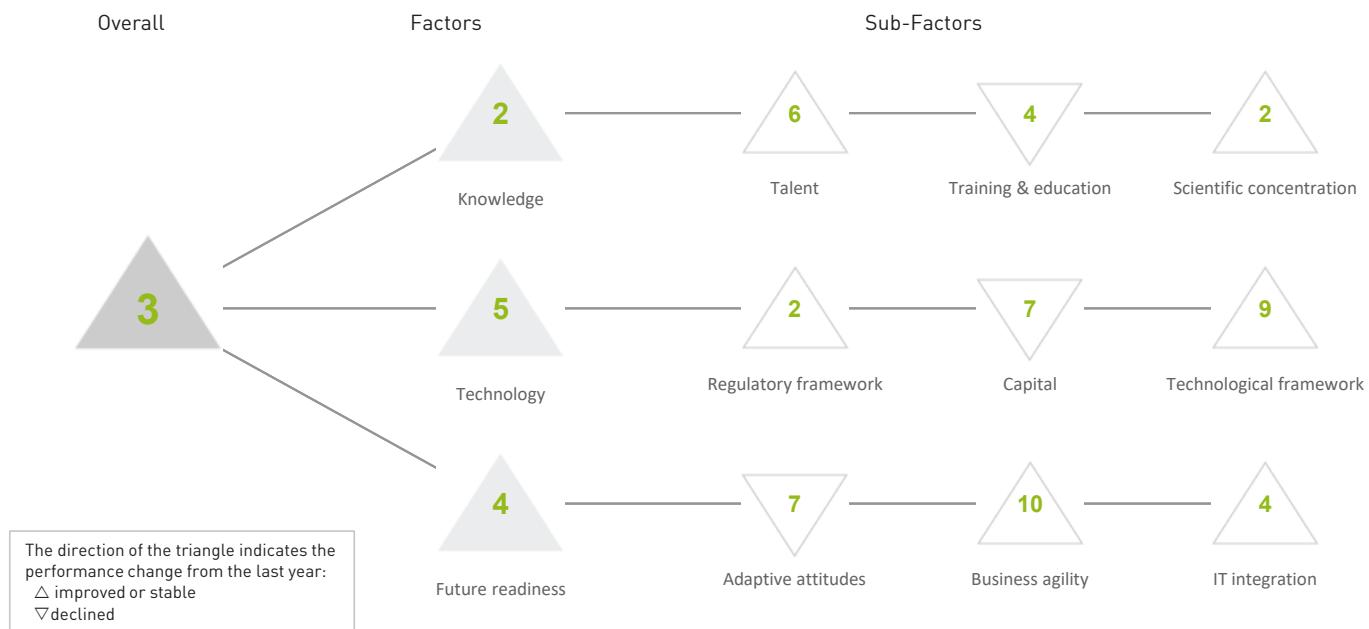
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	26	25	35	33	25
Business agility	44	38	48	49	44
IT integration	27	25	30	29	20

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	33	Opportunities and threats	44	E-Government	17
Internet retailing	28	▷ World robots distribution	10	Public-private partnerships	25
Tablet possession	27	Agility of companies	32	Cyber security	39
► Smartphone possession	07	▷ Use of big data and analytics	55	Software piracy	32
Attitudes toward globalization	33	Knowledge transfer	46	► Government cyber security capacity	12
		Entrepreneurial fear of failure	41	Privacy protection by law content	13

SWEDEN

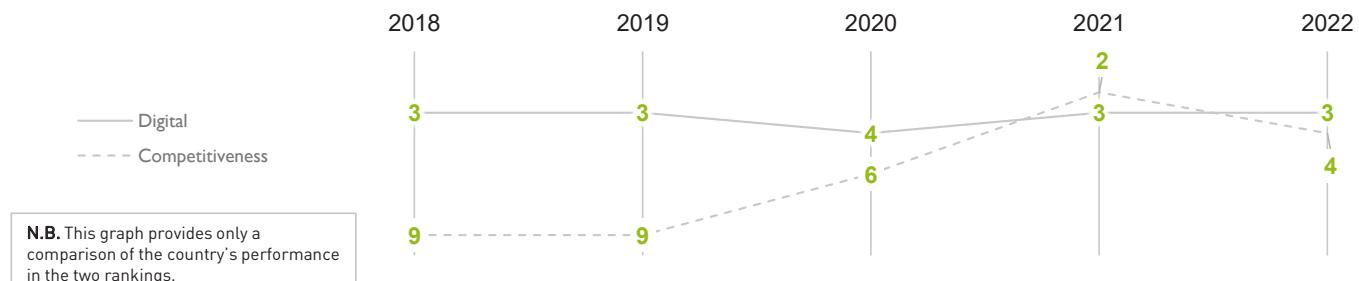
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	03	03	04	03	03
Knowledge	07	04	04	02	02
Technology	05	07	06	08	05
Future readiness	05	06	07	06	04

COMPETITIVENESS & DIGITAL RANKINGS

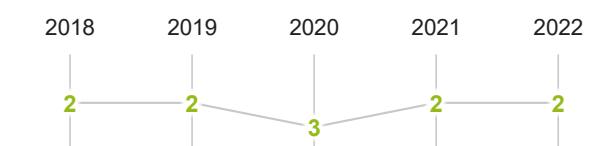


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



SWEDEN

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	10	08	09	07	06
Training & education	05	02	02	02	04
Scientific concentration	03	03	06	04	02

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	16	Employee training	07	Total expenditure on R&D (%)	04
International experience	03	Total public expenditure on education	05	Total R&D personnel per capita	08
Foreign highly-skilled personnel	17	Higher education achievement	22	▷ Female researchers	39
Management of cities	11	Pupil-teacher ratio (tertiary education)	20	▷ R&D productivity by publication	38
Digital/Technological skills	04	Graduates in Sciences	19	▶ Scientific and technical employment	02
Net flow of international students	22	Women with degrees	13	High-tech patent grants	08
				Robots in Education and R&D	20

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	12	05	05	03	02
Capital	10	04	04	05	07
Technological framework	07	12	11	13	09

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	23	IT & media stock market capitalization	25	Communications technology	04
Enforcing contracts	30	Funding for technological development	05	Mobile Broadband subscribers	13
Immigration laws	17	Banking and financial services	03	Wireless broadband	24
Development & application of tech.	03	▶ Country credit rating	01	Internet users	09
▶ Scientific research legislation	02	▶ Venture capital	01	Internet bandwidth speed	10
Intellectual property rights	04	▷ Investment in Telecommunications	49	▷ High-tech exports (%)	30

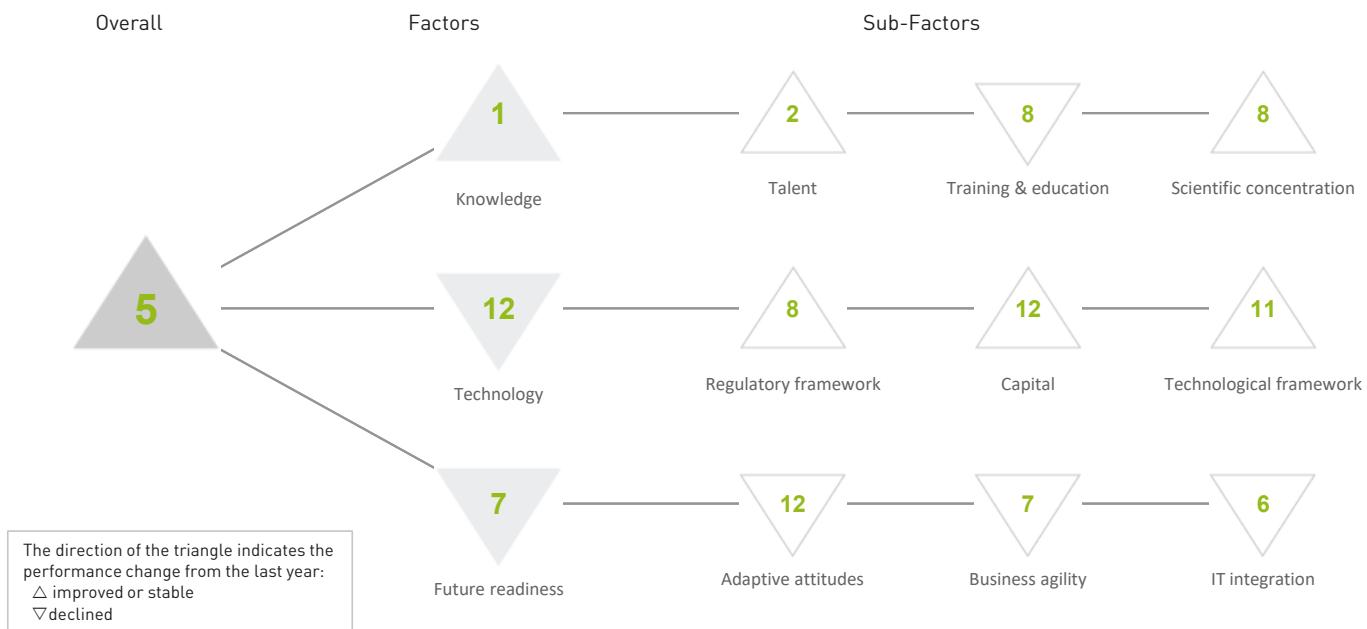
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	09	08	08	05	07
Business agility	10	13	10	13	10
IT integration	11	12	04	05	04

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	34	Opportunities and threats	07	E-Government	06
Internet retailing	11	World robots distribution	21	Public-private partnerships	11
Tablet possession	04	Agility of companies	07	Cyber security	13
Smartphone possession	29	Use of big data and analytics	14	Software piracy	06
▶ Attitudes toward globalization	01	Knowledge transfer	03	Government cyber security capacity	17
		▷ Entrepreneurial fear of failure	22	Privacy protection by law content	06

SWITZERLAND

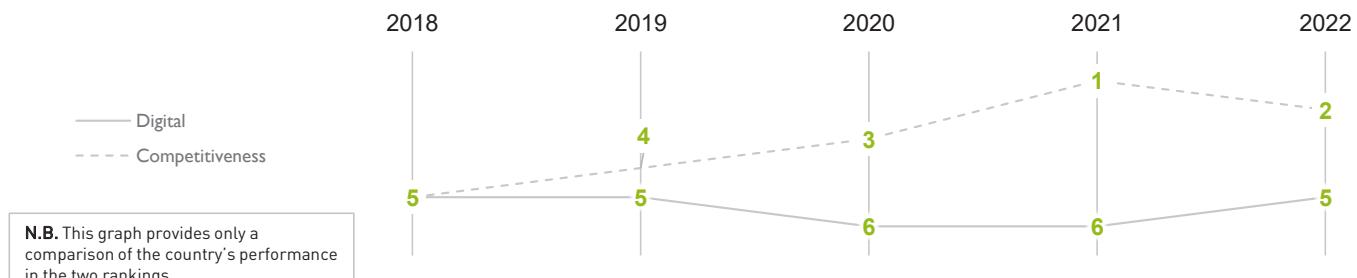
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	05	05	06	06	05
Knowledge	06	02	03	01	01
Technology	09	10	11	11	12
Future readiness	10	10	05	03	07

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



SWITZERLAND

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	02	02	02	03	02
Training & education	15	15	14	07	08
Scientific concentration	06	07	09	08	08

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	10	Employee training	02	Total expenditure on R&D (%)	09
▶ International experience	01	Total public expenditure on education	19	Total R&D personnel per capita	04
▶ Foreign highly-skilled personnel	01	Higher education achievement	17	Female researchers	31
Management of cities	05	Pupil-teacher ratio (tertiary education)	06	▷ R&D productivity by publication	35
Digital/Technological skills	18	Graduates in Sciences	26	Scientific and technical employment	05
Net flow of international students	09	Women with degrees	30	High-tech patent grants	27
				Robots in Education and R&D	13

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	15	14	10	09	08
Capital	15	16	14	12	12
Technological framework	08	09	14	11	11

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	36	▷ IT & media stock market capitalization	49	Communications technology	07
▷ Enforcing contracts	40	Funding for technological development	09	Mobile Broadband subscribers	11
Immigration laws	21	Banking and financial services	06	▷ Wireless broadband	42
Development & application of tech.	04	▶ Country credit rating	01	Internet users	11
▶ Scientific research legislation	01	Venture capital	11	Internet bandwidth speed	02
Intellectual property rights	02	Investment in Telecommunications	23	▷ High-tech exports (%)	33

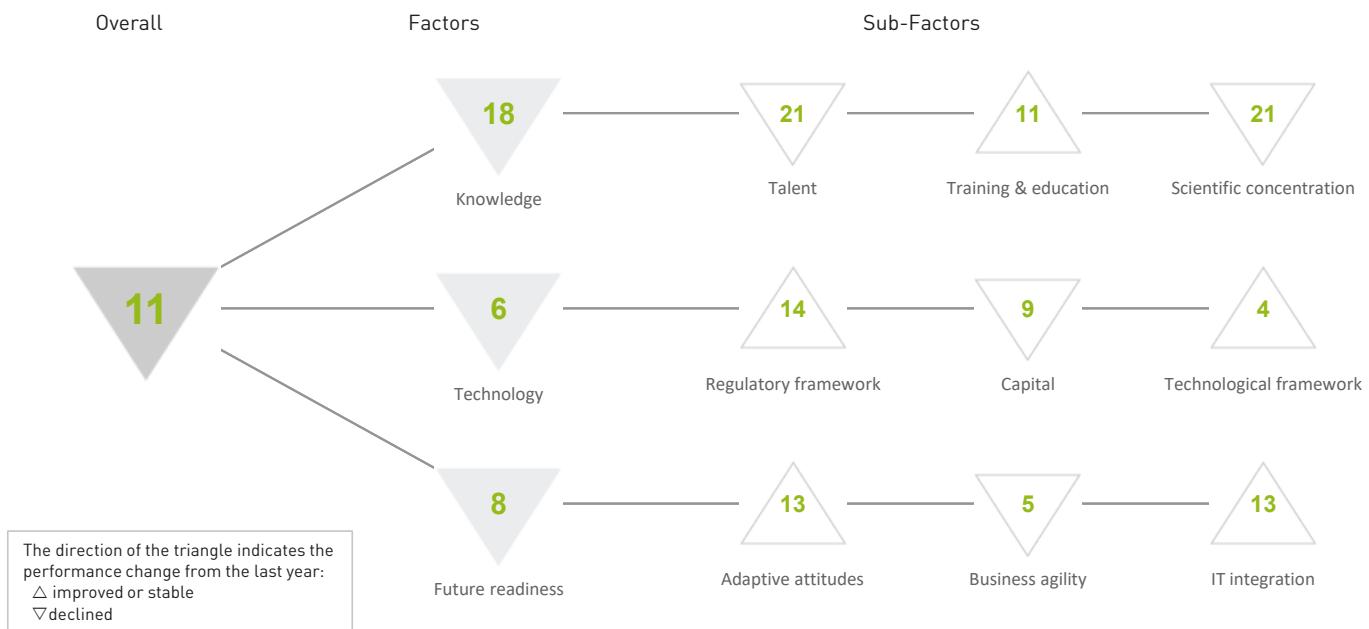
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	12	11	09	10	12
Business agility	07	14	06	04	07
IT integration	16	07	07	04	06

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	18	Opportunities and threats	08	E-Government	16
Internet retailing	10	World robots distribution	24	Public-private partnerships	07
Tablet possession	09	Agility of companies	09	Cyber security	15
Smartphone possession	26	Use of big data and analytics	25	Software piracy	10
Attitudes toward globalization	23	▶ Knowledge transfer	01	Government cyber security capacity	27
		Entrepreneurial fear of failure	05	Privacy protection by law content	03

TAIWAN, CHINA

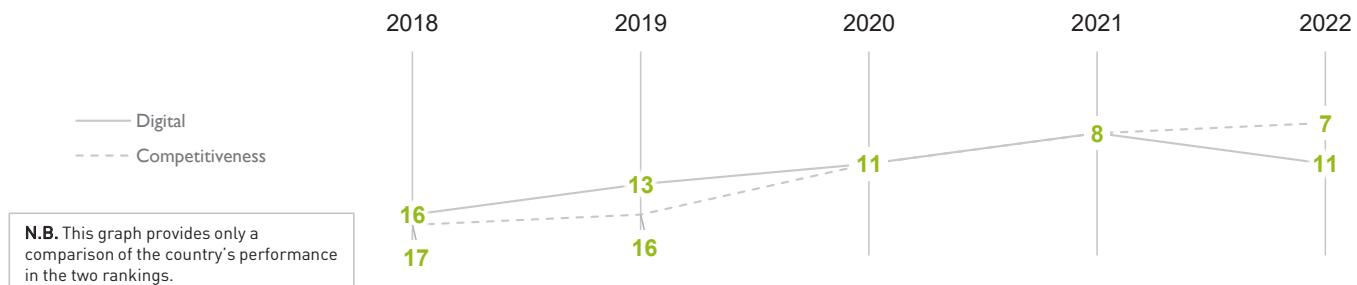
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	16	13	11	08	11
Knowledge	19	17	18	16	18
Technology	11	09	05	02	06
Future readiness	22	12	08	07	08

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



TAIWAN, CHINA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	25	21	18	17	21
Training & education	25	20	21	12	11
Scientific concentration	13	15	18	19	21

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	04	Employee training	06	Total expenditure on R&D (%)	03
International experience	27	▷ Total public expenditure on education	52	► Total R&D personnel per capita	01
Foreign highly-skilled personnel	43	Higher education achievement	03	▷ Female researchers	52
Management of cities	18	▷ Pupil-teacher ratio (tertiary education)	50	R&D productivity by publication	33
Digital/Technological skills	33	Graduates in Sciences	05	▷ Scientific and technical employment	45
Net flow of international students	11	Women with degrees	18	High-tech patent grants	20
				Robots in Education and R&D	19

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	21	23	16	16	14
Capital	13	12	08	02	09
Technological framework	10	04	04	04	04

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	10	► IT & media stock market capitalization	01	Communications technology	22
Enforcing contracts	11	Funding for technological development	16	► Mobile Broadband subscribers	01
Immigration laws	34	Banking and financial services	10	Wireless broadband	13
Development & application of tech.	17	Country credit rating	16	Internet users	21
Scientific research legislation	10	Venture capital	13	Internet bandwidth speed	20
Intellectual property rights	19	▷ Investment in Telecommunications	57	► High-tech exports (%)	03

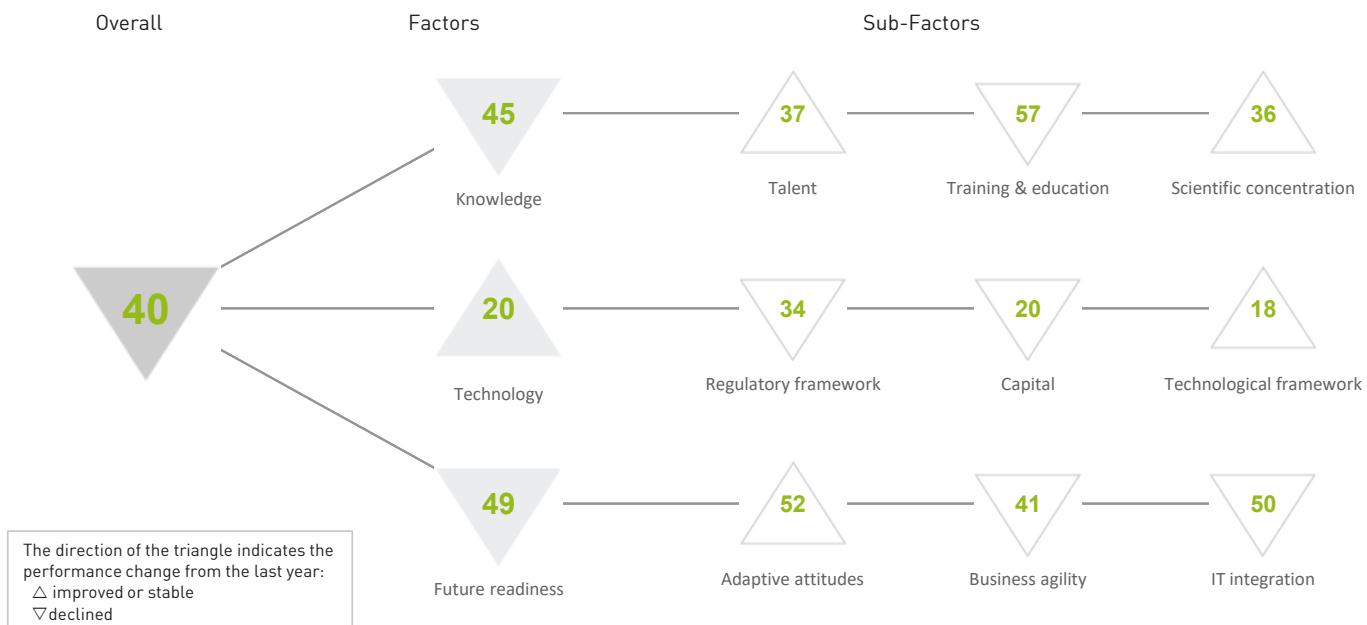
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	28	14	14	13	13
Business agility	13	03	01	02	05
IT integration	23	24	17	15	13

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	-	Opportunities and threats	05	E-Government	-
Internet retailing	22	World robots distribution	07	Public-private partnerships	13
Tablet possession	25	Agility of companies	03	Cyber security	09
Smartphone possession	05	► Use of big data and analytics	02	Software piracy	25
Attitudes toward globalization	05	Knowledge transfer	10	Government cyber security capacity	09
		Entrepreneurial fear of failure	18	Privacy protection by law content	40

THAILAND

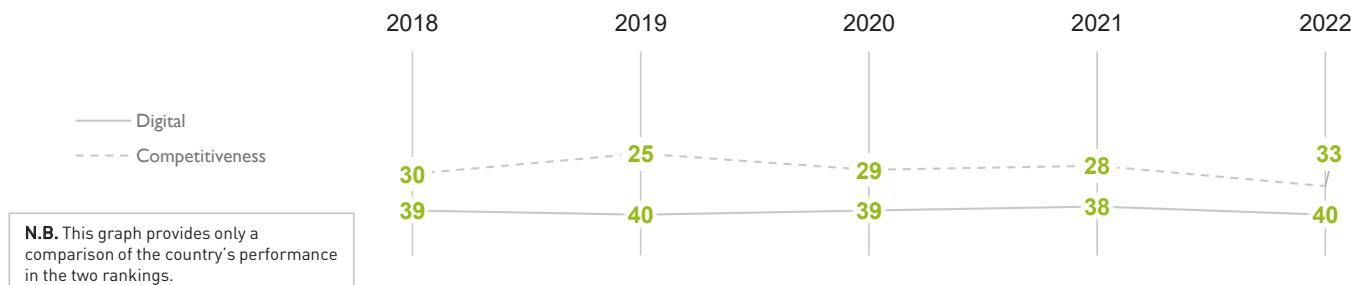
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	39	40	39	38	40
Knowledge	44	43	43	42	45
Technology	28	27	22	22	20
Future readiness	49	50	45	44	49

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



THAILAND

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	42	40	36	39	37
Training & education	44	50	55	56	57
Scientific concentration	45	35	37	36	36

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	46	Employee training	20	Total expenditure on R&D (%)	33
International experience	19	Total public expenditure on education	50	Total R&D personnel per capita	39
Foreign highly-skilled personnel	25	Higher education achievement	45	▶ Female researchers	06
Management of cities	29	▷ Pupil-teacher ratio (tertiary education)	55	R&D productivity by publication	30
Digital/Technological skills	45	Graduates in Sciences	37	▷ Scientific and technical employment	55
Net flow of international students	40	Women with degrees	48	High-tech patent grants	31
				Robots in Education and R&D	17

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	34	33	31	29	34
Capital	28	21	17	19	20
Technological framework	23	29	25	22	18

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	26	IT & media stock market capitalization	17	Communications technology	15
Enforcing contracts	28	Funding for technological development	40	Mobile Broadband subscribers	25
Immigration laws	32	Banking and financial services	23	Wireless broadband	27
Development & application of tech.	39	Country credit rating	41	Internet users	44
Scientific research legislation	39	Venture capital	32	▶ Internet bandwidth speed	14
Intellectual property rights	43	▷ Investment in Telecommunications	07	▶ High-tech exports (%)	11

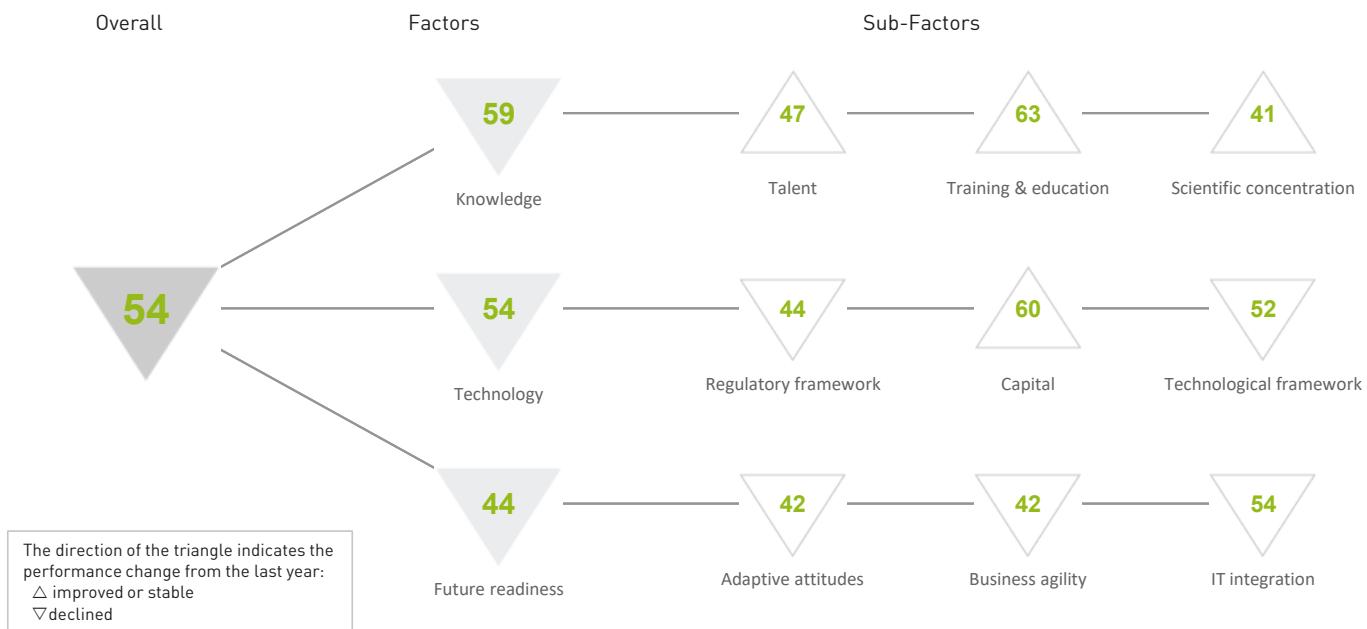
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	55	58	53	53	52
Business agility	34	30	44	34	41
IT integration	55	51	43	43	50

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	40	Opportunities and threats	27	E-Government	49
Internet retailing	50	▷ World robots distribution	11	Public-private partnerships	26
▷ Tablet possession	57	Agility of companies	37	Cyber security	38
Smartphone possession	39	Use of big data and analytics	28	▶ Software piracy	56
Attitudes toward globalization	14	Knowledge transfer	33	▷ Government cyber security capacity	57
		Entrepreneurial fear of failure	50	Privacy protection by law content	43

TURKEY

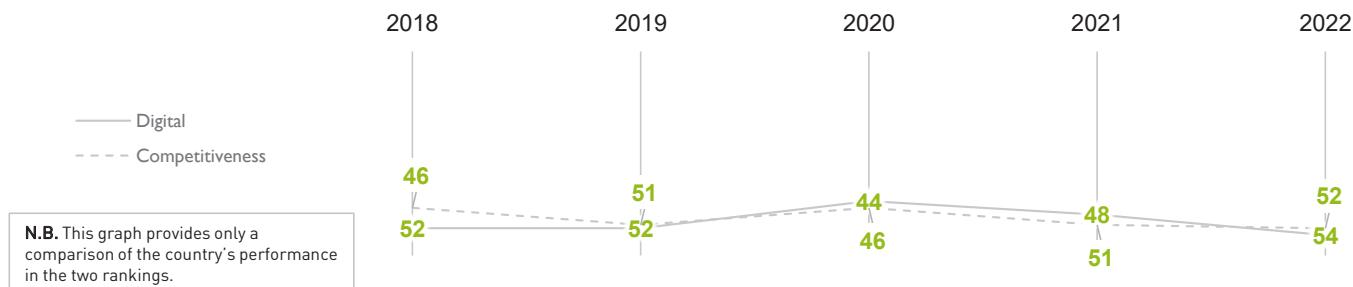
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	52	52	44	48	54
Knowledge	59	60	56	57	59
Technology	45	48	42	52	54
Future readiness	42	41	34	41	44

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS > 20 MILLION (27 countries)



TURKEY

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	49	52	38	49	47
Training & education	62	63	62	63	63
Scientific concentration	48	43	45	41	41

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	38	▷ Employee training	63	Total expenditure on R&D (%)	39
International experience	43	Total public expenditure on education	24	Total R&D personnel per capita	41
Foreign highly-skilled personnel	52	Higher education achievement	43	Female researchers	30
Management of cities	50	▷ Pupil-teacher ratio (tertiary education)	59	▶ R&D productivity by publication	11
Digital/Technological skills	50	Graduates in Sciences	55	Scientific and technical employment	41
Net flow of international students	26	Women with degrees	51	High-tech patent grants	53
				Robots in Education and R&D	27

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	37	38	34	41	44
Capital	41	56	51	60	60
Technological framework	51	50	51	48	52

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	35	IT & media stock market capitalization	37	Communications technology	54
▶ Enforcing contracts	20	Funding for technological development	55	▶ Mobile Broadband subscribers	17
Immigration laws	50	Banking and financial services	51	Wireless broadband	54
Development & application of tech.	51	▷ Country credit rating	60	Internet users	46
Scientific research legislation	45	Venture capital	55	▷ Internet bandwidth speed	60
Intellectual property rights	59	Investment in Telecommunications	48	High-tech exports (%)	59

FUTURE READINESS

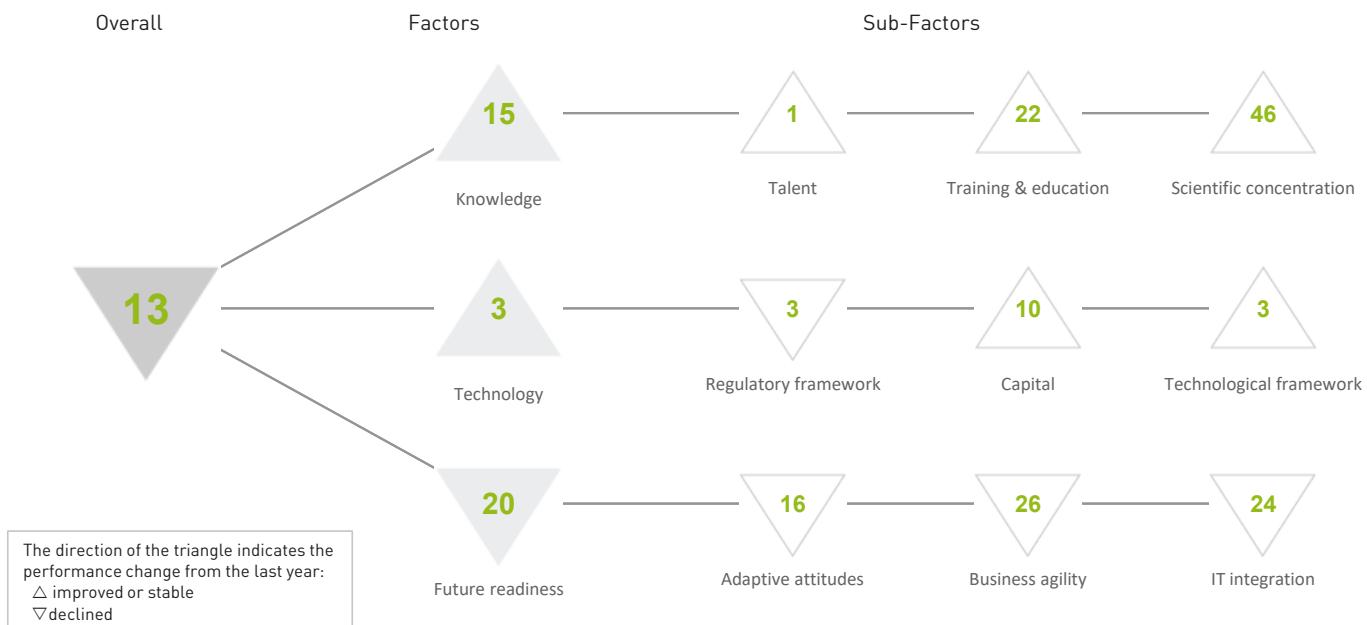
Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	42	38	32	34	42
Business agility	42	44	20	29	42
IT integration	50	48	42	47	54

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
▶ E-Participation	22	Opportunities and threats	47	E-Government	46
Internet retailing	42	World robots distribution	18	Public-private partnerships	48
Tablet possession	44	Agility of companies	46	Cyber security	49
Smartphone possession	26	Use of big data and analytics	40	Software piracy	49
▷ Attitudes toward globalization	59	Knowledge transfer	51	Government cyber security capacity	41
		▶ Entrepreneurial fear of failure	16	Privacy protection by law content	54

DIGITAL TRENDS - OVERALL

UAE

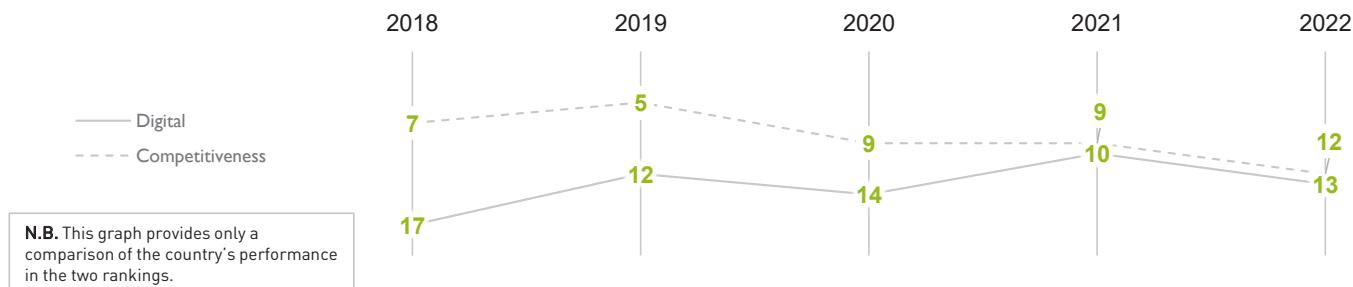
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	17	12	14	10	13
Knowledge	36	35	31	18	15
Technology	07	02	04	05	03
Future readiness	12	09	11	12	20

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS < 20 MILLION (36 countries)



- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	04	05	05	01	01
Training & education	53	41	44	25	22
Scientific concentration	56	56	52	52	46

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	43	Employee training	28	Total expenditure on R&D [%]	29
International experience	04	▷ Total public expenditure on education	49	Total R&D personnel per capita	32
Foreign highly-skilled personnel	03	Higher education achievement	12	Female researchers	37
▶ Management of cities	01	Pupil-teacher ratio (tertiary education)	42	▷ R&D productivity by publication	50
Digital/Technological skills	16	Graduates in Sciences	08	Scientific and technical employment	24
▶ Net flow of international students	01	Women with degrees	14	High-tech patent grants	26
				Robots in Education and R&D	43

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	03	01	03	02	03
Capital	11	02	10	11	10
Technological framework	16	05	08	05	03

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	08	IT & media stock market capitalization	14	Communications technology	28
Enforcing contracts	09	Funding for technological development	11	Mobile Broadband subscribers	03
▶ Immigration laws	01	Banking and financial services	26	▶ Wireless broadband	01
Development & application of tech.	05	Country credit rating	19	▶ Internet users	01
Scientific research legislation	15	Venture capital	17	Internet bandwidth speed	29
Intellectual property rights	39	Investment in Telecommunications	25	▷ High-tech exports (%)	56

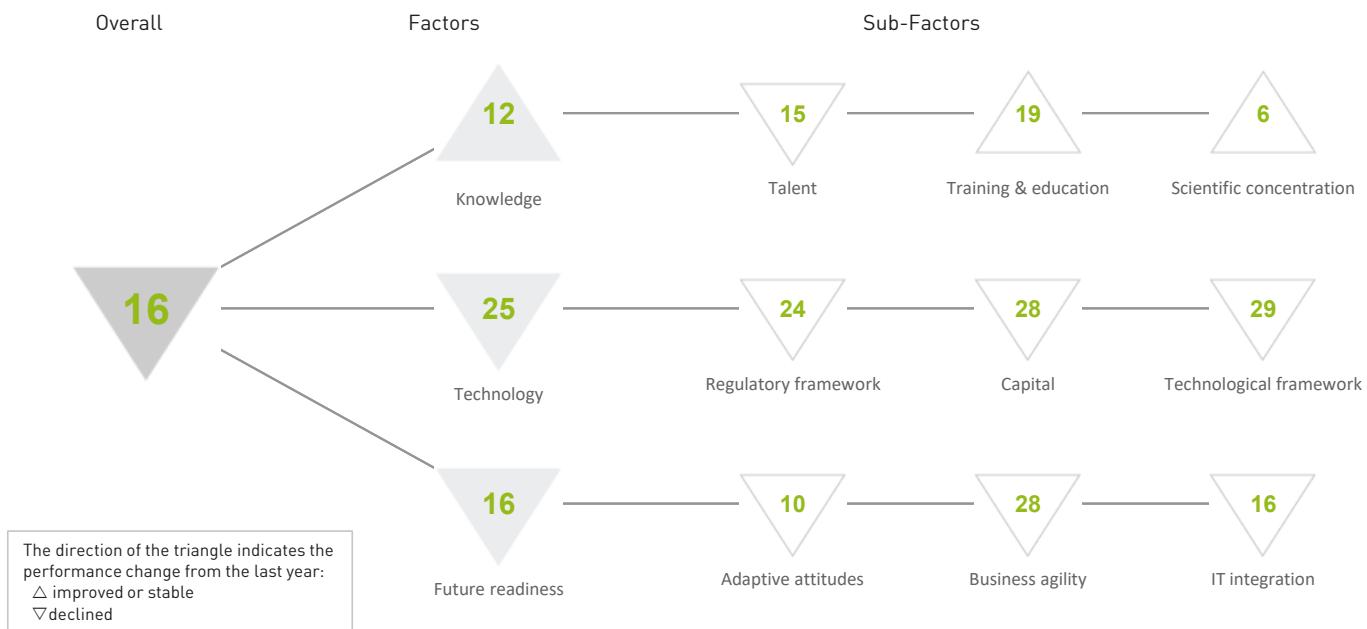
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	21	20	15	15	16
Business agility	01	04	12	10	26
IT integration	14	08	08	10	24

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	16	Opportunities and threats	23	E-Government	21
Internet retailing	31	▷ World robots distribution	51	Public-private partnerships	10
Tablet possession	11	Agility of companies	08	Cyber security	05
Smartphone possession	10	Use of big data and analytics	20	Software piracy	20
Attitudes toward globalization	09	Knowledge transfer	21	Government cyber security capacity	07
		Entrepreneurial fear of failure	38	▷ Privacy protection by law content	62

UNITED KINGDOM

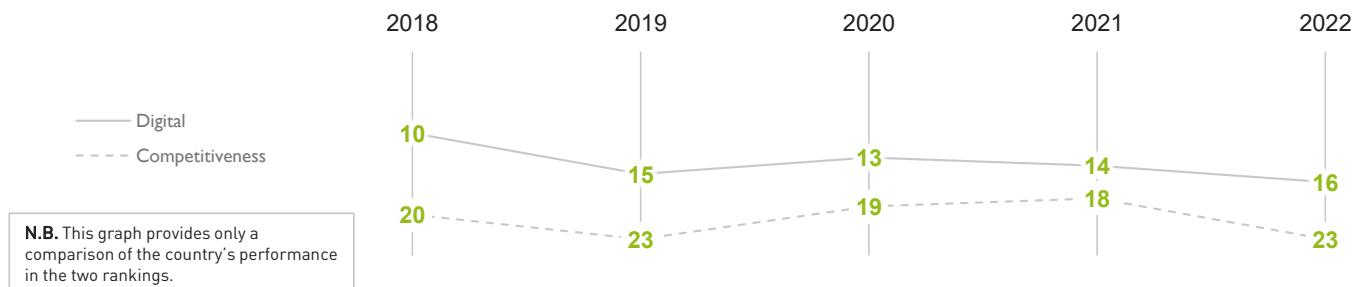
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	10	15	13	14	16
Knowledge	10	14	13	13	12
Technology	13	18	16	17	25
Future readiness	03	13	13	13	16

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)



POPULATIONS > 20 MILLION (27 countries)



UNITED KINGDOM

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	09	17	10	11	15
Training & education	20	23	25	26	19
Scientific concentration	08	08	08	07	06

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	17	Employee training	37	Total expenditure on R&D (%)	23
International experience	33	Total public expenditure on education	22	Total R&D personnel per capita	19
Foreign highly-skilled personnel	18	Higher education achievement	14	Female researchers	24
Management of cities	28	Pupil-teacher ratio (tertiary education)	34	► R&D productivity by publication	06
Digital/Technological skills	24	Graduates in Sciences	22	Scientific and technical employment	07
► Net flow of international students	04	Women with degrees	15	High-tech patent grants	21
				► Robots in Education and R&D	06

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	07	18	17	20	24
Capital	17	22	22	18	28
Technological framework	17	18	22	19	29

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	09	IT & media stock market capitalization	32	Communications technology	40
Enforcing contracts	26	Funding for technological development	21	Mobile Broadband subscribers	16
Immigration laws	40	Banking and financial services	28	Wireless broadband	26
Development & application of tech.	27	Country credit rating	20	Internet users	36
Scientific research legislation	21	Venture capital	20	Internet bandwidth speed	37
Intellectual property rights	27	▷ Investment in Telecommunications	50	High-tech exports (%)	15

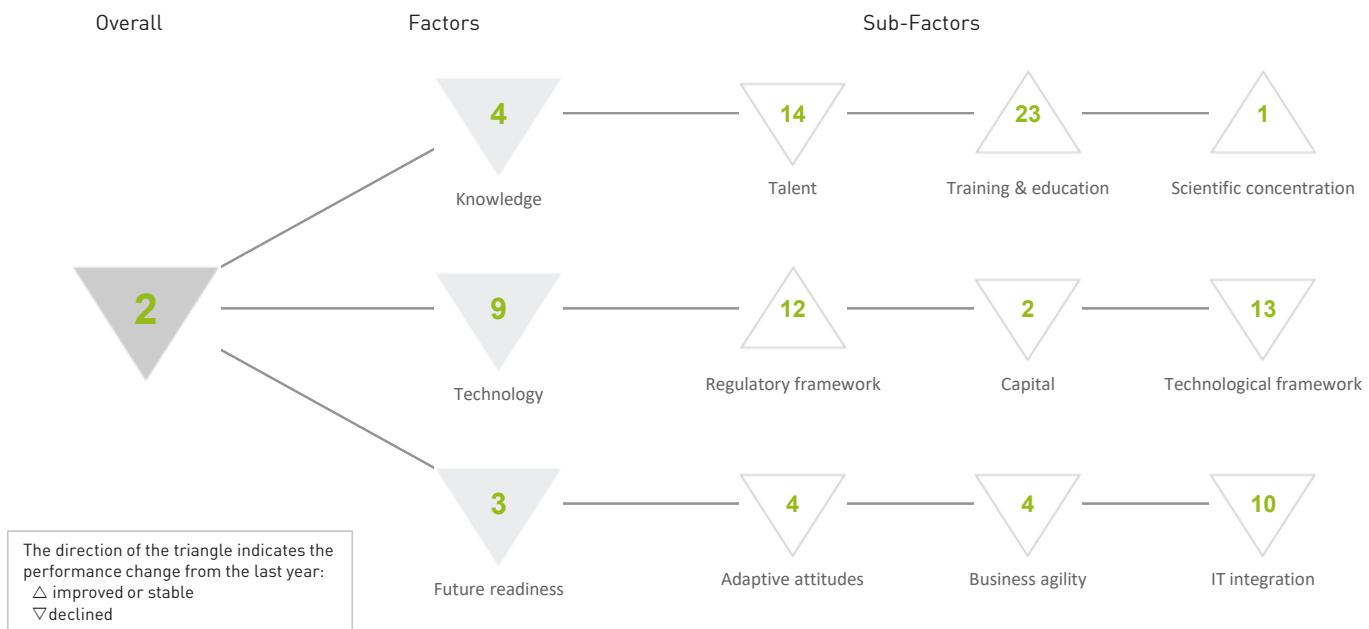
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	04	10	11	09	10
Business agility	16	26	25	23	28
IT integration	02	14	11	09	16

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
► E-Participation	06	Opportunities and threats	32	E-Government	07
► Internet retailing	03	World robots distribution	15	Public-private partnerships	21
Tablet possession	17	Agility of companies	25	Cyber security	22
▷ Smartphone possession	45	Use of big data and analytics	19	Software piracy	10
▷ Attitudes toward globalization	45	Knowledge transfer	19	Government cyber security capacity	22
		▷ Entrepreneurial fear of failure	43	▷ Privacy protection by law content	46

USA

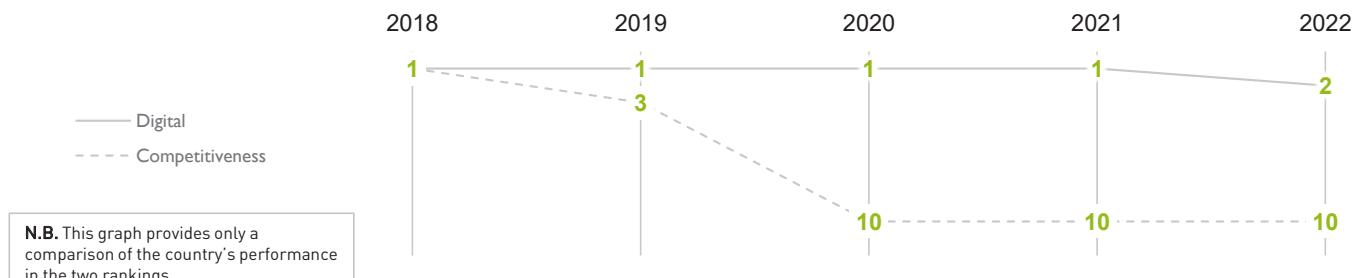
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	01	01	01	01	02
Knowledge	04	01	01	03	04
Technology	03	05	07	04	09
Future readiness	02	01	02	01	03

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



- Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	11	14	14	13	14
Training & education	21	25	24	24	23
Scientific concentration	01	01	01	02	01

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	35	Employee training	33	Total expenditure on R&D (%)	06
International experience	26	Total public expenditure on education	11	Total R&D personnel per capita	-
Foreign highly-skilled personnel	06	Higher education achievement	19	Female researchers	-
Management of cities	20	Pupil-teacher ratio (tertiary education)	18	R&D productivity by publication	03
Digital/Technological skills	10	▷ Graduates in Sciences	50	Scientific and technical employment	18
Net flow of international students	14	Women with degrees	10	High-tech patent grants	05
				Robots in Education and R&D	03

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	16	19	22	12	12
Capital	01	01	01	01	02
Technological framework	09	11	07	09	13

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
Starting a business	29	IT & media stock market capitalization	06	Communications technology	21
Enforcing contracts	16	Funding for technological development	04	Mobile Broadband subscribers	28
▷ Immigration laws	41	Banking and financial services	09	Wireless broadband	08
Development & application of tech.	09	Country credit rating	11	Internet users	35
Scientific research legislation	07	Venture capital	03	Internet bandwidth speed	09
Intellectual property rights	13	Investment in Telecommunications	14	High-tech exports (%)	22

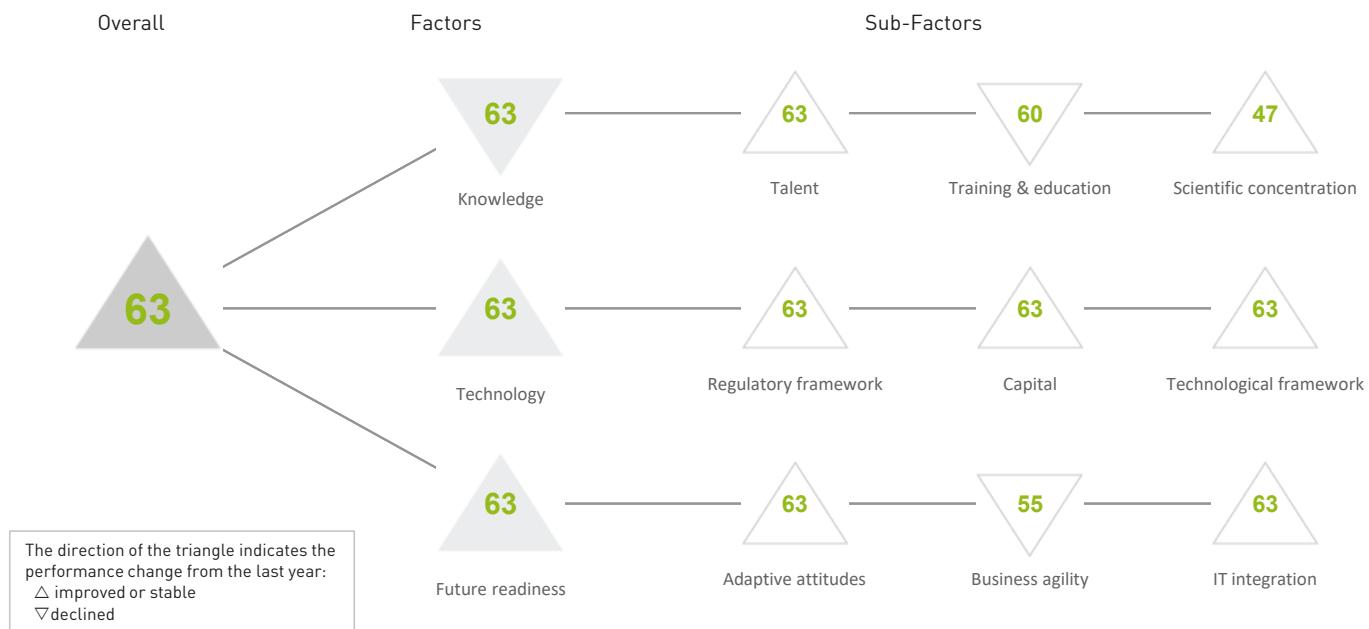
FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	01	02	03	01	04
Business agility	09	02	02	01	04
IT integration	08	05	10	03	10

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
► E-Participation	01	Opportunities and threats	19	E-Government	09
► Internet retailing	02	World robots distribution	04	Public-private partnerships	18
► Tablet possession	02	Agility of companies	21	Cyber security	27
▷ Smartphone possession	41	► Use of big data and analytics	01	► Software piracy	01
▷ Attitudes toward globalization	40	Knowledge transfer	07	Government cyber security capacity	15
		Entrepreneurial fear of failure	17	▷ Privacy protection by law content	37

VENEZUELA

OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

	2018	2019	2020	2021	2022
OVERALL	63	63	63	64	63
Knowledge	63	63	61	61	63
Technology	63	63	63	64	63
Future readiness	63	63	63	64	63

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



VENEZUELA

- ▶ Overall Top Strengths
- ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2018	2019	2020	2021	2022
Talent	63	63	63	64	63
Training & education	60	56	47	52	60
Scientific concentration	22	51	48	49	47

Talent	Rank	Training & education	Rank	Scientific concentration	Rank
Educational assessment PISA - Math	-	Employee training	58	Total expenditure on R&D (%)	61
International experience	60	Total public expenditure on education	-	Total R&D personnel per capita	-
Foreign highly-skilled personnel	63	Higher education achievement	-	► Female researchers	01
Management of cities	63	Pupil-teacher ratio (tertiary education)	-	R&D productivity by publication	31
Digital/Technological skills	63	Graduates in Sciences	-	Scientific and technical employment	-
Net flow of international students	-	Women with degrees	-	High-tech patent grants	55
				Robots in Education and R&D	53

TECHNOLOGY

Sub-Factors	2018	2019	2020	2021	2022
Regulatory framework	63	63	63	64	63
Capital	63	63	63	64	63
Technological framework	63	63	63	63	63

Regulatory framework	Rank	Capital	Rank	Technological framework	Rank
► Starting a business	63	IT & media stock market capitalization	59	► Communications technology	63
Enforcing contracts	60	Funding for technological development	63	Mobile Broadband subscribers	59
Immigration laws	47	Banking and financial services	63	► Wireless broadband	63
Development & application of tech.	63	► Country credit rating	63	Internet users	60
Scientific research legislation	63	Venture capital	63	Internet bandwidth speed	62
Intellectual property rights	63	► Investment in Telecommunications	63	High-tech exports (%)	-

FUTURE READINESS

Sub-Factors	2018	2019	2020	2021	2022
Adaptive attitudes	63	63	63	64	63
Business agility	51	49	49	52	55
IT integration	63	63	63	64	63

Adaptive attitudes	Rank	Business agility	Rank	IT integration	Rank
E-Participation	61	Opportunities and threats	49	E-Government	61
Internet retailing	57	World robots distribution	55	Public-private partnerships	62
Tablet possession	51	Agility of companies	53	Cyber security	63
Smartphone possession	60	Use of big data and analytics	58	Software piracy	62
Attitudes toward globalization	49	Knowledge transfer	62	Government cyber security capacity	42
		Entrepreneurial fear of failure	-	Privacy protection by law content	56

Appendices and Sources

The statistical tables are available for subscribers of the [IMD World Competitiveness Online](#).

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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 2017-2019)
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 GDP

Appendices and Sources

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	
3.3.5	Government cyber security capacity	The government's capability to mitigate harm from cyber security threats	
3.3.6	Privacy protection by law content	Extent of the legal framework to protect Internet users' privacy	

Notes and Sources by Criteria

The source of the survey criteria is always :

IMD World Competitiveness Center's Executive Opinion Survey 2022.

Which was conducted from mid-February to early May 2022, with a total number of 6'031 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 2022 (IMF) and national sources.
Per capita	For all information presented "per capita" the sources for the population are Passport GMID (Euromonitor) and national sources.
% of GDP	For all information presented as a "percentage of GDP" the sources for GDP are the OECD Main Economic Indicators April 2022 and national sources.

Background

0.0.1 [B]	Exchange Rate International Financial Statistics Online February-March 2022 (IMF) National sources Period average.
0.0.2 [B]	Population - market size World Economic Outlook April 2022 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).
0.0.3 [B]	GDP per capita OECD (2022), Main Economic Indicators - complete database National sources Provisional data or estimates for most recent year. Malaysia: Data for 2021 is sum of 4 quarters. Taiwan, China: 2019 and 2020 data are revised according to the annual revisions released by DGBAS in November 2021.

Knowledge

Talent

1.1.1 Educational assessment PISA - Math

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

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.

Training & education

1.2.2 Total public expenditure on education

IMF Government Finance Statistics
Eurostat March 2022
UNESCO <http://stats UIS.unesco.org>
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

OECD Education at a Glance 2021
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 SAR: Figures starting from 2012 exclude post-secondary diploma or certificate and exclude foreign domestic helpers. Kazakhstan: The data were reviewed taking into account the inclusion of graduates in technical and vocational education organizations (-5). 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).

Notes and Sources by Criteria

1.2.4 Pupil-teacher ratio (tertiary education)

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. Czech Republic, France, Ireland and Poland: 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

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. Jordan: 2020 data used in 2019. Philippines: includes Medical and Allied Disciplines Graduates.

1.2.6 Women with degrees

OECD Education at a Glance 2021

National sources

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. Taiwan, China: Including those attending & suspended.

Scientific concentration

1.3.1 Total expenditure on R&D (%)

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

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, China: break in series. Mongolia: Total number of employees in science sector. United Kingdom: underestimated or based on underestimated data. Jordan, Philippines: based on headcount, not FTE.

1.3.3 Female researchers

UNESCO

OECD (2022), "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 NSF Science & Engineering Indicators 2021 Courtesy: National Science Foundation National sources
	<p>The indicator is calculated as a ratio between the number of scientific articles by author's origin and the total expenditure in R&D as % GDP, which clearly include the input costs to produce research (e.g. researchers' salaries, equipment etc.). The result gives therefore the number of scientific articles published every year for a one percent (of GDP) expenditure in R&D activities. This measure can be considered as a proxy to assess the efficiency (or productivity) in producing high-level scientific research at country level.</p>
1.3.5	Scientific and technical employment Eurostat OECD (2022), "Labour Force Statistics: Employment by activities and status", OECD Employment and Labour Market Statistics ILOSTAT National sources
	<p>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.</p>
1.3.6	High-tech patent grants WIPO Statistics Database http://www.wipo.int/ipstats/en/statistics/patents/ TIPO for Taiwan, China
	<p>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, China: data compiled by TIPO using data supplied by international patent offices (USPTO, JPO, EPO, KIPO, SIPO).</p>
1.3.7	Robots in Education and R&D World Robotics 2022 International Federation of Robotics (IFR)
	<p>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.</p> <p>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.</p> <p>IFR Statistical Departments estimates the operational stock assuming an average service life of 12 years with an immediate withdrawal from service afterwards.</p>
1.3.7	Robots in Education and R&D (number of robots) World Robotics 2020 International Federation of Robotics (IFR)
	<p>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.</p>

Notes and Sources by Criteria

Technology

Regulatory framework

2.1.1 Starting a business

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

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.

Capital

2.2.1 IT & media 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

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

Passport

Source: © Euromonitor International

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.

Technological framework

2.3.2 Mobile Broadband subscribers

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

Passport

Source: © Euromonitor International

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

ITU via World Bank

Internet World Stats www.internetworkworldstats.com

National sources

Average of available sources

2.3.5 Internet bandwidth speed

M-Labs / cable.co.uk: <https://www.cable.co.uk/broadband/speed/worldwide-speed-league/>

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; Ookla; and OpenSignal.

2.3.6 High-tech 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.

Notes and Sources by Criteria

Future readiness

Adaptive attitudes

3.1.1 E-Participation

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

Passport

Source: © Euromonitor International

National sources

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

Passport

Source: © Euromonitor International

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

Passport

Source: © Euromonitor International

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

World Robotics 2022

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

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

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.

3.3.5 Government cyber security capacity

Digital Society Project

Does the government have sufficiently technologically skilled staff and resources to mitigate harm from cyber-security threats? 0: No. The government does not have the capacity to counter even unsophisticated cyber security threats.

- 1: Not really. The government has the resources to combat only unsophisticated cyber attacks.
 - 2: Somewhat. The government has the resources to combat moderately sophisticated cyber attacks.
 - 3: Mostly. The government has the resources to combat most sophisticated cyber attacks.
 - 4: Yes. The government has the resources to combat sophisticated cyber attacks, even those launched by highly skilled actors.
-

3.3.6 Privacy protection by law content

Digital Society Project

What does the legal framework to protect Internet users' privacy and their data stipulate? The legal framework explicitly allows the government to access...

- 0: ...any type of personal data on the Internet.
- 1: ...most types of personal data on the Internet.
- 2: ...many types of personal data on the Internet.
- 3: ...only a few types of personal information on the Internet.
- 4: ...personal information on the Internet only in extraordinary circumstances.

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
- Broadband 2.3.2-2.3.3

C

- Capital 2.2.1-2.2.6
- City, management 1.1.4
- Communications technology 2.3.1
- Company agility 3.2.1-3.2.3
- Computer penetration 3.1.1-3.1.5
- Cyber security 3.3.3, 3.3.5
- Credit Rating 2.2.4

D

- Degrees, 1.2.5-1.2.6
- Digital/Technological skills 1.1.5

E

- Education 1.2.1-1.2.6
- Educational assessment PISA - Math 1.1.1
- E-Government 3.3.1
- Employee training 1.2.1
- Enforcing contracts 2.1.2
- Entrepreneurship (fear of failure) 3.2.6
- E-Participation 3.1.1
- Exports, High-tech 2.3.6

F

- Fear of failure (entrepreneurship) 3.2.6
- Female researchers 1.3.3
- Foreign highly-skilled personnel 1.1.3
- Funding for technological development 2.2.2

G

- Globalization, attitudes towards 3.1.5
- Graduates in Sciences 1.2.5

H

- Higher education achievement 1.2.3
- High-tech exports (%) 2.3.6
- High-tech patent grants 1.3.6

I

- Immigration laws 2.1.3
- Innovative firms 3.2.2
- Intellectual property rights 2.1.6
- International experience 1.1.2
- Internet 2.3.1-2.3.6
- Internet bandwidth speed 2.3.5
- Internet retailing 3.1.2
- Internet users 2.3.4
- Investment 2.2.1-2.2.6
- Investment in Telecommunications 2.2.6
- Investment risk 2.2.4
- IT & media stock market capitalization 2.2.1
- IT penetration 3.1.1-3.1.5
- IT, digital skills 1.1.5

K-L

- Knowledge transfer 3.2.5
- Legislation 2.1.1-2.1.6

M

- Management of cities 1.1.4
- Mobile Broadband subscribers 2.3.2

N-O

- Net flow of international students 1.1.6
- Opportunities and threats 3.2.1

P

Piracy	3.3.4
Privacy.....	3.3.6
Public-private partnerships.....	3.3.2
Pupil-teacher ratio (tertiary education).....	1.2.4

R

R&D	1.3.1-1.3.6
R&D productivity.....	1.3.4
Regulations.....	2.1.1-2.1.6
Robotics	1.3.7, 3.2.2

S

Scientific and technical employment.....	1.3.5
Scientific research legislation.....	2.1.5
Skills	1.1.2, 1.1.3, 1.1.5
Smartphone possession.....	3.1.4
Sofware piracy	3.3.4
Starting a business.....	2.1.1

T

Tablet possession	3.1.3
Talent	1.1.2, 1.1.3, 1.1.5
Technological regulation.....	2.1.4
Technology.....	2.3.1-2.3-6
Total expenditure on R&D (%).....	1.3.1
Total public expenditure on education.....	1.2.2
Total R&D personnel per capita	1.3.2
Training	1.2.1

U-V

Use of big data and analytics	3.2.4
Venture capital.....	2.2.5

W

Wireless broadband.....	2.3.3
Women with degrees.....	1.2.6

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