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IMD WORLD DIGITAL COMPETITIVENESS RANKING 2022

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

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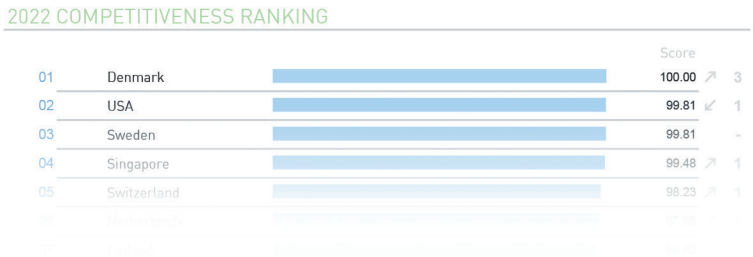
User's Guide to the IMD World Digital Competitiveness Ranking

Overall and Breakdown Digital Rankings

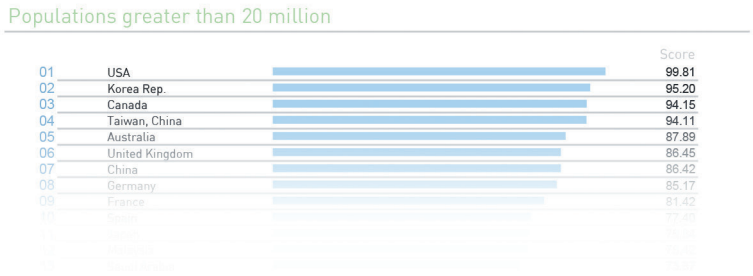
The IMD World Digital Competitiveness Ranking

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.



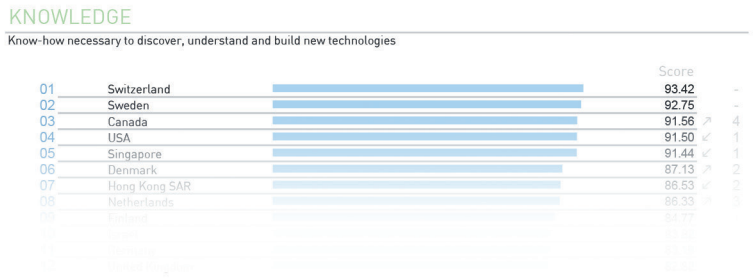
Selected breakdowns of the IMD World Digital Competitiveness Ranking

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



Digital Competitiveness Factor Rankings

The global rankings for each of the Digital Competitiveness Factors are then shown as individual ranking tables. Again, the economies are ranked from the most to the least digital competitive and the previous year's rankings (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.



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	62	59	57	51	51	55	57	57	55	55

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			
	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	56	57	51	43	52	43	Brazil

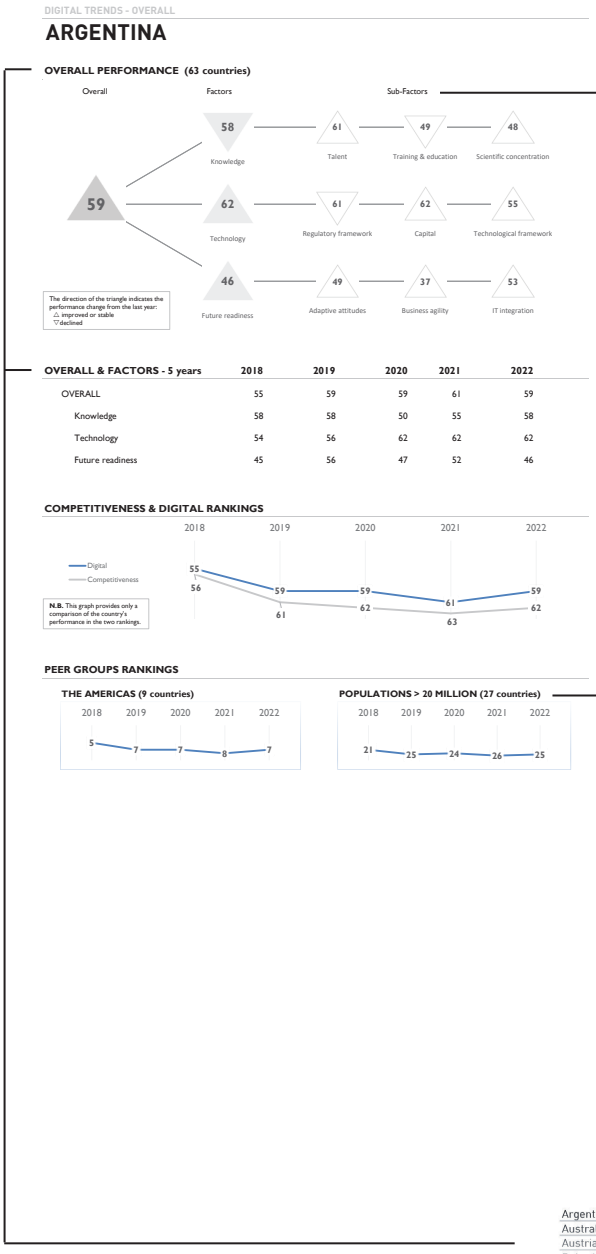
Digital Competitiveness Country Profiles

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

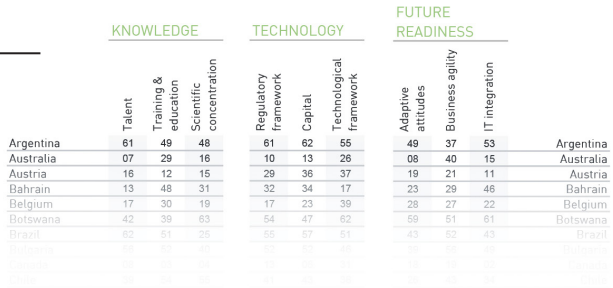
The evolution of the overall and factors digital rankings in the past 5 years.

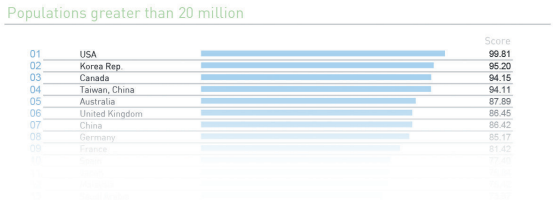
3. Competitiveness and Digital Rankings

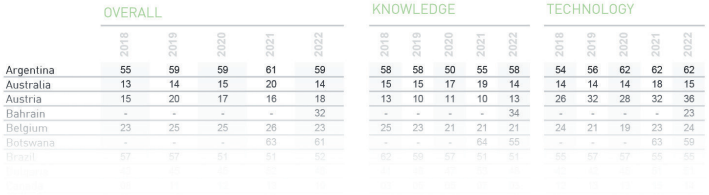
Comparison of the country' performances in the World Competitiveness Ranking and World Digital Competitiveness Ranking in the last 5 years.

4. Peer Group Rankings

Based on geographical region and population size.

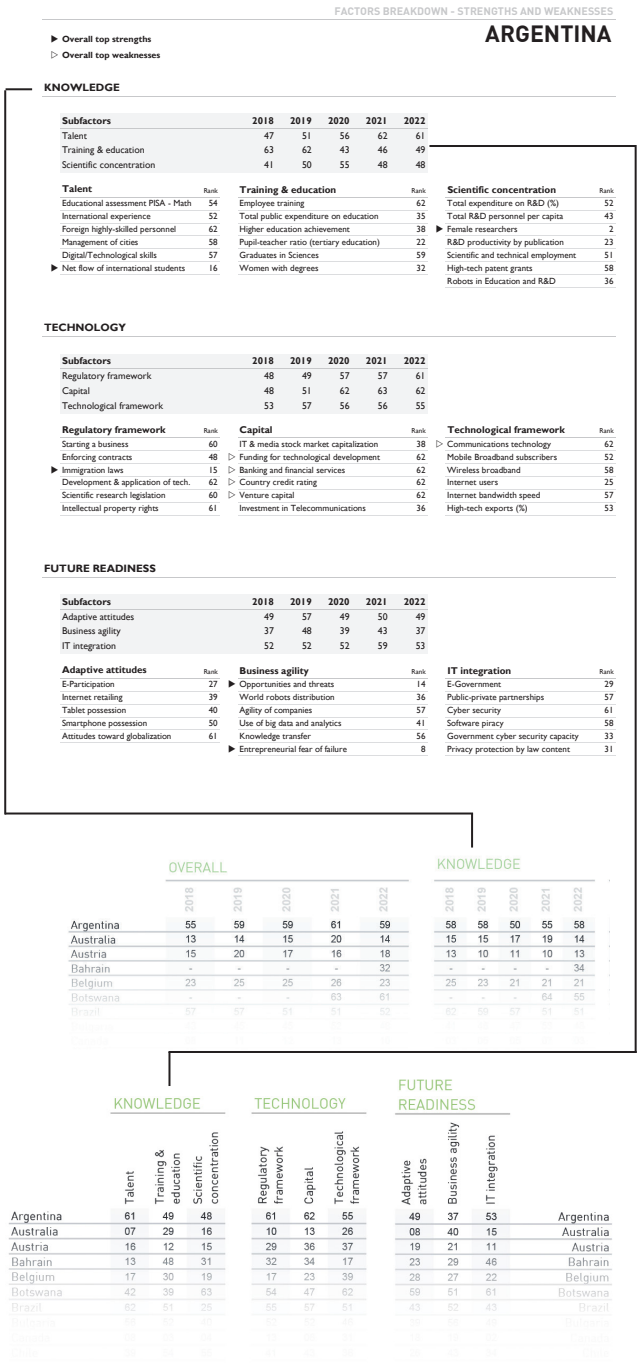






Page 2: Factors breakdown & Strengths and Weaknesses

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.



FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

ARGENTINA

▶ Overall top strengths
▷ Overall top weaknesses

KNOWLEDGE

Subfactors	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
Educational assessment PISA - Math	54
International experience	52
Foreign highly-skilled personnel	62
Management of cities	58
Digital/Technological skills	57
▶ Net flow of international students	16

Training & education	Rank
Employee training	62
Total public expenditure on education	35
Higher education achievement	38
Pupil-teacher ratio (tertiary education)	22
Graduates in Sciences	59
Women with degrees	32

Scientific concentration	Rank
Total expenditure on R&D (%)	52
Total R&D personnel per capita	43
▶ Female researchers	2
R&D productivity by publication	23
Scientific and technical employment	51
High-tech patent grants	58
Robots in Education and R&D	36

TECHNOLOGY

Subfactors	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
Starting a business	60
Enforcing contracts	48
▶ Immigration laws	15
Development & application of tech.	62
Scientific research legislation	60
Intellectual property rights	61

Capital	Rank
IT & media stock market capitalization	38
▷ Funding for technological development	62
▷ Banking and financial services	62
▷ Country credit rating	62
▷ Venture capital	62
Investment in Telecommunications	36

Technological framework	Rank
▷ Communications technology	62
Mobile Broadband subscribers	52
Wireless broadband	58
Internet users	25
Internet bandwidth speed	57
High-tech exports (%)	53

FUTURE READINESS

Subfactors	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
E-Participation	27
Internet retailing	39
Tablet possession	40
Smartphone possession	50
Attitudes toward globalization	61

Business agility	Rank
▶ Opportunities and threats	14
World robots distribution	36
Agility of companies	57
Use of big data and analytics	41
Knowledge transfer	56
▶ Entrepreneurial fear of failure	8

IT integration	Rank
E-Government	29
Public-private partnerships	57
Cyber security	61
Software piracy	58
Government cyber security capacity	33
Privacy protection by law content	31

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

KNOWLEDGE

	2018	2019	2020	2021	2022
Argentina	58	58	50	55	58
Australia	15	15	17	19	14
Austria	13	10	11	10	13
Bahrain	-	-	-	-	34
Belgium	25	23	21	21	21
Botswana	-	-	-	64	55
Brazil	62	59	57	51	51

KNOWLEDGE

	Talent	Training & education	Scientific concentration
Argentina	61	49	48
Australia	07	29	16
Austria	16	12	15
Bahrain	13	48	31
Belgium	17	30	19
Botswana	42	39	63
Brazil	62	51	25

TECHNOLOGY

	Regulatory framework	Capital	Technological framework
Argentina	61	62	55
Australia	10	13	26
Austria	29	36	37
Bahrain	32	34	17
Belgium	17	23	39
Botswana	54	47	62
Brazil	55	57	51

FUTURE READINESS

	Adaptive attitudes	Business agility	IT integration	
Argentina	49	37	53	Argentina
Australia	08	40	15	Australia
Austria	19	21	11	Austria
Bahrain	23	29	46	Bahrain
Belgium	28	27	22	Belgium
Botswana	59	51	61	Botswana
Brazil	43	52	43	Brazil

1. Factors Breakdown

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

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)

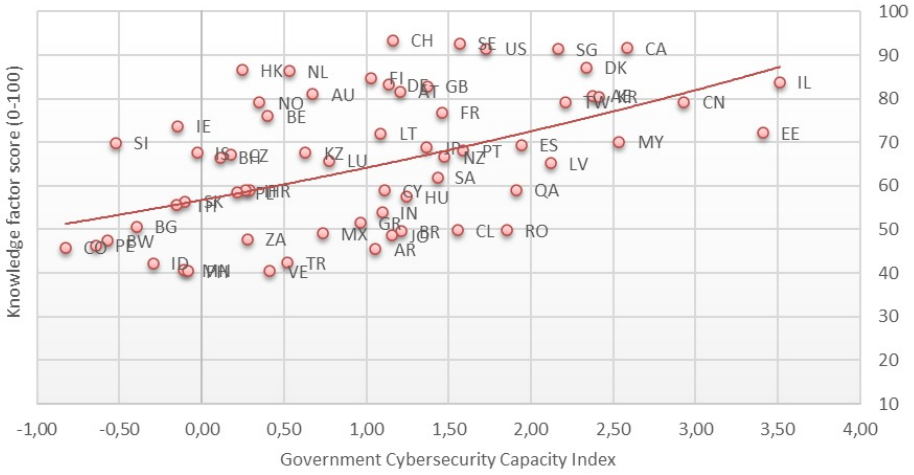
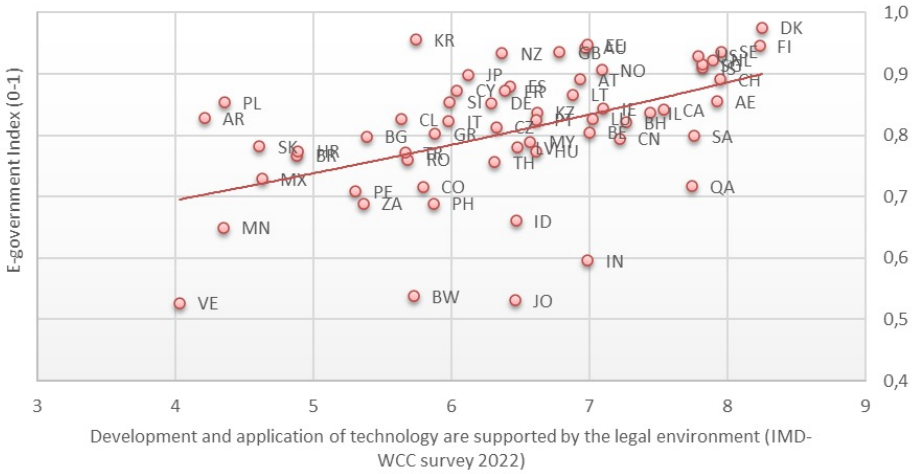


Figure 2: Correlation between "Development and application of technology are supported by the legal environment" and E-Government index. (IMD, 2022)



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' 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

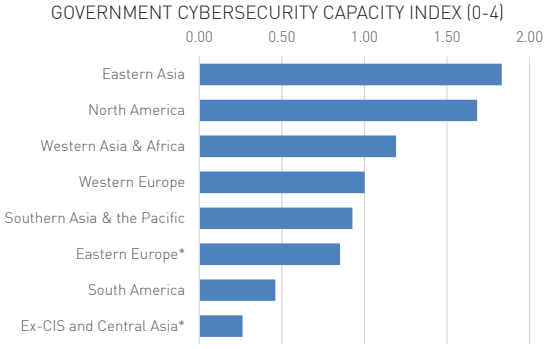


Figure 4: E-government index by region

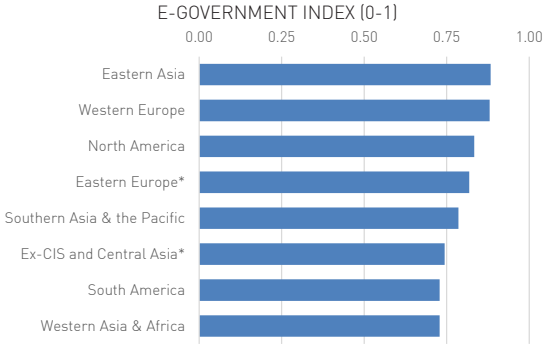
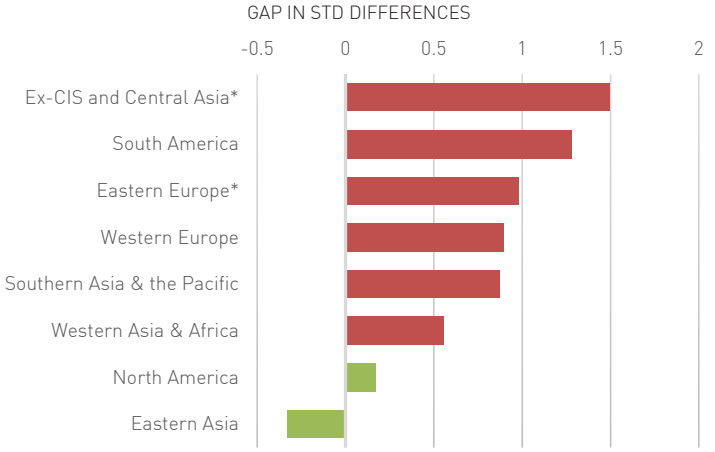


Figure 5: Gap between scores in the E-government index and the Cybersecurity capacity index. IMD (2022)



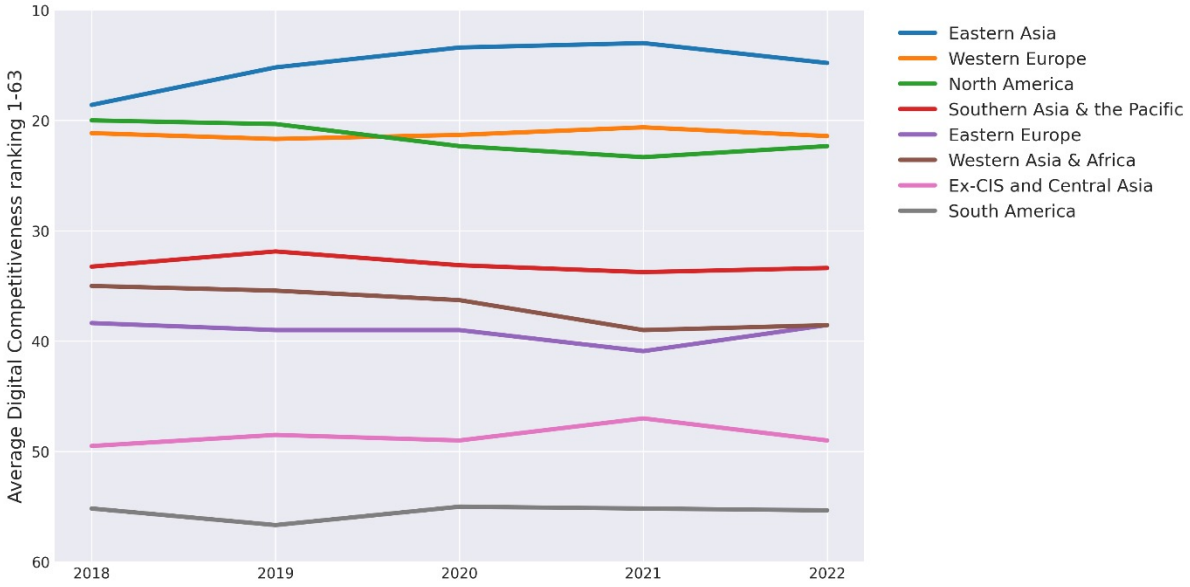
NOTE: *Eastern Europe does not include values for Ukraine; Ex-CIS and Central Asia does not include values for Russia.

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.

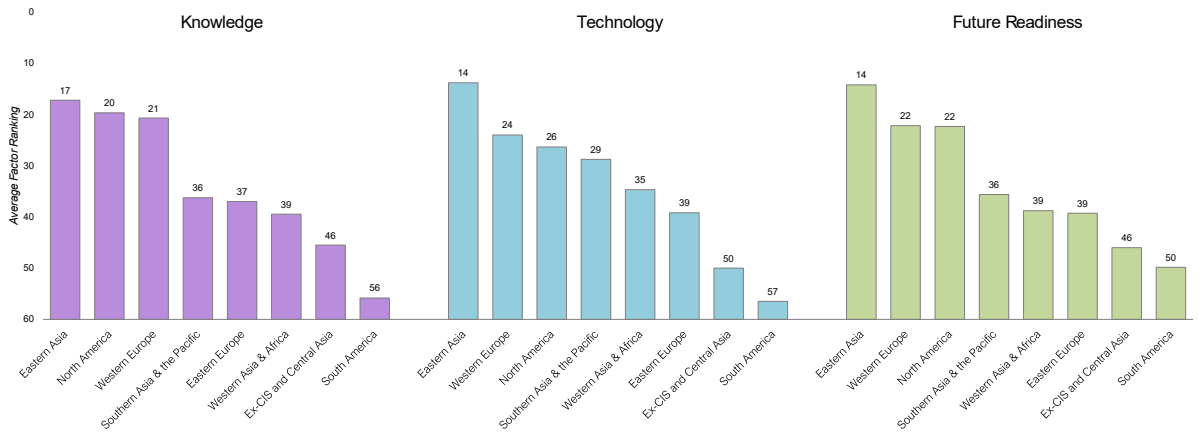
3. Digital competitiveness trends at a regional level

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	▪ Austria ▪ Belgium ▪ Cyprus ▪ Denmark ▪ Finland ▪ France ▪ Germany ▪ Greece ▪ Iceland ▪ Ireland	▪ Italy ▪ Luxembourg ▪ Netherlands ▪ Norway ▪ Portugal ▪ Spain ▪ Sweden ▪ Switzerland ▪ United Kingdom	**Europe, Middle East & Africa**
Eastern Europe	▪ Bulgaria ▪ Czech Republic ▪ Estonia ▪ Croatia ▪ Hungary ▪ Latvia	▪ Lithuania ▪ Poland ▪ Romania ▪ Slovenia ▪ Slovak Republic	
Western Asia & Africa	▪ Bahrain ▪ Botswana ▪ Israel ▪ Jordan ▪ Qatar	▪ Saudi Arabia ▪ South Africa ▪ Turkey ▪ UAE	
Ex-CIS & Central Asia	▪ Kazakhstan ▪ Mongolia		
Eastern Asia	▪ China ▪ Hong Kong SAR ▪ Japan	▪ Korea Rep. ▪ Taiwan, China	**Asia & Pacific**
Southern Asia & The Pacific	▪ Australia ▪ India ▪ Indonesia ▪ Malaysia	▪ New Zealand ▪ Philippines ▪ Singapore ▪ Thailand	
North America	▪ Canada ▪ Mexico	▪ USA	**The Americas**
South America	▪ Argentina ▪ Brazil ▪ Chile	▪ Colombia ▪ Peru ▪ Venezuela	

IMD World Digital Competitiveness Ranking 2022

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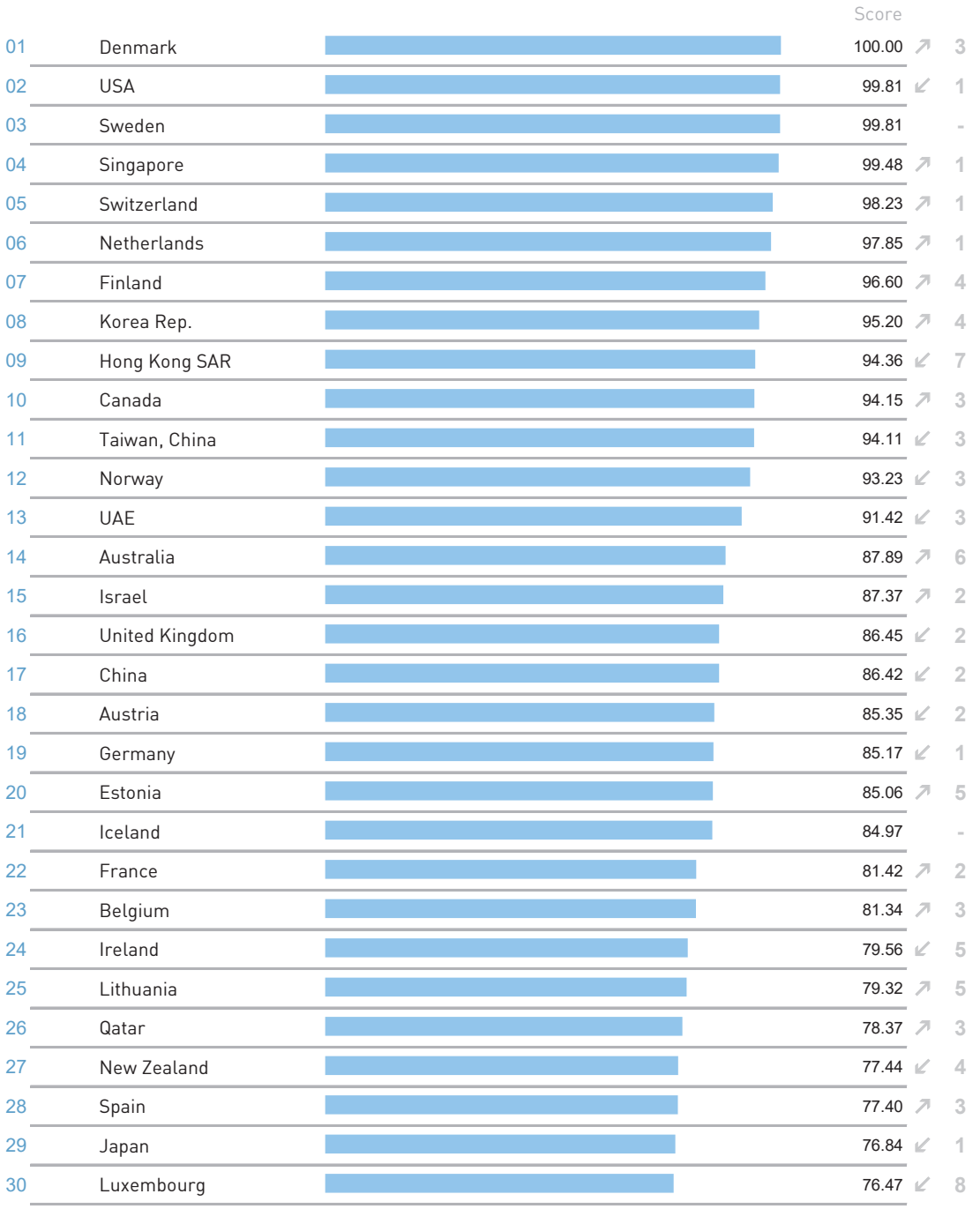
The 2022 IMD World Digital Competitiveness Ranking

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.

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 ÷ 9 ~ 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

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

- Talent
- Training and Education
- Scientific Concentration

Technology

Overall context that enables the development of digital technologies.

- Regulatory Framework
- Capital
- Technological Framework

Future Readiness

Level of country preparedness to exploit digital transformation.

- Adaptive Attitudes
- Business Agility
- IT Integration

Computing the Rankings

HARD DATA

Statistics from international, regional and national sources

34 Criteria

SURVEY

International Panel of Experts Executives Opinion Survey

20 Criteria

COMPUTE STD VALUES

Individually, for all criteria used in the ranking

54 Criteria

OVERALL RANKINGS

Aggregates the STD values for all the 54 ranked criteria

FACTORS RANKINGS

Knowledge, Technology, Future Readiness

CRITERIA RANKINGS

Each of the 54 criteria is individually rankd for the countries

The 2022 IMD World Digital Competitiveness Rankings

Populations greater than 20 million

		Score
01	USA	99.81
02	Korea Rep.	95.20
03	Canada	94.15
04	Taiwan, China	94.11
05	Australia	87.89
06	United Kingdom	86.45
07	China	86.42
08	Germany	85.17
09	France	81.42
10	Spain	77.40
11	Japan	76.84
12	Malaysia	76.42
13	Saudi Arabia	73.87
14	Italy	68.33
15	Thailand	68.19
16	India	63.93
17	Poland	63.09
18	Indonesia	56.74
19	Brazil	56.14
20	Turkey	55.02
21	Mexico	54.72
22	Philippines	52.81
23	Peru	52.06
24	South Africa	51.24
25	Argentina	50.22
26	Colombia	49.22
27	Venezuela	27.00

Populations less than 20 million

		Score
01	Denmark	100.00
02	Sweden	99.81
03	Singapore	99.48
04	Switzerland	98.23
05	Netherlands	97.85
06	Finland	96.60
07	Hong Kong SAR	94.36
08	Norway	93.23
09	UAE	91.42
10	Israel	87.37
11	Austria	85.35
12	Estonia	85.06
13	Iceland	84.97
14	Belgium	81.34
15	Ireland	79.56
16	Lithuania	79.32
17	Qatar	78.37
18	New Zealand	77.44
19	Luxembourg	76.47
20	Bahrain	75.85
21	Czech Republic	75.54
22	Latvia	74.24
23	Kazakhstan	73.03
24	Slovenia	71.45
25	Portugal	70.84
26	Chile	66.23
27	Hungary	65.25
28	Croatia	64.58
29	Cyprus	63.67
30	Slovak Republic	59.64
31	Bulgaria	58.51
32	Romania	58.32
33	Greece	56.93
34	Jordan	56.04
35	Botswana	48.25
36	Mongolia	45.25

Selected Breakdowns

GDP per capita greater than $20,000

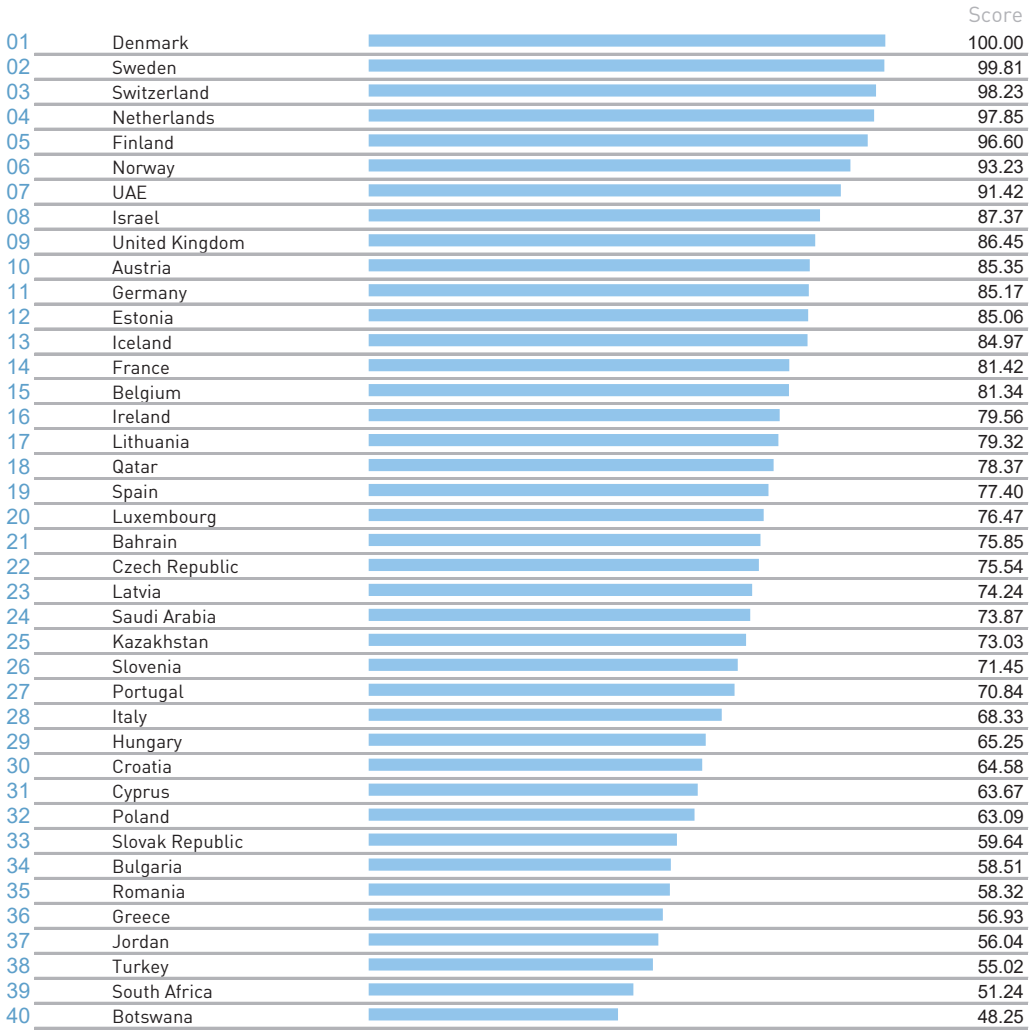
		Score
01	Denmark	100.00
02	USA	99.81
03	Sweden	99.81
04	Singapore	99.48
05	Switzerland	98.23
06	Netherlands	97.85
07	Finland	96.60
08	Korea Rep.	95.20
09	Hong Kong SAR	94.36
10	Canada	94.15
11	Taiwan, China	94.11
12	Norway	93.23
13	UAE	91.42
14	Australia	87.89
15	Israel	87.37
16	United Kingdom	86.45
17	Austria	85.35
18	Germany	85.17
19	Estonia	85.06
20	Iceland	84.97
21	France	81.42
22	Belgium	81.34
23	Ireland	79.56
24	Lithuania	79.32
25	Qatar	78.37
26	New Zealand	77.44
27	Spain	77.40
28	Japan	76.84
29	Luxembourg	76.47
30	Bahrain	75.85
31	Czech Republic	75.54
32	Latvia	74.24
33	Saudi Arabia	73.87
34	Slovenia	71.45
35	Portugal	70.84
36	Italy	68.33
37	Cyprus	63.67
38	Slovak Republic	59.64
39	Greece	56.93

GDP per capita less than $20,000

		Score
01	China	86.42
02	Malaysia	76.42
03	Kazakhstan	73.03
04	Thailand	68.19
05	Chile	66.23
06	Hungary	65.25
07	Croatia	64.58
08	India	63.93
09	Poland	63.09
10	Bulgaria	58.51
11	Romania	58.32
12	Indonesia	56.74
13	Brazil	56.14
14	Jordan	56.04
15	Turkey	55.02
16	Mexico	54.72
17	Philippines	52.81
18	Peru	52.06
19	South Africa	51.24
20	Argentina	50.22
21	Colombia	49.22
22	Botswana	48.25
23	Mongolia	45.25
24	Venezuela	27.00

The 2022 IMD World Digital Competitiveness Rankings

Europe - Middle East - Africa



		Score
01	Denmark	100.00
02	Sweden	99.81
03	Switzerland	98.23
04	Netherlands	97.85
05	Finland	96.60
06	Norway	93.23
07	UAE	91.42
08	Israel	87.37
09	United Kingdom	86.45
10	Austria	85.35
11	Germany	85.17
12	Estonia	85.06
13	Iceland	84.97
14	France	81.42
15	Belgium	81.34
16	Ireland	79.56
17	Lithuania	79.32
18	Qatar	78.37
19	Spain	77.40
20	Luxembourg	76.47
21	Bahrain	75.85
22	Czech Republic	75.54
23	Latvia	74.24
24	Saudi Arabia	73.87
25	Kazakhstan	73.03
26	Slovenia	71.45
27	Portugal	70.84
28	Italy	68.33
29	Hungary	65.25
30	Croatia	64.58
31	Cyprus	63.67
32	Poland	63.09
33	Slovak Republic	59.64
34	Bulgaria	58.51
35	Romania	58.32
36	Greece	56.93
37	Jordan	56.04
38	Turkey	55.02
39	South Africa	51.24
40	Botswana	48.25

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

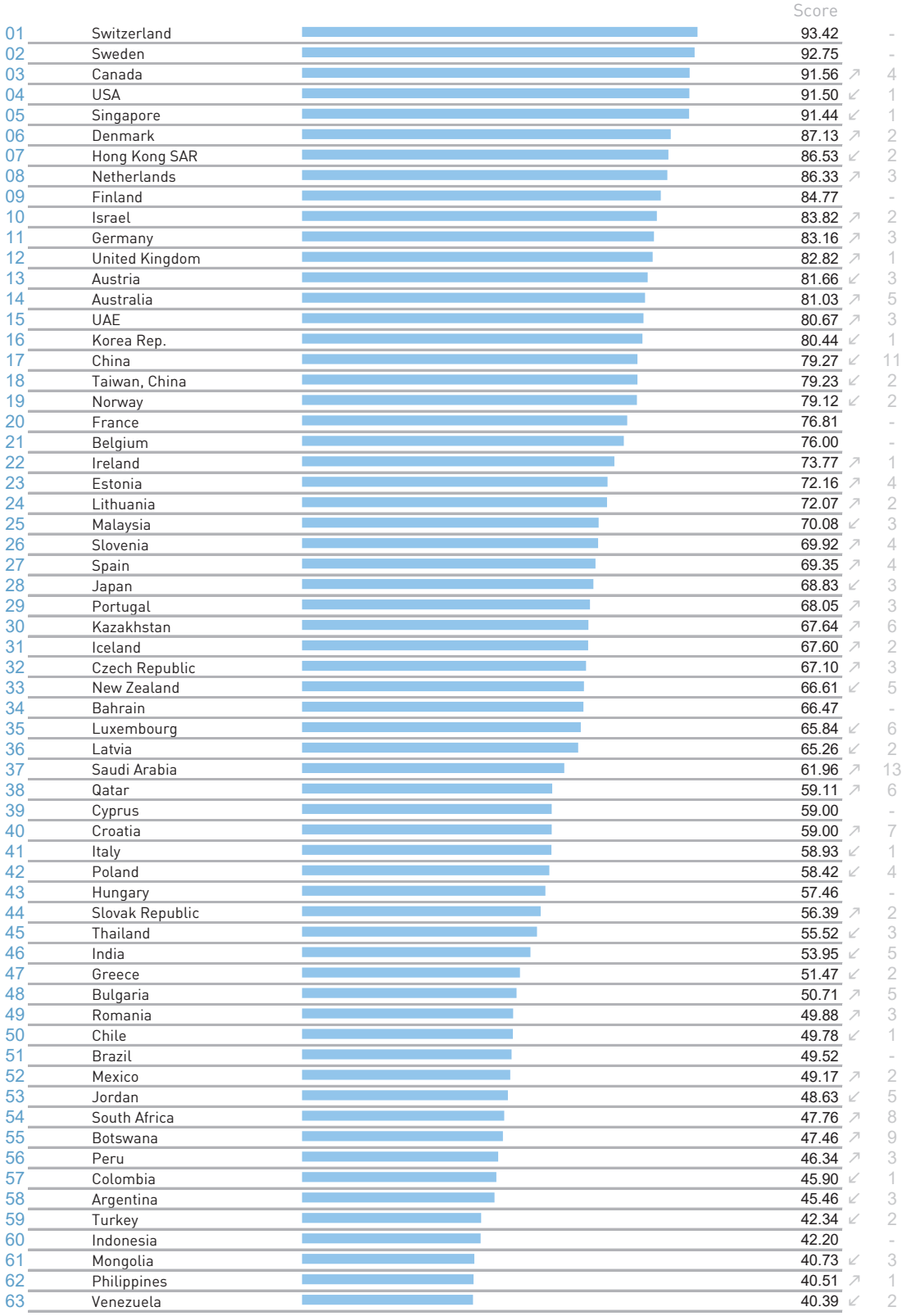
The Americas

		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

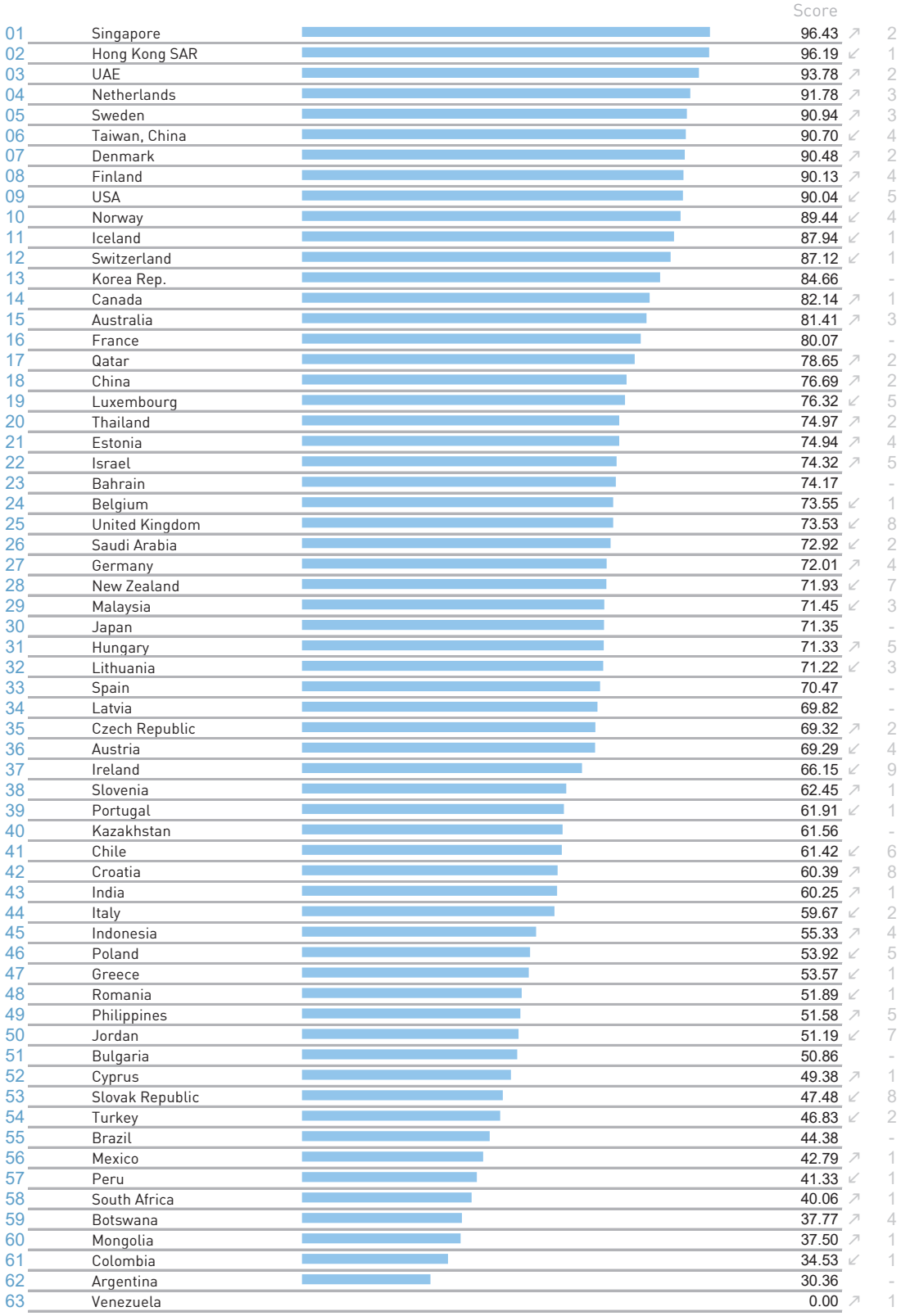


		Score		
01	Switzerland	93.42		-
02	Sweden	92.75		-
03	Canada	91.56	↗	4
04	USA	91.50	↙	1
05	Singapore	91.44	↙	1
06	Denmark	87.13	↗	2
07	Hong Kong SAR	86.53	↙	2
08	Netherlands	86.33	↗	3
09	Finland	84.77		-
10	Israel	83.82	↗	2
11	Germany	83.16	↗	3
12	United Kingdom	82.82	↗	1
13	Austria	81.66	↙	3
14	Australia	81.03	↗	5
15	UAE	80.67	↗	3
16	Korea Rep.	80.44	↙	1
17	China	79.27	↙	11
18	Taiwan, China	79.23	↙	2
19	Norway	79.12	↙	2
20	France	76.81		-
21	Belgium	76.00		-
22	Ireland	73.77	↗	1
23	Estonia	72.16	↗	4
24	Lithuania	72.07	↗	2
25	Malaysia	70.08	↙	3
26	Slovenia	69.92	↗	4
27	Spain	69.35	↗	4
28	Japan	68.83	↙	3
29	Portugal	68.05	↗	3
30	Kazakhstan	67.64	↗	6
31	Iceland	67.60	↗	2
32	Czech Republic	67.10	↗	3
33	New Zealand	66.61	↙	5
34	Bahrain	66.47		-
35	Luxembourg	65.84	↙	6
36	Latvia	65.26	↙	2
37	Saudi Arabia	61.96	↗	13
38	Qatar	59.11	↗	6
39	Cyprus	59.00		-
40	Croatia	59.00	↗	7
41	Italy	58.93	↙	1
42	Poland	58.42	↙	4
43	Hungary	57.46		-
44	Slovak Republic	56.39	↗	2
45	Thailand	55.52	↙	3
46	India	53.95	↙	5
47	Greece	51.47	↙	2
48	Bulgaria	50.71	↗	5
49	Romania	49.88	↗	3
50	Chile	49.78	↙	1
51	Brazil	49.52		-
52	Mexico	49.17	↗	2
53	Jordan	48.63	↙	5
54	South Africa	47.76	↗	8
55	Botswana	47.46	↗	9
56	Peru	46.34	↗	3
57	Colombia	45.90	↙	1
58	Argentina	45.46	↙	3
59	Turkey	42.34	↙	2
60	Indonesia	42.20		-
61	Mongolia	40.73	↙	3
62	Philippines	40.51	↗	1
63	Venezuela	40.39	↙	2

Selected Breakdowns

TECHNOLOGY

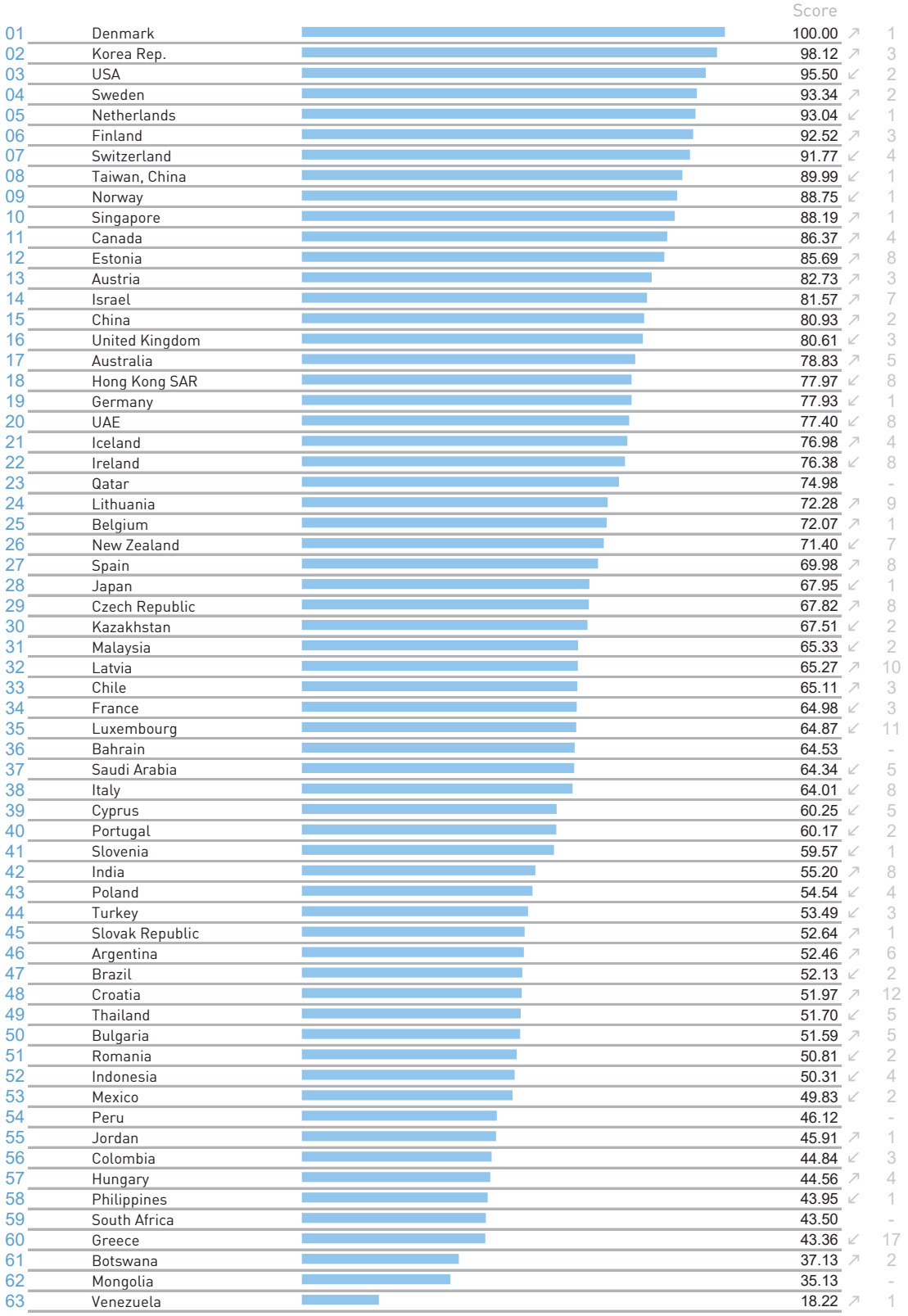
Overall context that enables the development of digital technologies



		Score		
01	Singapore	96.43	↗	2
02	Hong Kong SAR	96.19	↙	1
03	UAE	93.78	↗	2
04	Netherlands	91.78	↗	3
05	Sweden	90.94	↗	3
06	Taiwan, China	90.70	↙	4
07	Denmark	90.48	↗	2
08	Finland	90.13	↗	4
09	USA	90.04	↙	5
10	Norway	89.44	↙	4
11	Iceland	87.94	↙	1
12	Switzerland	87.12	↙	1
13	Korea Rep.	84.66		-
14	Canada	82.14	↗	1
15	Australia	81.41	↗	3
16	France	80.07		-
17	Qatar	78.65	↗	2
18	China	76.69	↗	2
19	Luxembourg	76.32	↙	5
20	Thailand	74.97	↗	2
21	Estonia	74.94	↗	4
22	Israel	74.32	↗	5
23	Bahrain	74.17		-
24	Belgium	73.55	↙	1
25	United Kingdom	73.53	↙	8
26	Saudi Arabia	72.92	↙	2
27	Germany	72.01	↗	4
28	New Zealand	71.93	↙	7
29	Malaysia	71.45	↙	3
30	Japan	71.35		-
31	Hungary	71.33	↗	5
32	Lithuania	71.22	↙	3
33	Spain	70.47		-
34	Latvia	69.82		-
35	Czech Republic	69.32	↗	2
36	Austria	69.29	↙	4
37	Ireland	66.15	↙	9
38	Slovenia	62.45	↗	1
39	Portugal	61.91	↙	1
40	Kazakhstan	61.56		-
41	Chile	61.42	↙	6
42	Croatia	60.39	↗	8
43	India	60.25	↗	1
44	Italy	59.67	↙	2
45	Indonesia	55.33	↗	4
46	Poland	53.92	↙	5
47	Greece	53.57	↙	1
48	Romania	51.89	↙	1
49	Philippines	51.58	↗	5
50	Jordan	51.19	↙	7
51	Bulgaria	50.86		-
52	Cyprus	49.38	↗	1
53	Slovak Republic	47.48	↙	8
54	Turkey	46.83	↙	2
55	Brazil	44.38		-
56	Mexico	42.79	↗	1
57	Peru	41.33	↙	1
58	South Africa	40.06	↗	1
59	Botswana	37.77	↗	4
60	Mongolia	37.50	↗	1
61	Colombia	34.53	↙	1
62	Argentina	30.36		-
63	Venezuela	0.00	↗	1

FUTURE READINESS

Level of country preparedness to exploit digital transformation



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

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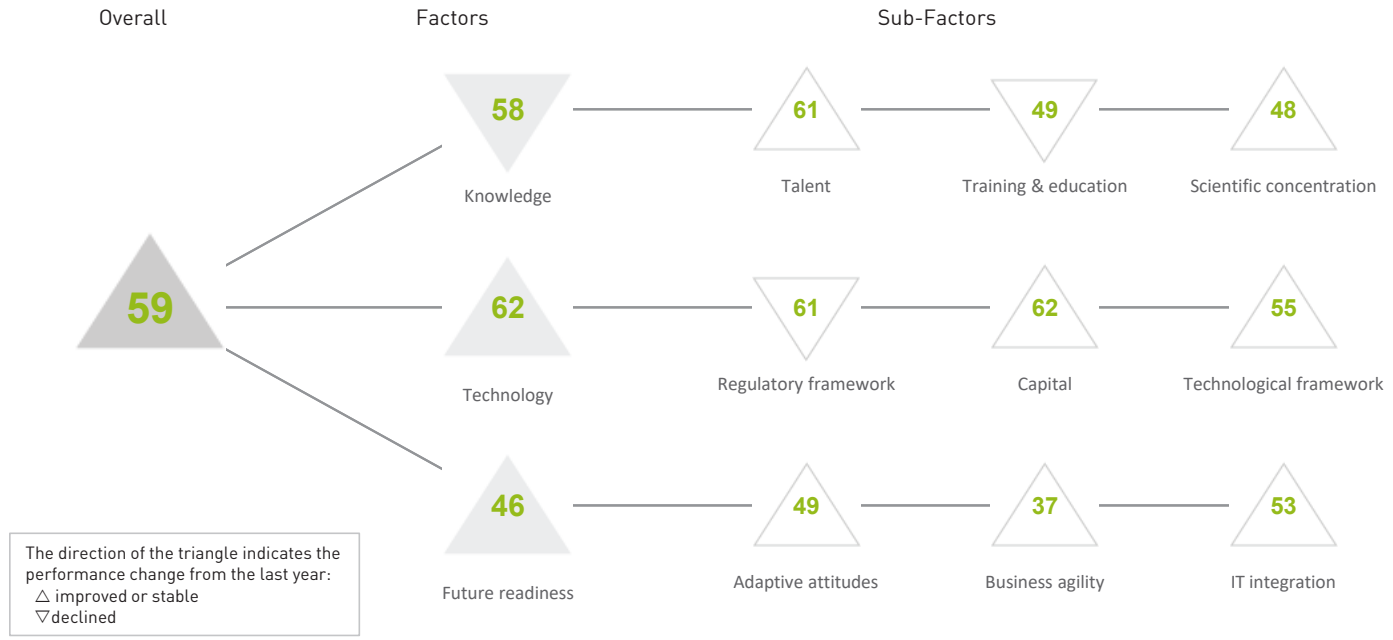
ARGENTINA

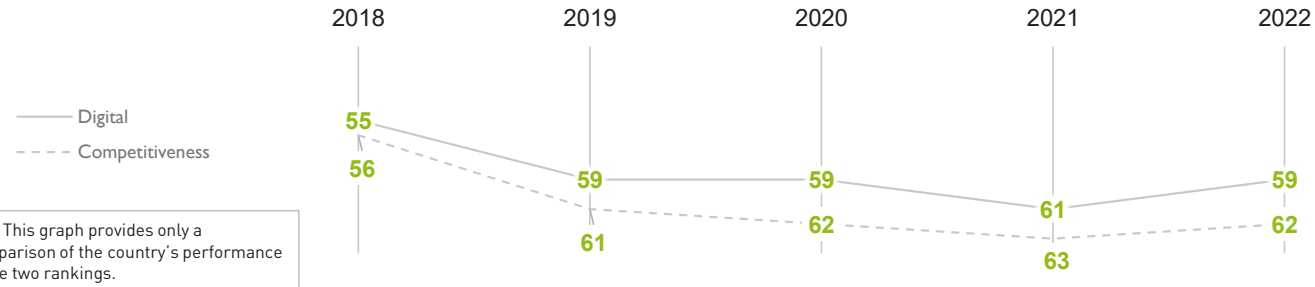
OVERALL PERFORMANCE (63 countries)



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
Educational assessment PISA - Math	54
International experience	52
Foreign highly-skilled personnel	62
Management of cities	58
Digital/Technological skills	57
▶ Net flow of international students	16

Training & education	Rank
Employee training	62
Total public expenditure on education	35
Higher education achievement	38
Pupil-teacher ratio (tertiary education)	22
Graduates in Sciences	59
Women with degrees	32

Scientific concentration	Rank
Total expenditure on R&D (%)	52
Total R&D personnel per capita	43
▶ Female researchers	02
R&D productivity by publication	23
Scientific and technical employment	51
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
Starting a business	60
Enforcing contracts	48
▶ Immigration laws	15
Development & application of tech.	62
Scientific research legislation	60
Intellectual property rights	61

Capital	Rank
IT & media stock market capitalization	38
▷ Funding for technological development	62
▷ Banking and financial services	62
▷ Country credit rating	62
▷ Venture capital	62
Investment in Telecommunications	36

Technological framework	Rank
▷ Communications technology	62
Mobile Broadband subscribers	52
Wireless broadband	58
Internet users	25
Internet bandwidth speed	57
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

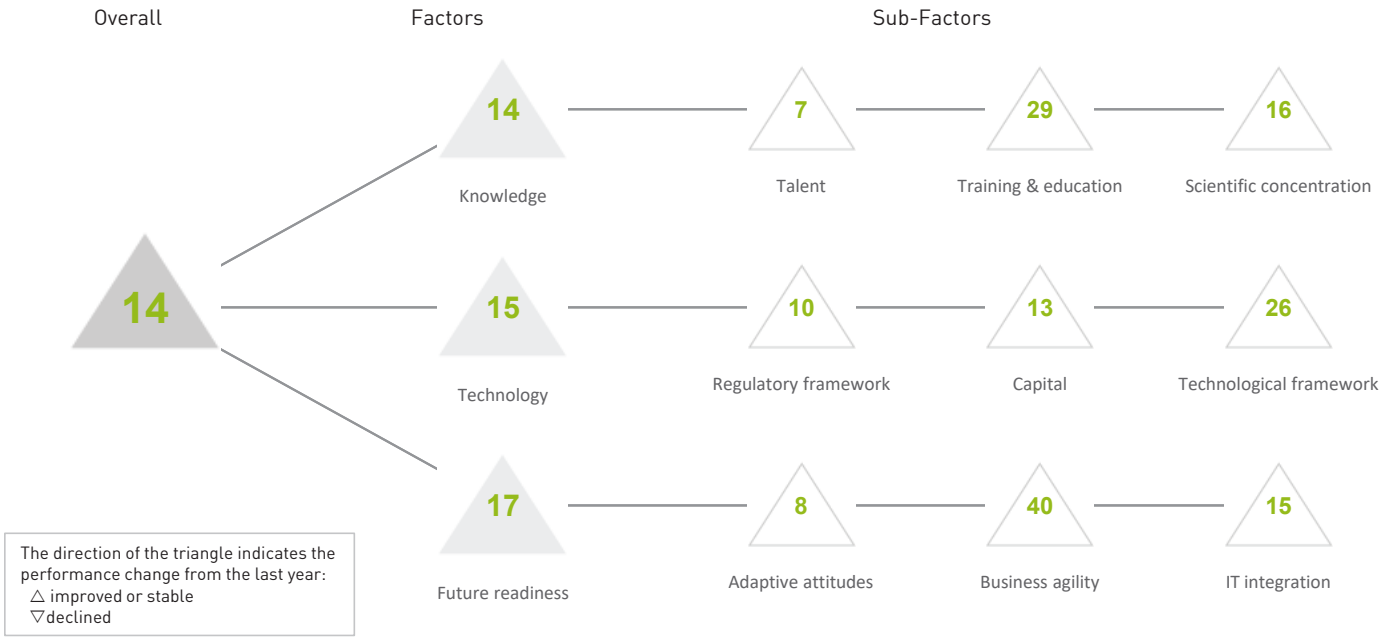
Adaptive attitudes	Rank
E-Participation	27
Internet retailing	39
Tablet possession	40
Smartphone possession	50
Attitudes toward globalization	61

Business agility	Rank
▶ Opportunities and threats	14
World robots distribution	36
Agility of companies	57
Use of big data and analytics	41
Knowledge transfer	56
▶ Entrepreneurial fear of failure	08

IT integration	Rank
E-Government	29
Public-private partnerships	57
Cyber security	61
Software piracy	58
Government cyber security capacity	33
Privacy protection by law content	31

AUSTRALIA

OVERALL PERFORMANCE (63 countries)

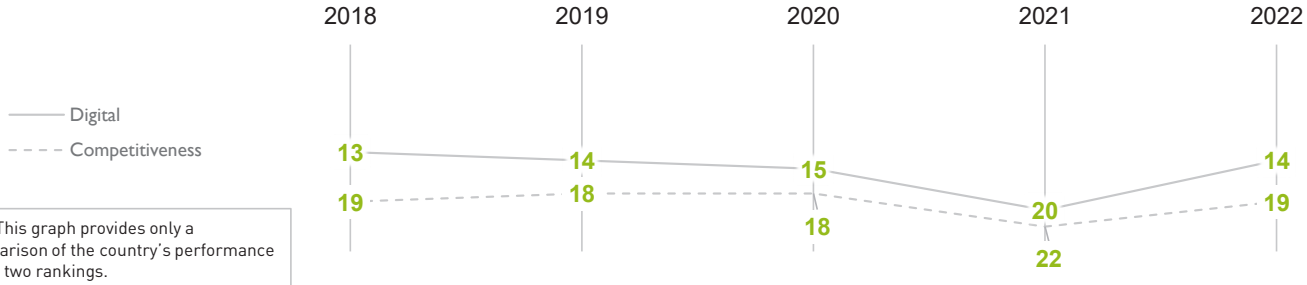


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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

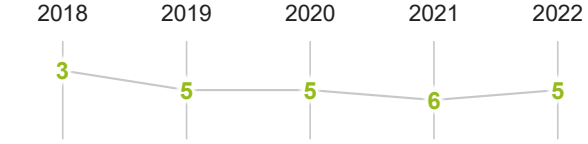
COMPETITIVENESS & DIGITAL RANKINGS



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	28
▷ International experience	49
Foreign highly-skilled personnel	12
Management of cities	21
Digital/Technological skills	39
▶ Net flow of international students	02

Training & education	Rank
▷ Employee training	44
Total public expenditure on education	17
Higher education achievement	15
Pupil-teacher ratio (tertiary education)	-
▷ Graduates in Sciences	52
Women with degrees	07

Scientific concentration	Rank
Total expenditure on R&D (%)	22
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	15
Scientific and technical employment	09
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
Starting a business	05
Enforcing contracts	06
Immigration laws	33
Development & application of tech.	24
Scientific research legislation	24
Intellectual property rights	12

Capital	Rank
IT & media stock market capitalization	35
Funding for technological development	37
Banking and financial services	19
▶ Country credit rating	01
Venture capital	23
▶ Investment in Telecommunications	04

Technological framework	Rank
▷ Communications technology	47
Mobile Broadband subscribers	09
Wireless broadband	14
Internet users	33
▷ Internet bandwidth speed	45
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

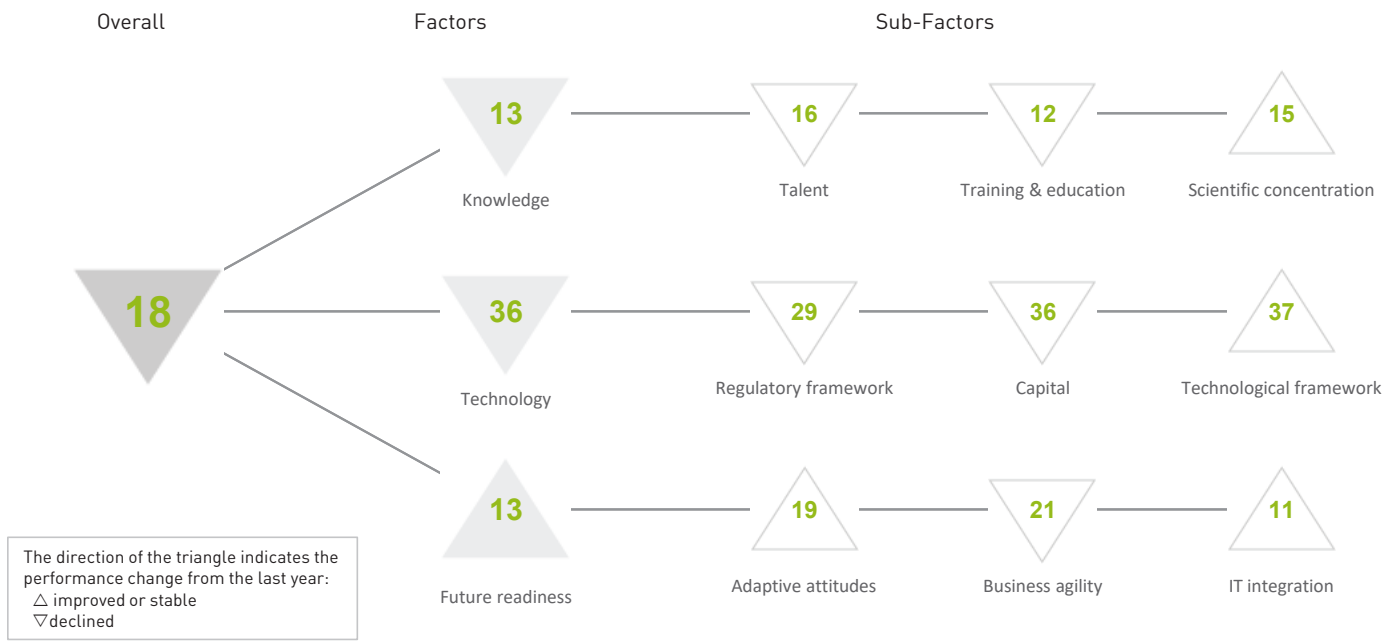
Adaptive attitudes	Rank
E-Participation	09
▶ Internet retailing	05
Tablet possession	06
Smartphone possession	17
Attitudes toward globalization	35

Business agility	Rank
Opportunities and threats	41
World robots distribution	30
Agility of companies	39
Use of big data and analytics	30
Knowledge transfer	29
Entrepreneurial fear of failure	33

IT integration	Rank
E-Government	05
Public-private partnerships	30
Cyber security	31
▶ Software piracy	05
Government cyber security capacity	38
Privacy protection by law content	23

AUSTRIA

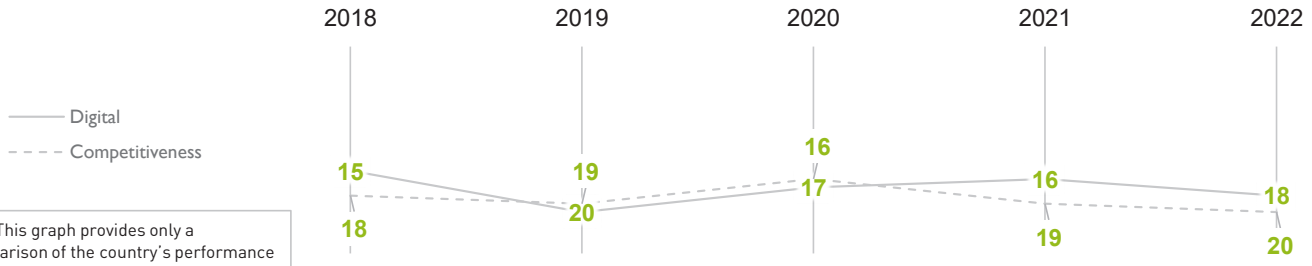
OVERALL PERFORMANCE (63 countries)



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

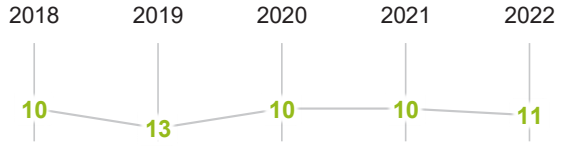


N.B. This graph provides only a comparison of the country's performance in the two rankings.

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
Educational assessment PISA - Math	22
International experience	28
Foreign highly-skilled personnel	22
Management of cities	10
Digital/Technological skills	40
Net flow of international students	06

Training & education	Rank
▶ Employee training	03
Total public expenditure on education	29
Higher education achievement	37
▶ Pupil-teacher ratio (tertiary education)	02
Graduates in Sciences	07
Women with degrees	37

Scientific concentration	Rank
Total expenditure on R&D (%)	08
Total R&D personnel per capita	09
Female researchers	43
▷ R&D productivity by publication	47
Scientific and technical employment	14
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
▷ Starting a business	52
Enforcing contracts	10
▷ Immigration laws	52
Development & application of tech.	25
Scientific research legislation	14
Intellectual property rights	08

Capital	Rank
▷ IT & media stock market capitalization	47
Funding for technological development	18
Banking and financial services	22
Country credit rating	12
Venture capital	39
▷ Investment in Telecommunications	53

Technological framework	Rank
Communications technology	24
Mobile Broadband subscribers	33
Wireless broadband	32
Internet users	30
Internet bandwidth speed	41
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

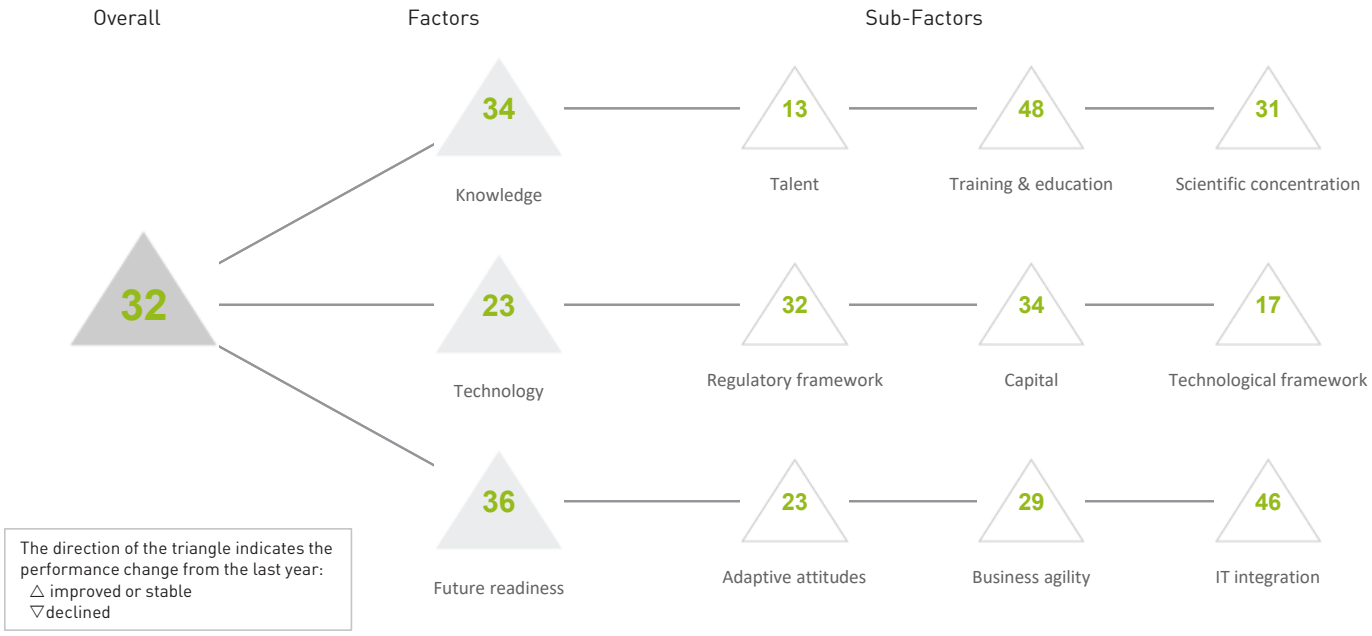
Adaptive attitudes	Rank
▶ E-Participation	06
Internet retailing	17
Tablet possession	18
Smartphone possession	15
Attitudes toward globalization	43

Business agility	Rank
Opportunities and threats	22
World robots distribution	23
Agility of companies	14
Use of big data and analytics	44
Knowledge transfer	14
Entrepreneurial fear of failure	10

IT integration	Rank
E-Government	15
Public-private partnerships	38
▶ Cyber security	04
▶ Software piracy	06
Government cyber security capacity	26
Privacy protection by law content	16

BAHRAIN

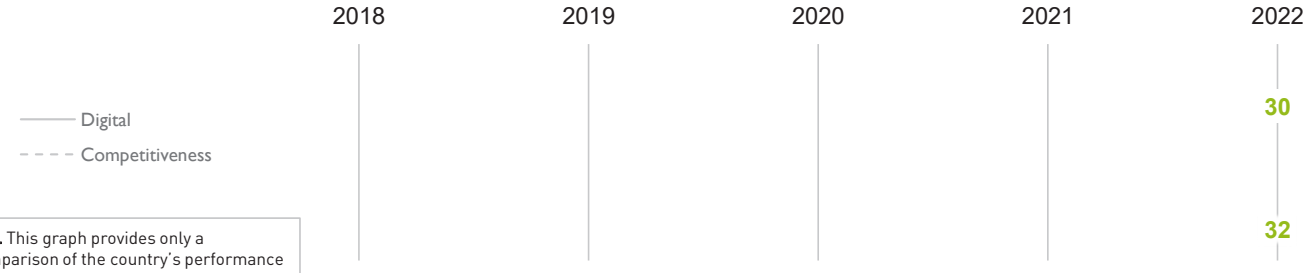
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

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

COMPETITIVENESS & DIGITAL RANKINGS



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	-
International experience	07
Foreign highly-skilled personnel	08
Management of cities	17
Digital/Technological skills	13
Net flow of international students	29

Training & education	Rank
Employee training	25
▷ Total public expenditure on education	61
Higher education achievement	34
Pupil-teacher ratio (tertiary education)	49
▷ Graduates in Sciences	58
▶ Women with degrees	03

Scientific concentration	Rank
Total expenditure on R&D (%)	-
Total R&D personnel per capita	-
Female researchers	19
R&D productivity by publication	-
Scientific and technical employment	-
High-tech patent grants	41
Robots in Education and R&D	-

TECHNOLOGY

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

Regulatory framework	Rank
Starting a business	33
Enforcing contracts	42
▶ Immigration laws	04
Development & application of tech.	15
Scientific research legislation	33
Intellectual property rights	33

Capital	Rank
IT & media stock market capitalization	26
Funding for technological development	28
Banking and financial services	18
▷ Country credit rating	59
Venture capital	38
Investment in Telecommunications	06

Technological framework	Rank
Communications technology	14
▶ Mobile Broadband subscribers	04
Wireless broadband	10
▶ Internet users	04
Internet bandwidth speed	34
▷ High-tech exports (%)	58

FUTURE READINESS

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

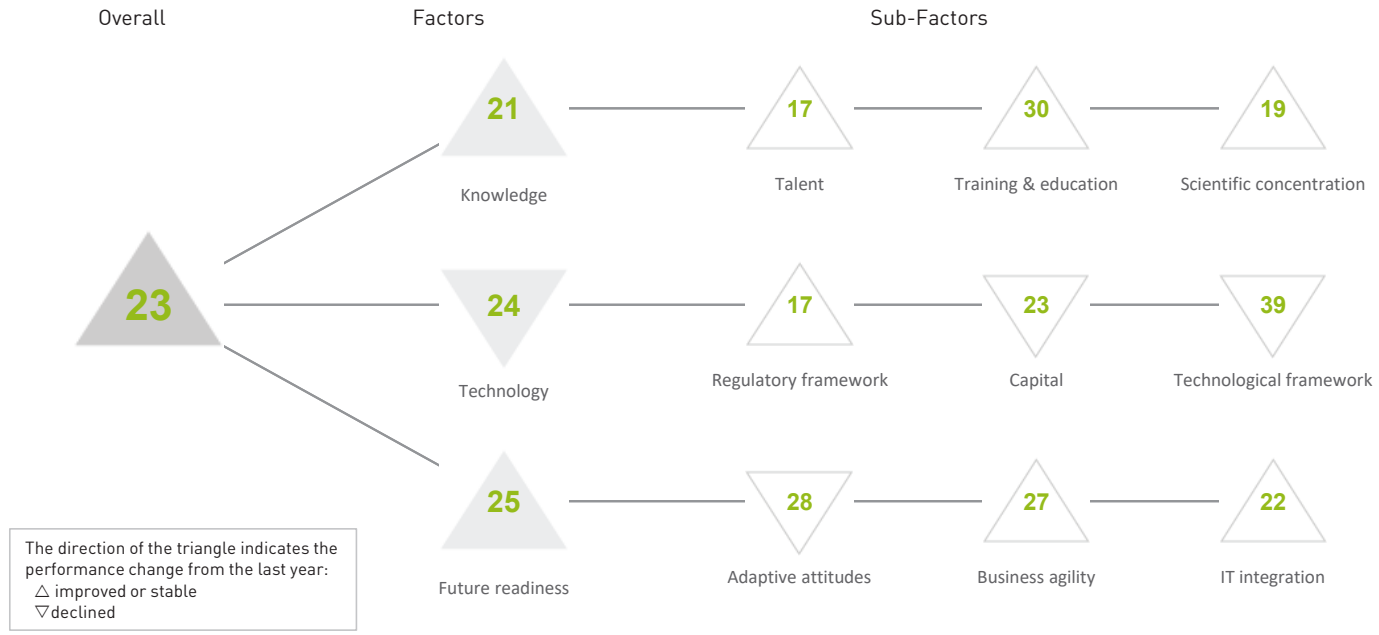
Adaptive attitudes	Rank
E-Participation	40
Internet retailing	41
▶ Tablet possession	01
Smartphone possession	24
Attitudes toward globalization	13

Business agility	Rank
Opportunities and threats	34
World robots distribution	-
Agility of companies	30
Use of big data and analytics	32
Knowledge transfer	25
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	34
Public-private partnerships	17
Cyber security	11
Software piracy	46
Government cyber security capacity	51
▷ Privacy protection by law content	60

BELGIUM

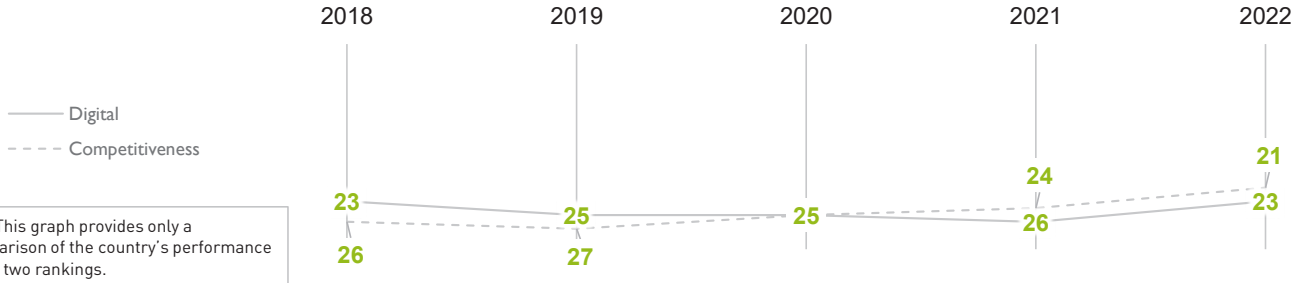
OVERALL PERFORMANCE (63 countries)



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
Educational assessment PISA - Math	14
International experience	12
Foreign highly-skilled personnel	20
Management of cities	31
Digital/Technological skills	36
Net flow of international students	13

Training & education	Rank
Employee training	22
▶ Total public expenditure on education	08
Higher education achievement	23
Pupil-teacher ratio (tertiary education)	38
▷ Graduates in Sciences	57
Women with degrees	22

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	05
Total R&D personnel per capita	12
Female researchers	40
▷ R&D productivity by publication	44
Scientific and technical employment	20
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
Starting a business	27
Enforcing contracts	39
▶ Immigration laws	07
Development & application of tech.	21
Scientific research legislation	13
Intellectual property rights	14

Capital	Rank
IT & media stock market capitalization	40
Funding for technological development	19
Banking and financial services	21
Country credit rating	20
Venture capital	15
Investment in Telecommunications	43

Technological framework	Rank
Communications technology	36
Mobile Broadband subscribers	39
▷ Wireless broadband	59
Internet users	18
Internet bandwidth speed	24
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

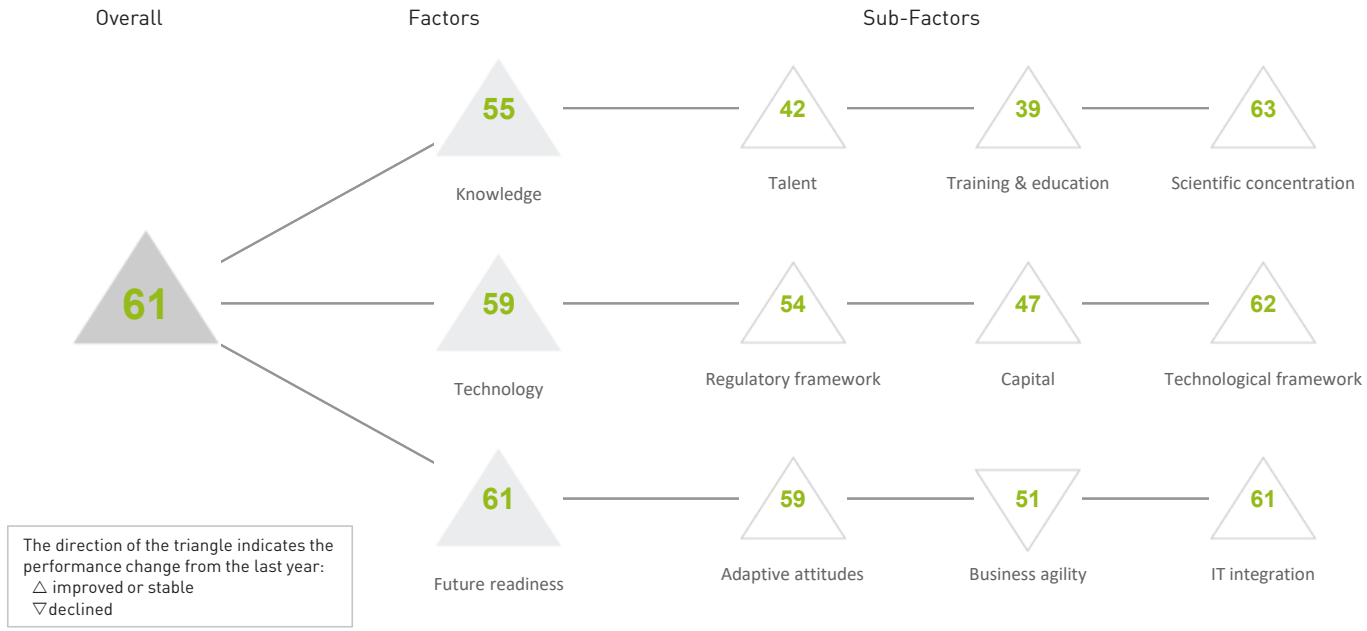
Adaptive attitudes	Rank
▷ E-Participation	55
Internet retailing	12
▶ Tablet possession	11
Smartphone possession	43
Attitudes toward globalization	39

Business agility	Rank
Opportunities and threats	33
World robots distribution	25
Agility of companies	29
Use of big data and analytics	31
Knowledge transfer	16
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	36
Public-private partnerships	15
Cyber security	35
Software piracy	13
▷ Government cyber security capacity	43
▶ Privacy protection by law content	10

BOTSWANA

OVERALL PERFORMANCE (63 countries)

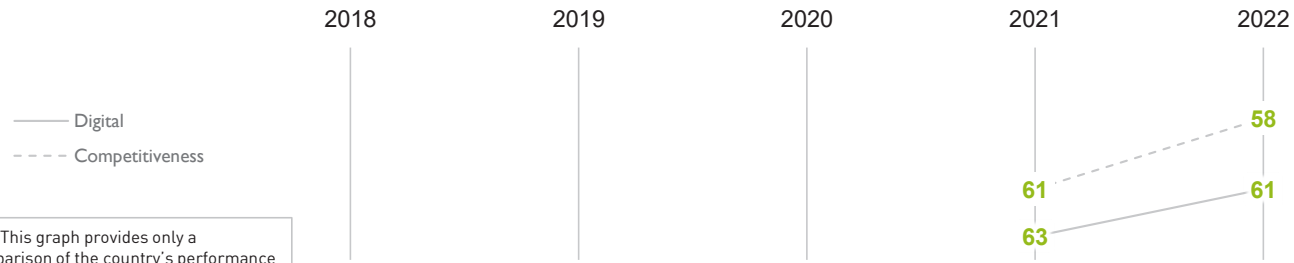


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	-
International experience	45
▶ Foreign highly-skilled personnel	21
Management of cities	49
Digital/Technological skills	55
Net flow of international students	47

Training & education	Rank
Employee training	57
▶ Total public expenditure on education	01
▷ Higher education achievement	61
Pupil-teacher ratio (tertiary education)	41
Graduates in Sciences	34
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	-
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	-
Scientific and technical employment	50
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
Starting a business	61
Enforcing contracts	56
Immigration laws	45
Development & application of tech.	49
Scientific research legislation	42
Intellectual property rights	50

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	51
Banking and financial services	50
Country credit rating	39
Venture capital	51
Investment in Telecommunications	41

Technological framework	Rank
Communications technology	53
▷ Mobile Broadband subscribers	63
Wireless broadband	49
▷ Internet users	62
▷ Internet bandwidth speed	63
▷ 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

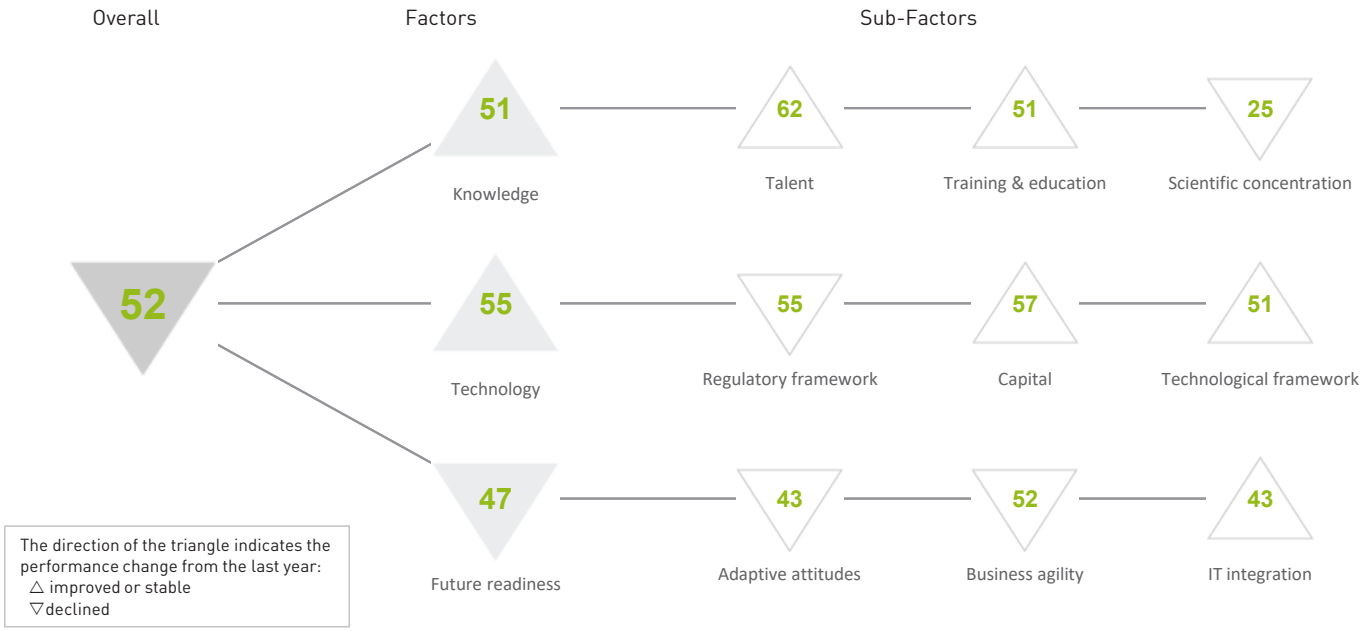
Adaptive attitudes	Rank
E-Participation	59
Internet retailing	-
Tablet possession	-
▶ Smartphone possession	16
Attitudes toward globalization	55

Business agility	Rank
Opportunities and threats	61
World robots distribution	-
Agility of companies	60
Use of big data and analytics	49
Knowledge transfer	53
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	59
Public-private partnerships	44
Cyber security	51
Software piracy	60
Government cyber security capacity	61
▶ Privacy protection by law content	27

BRAZIL

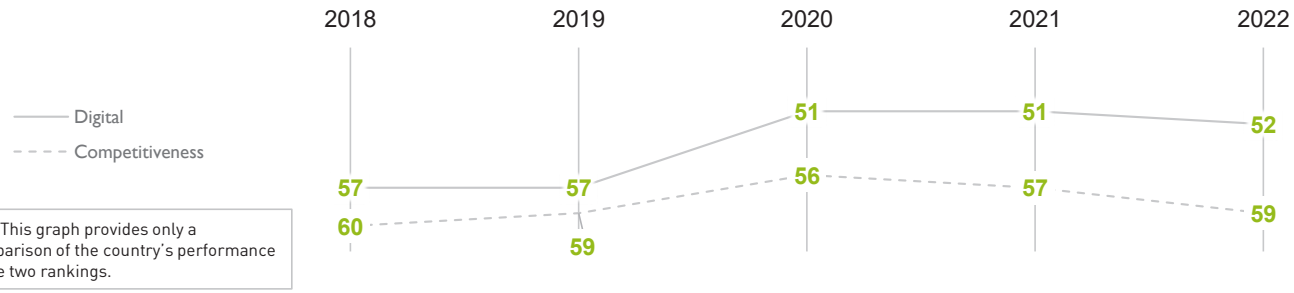
OVERALL PERFORMANCE (63 countries)



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
Educational assessment PISA - Math	53
▷ International experience	62
▷ Foreign highly-skilled personnel	60
▷ Management of cities	60
Digital/Technological skills	60
Net flow of international students	43

Training & education	Rank
Employee training	45
▶ Total public expenditure on education	07
Higher education achievement	56
Pupil-teacher ratio (tertiary education)	44
Graduates in Sciences	54
Women with degrees	49

Scientific concentration	Rank
Total expenditure on R&D (%)	37
Total R&D personnel per capita	-
▶ Female researchers	16
▶ R&D productivity by publication	08
Scientific and technical employment	35
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
Starting a business	57
Enforcing contracts	41
Immigration laws	26
Development & application of tech.	57
Scientific research legislation	59
▷ Intellectual property rights	60

Capital	Rank
IT & media stock market capitalization	45
Funding for technological development	59
Banking and financial services	56
Country credit rating	56
Venture capital	52
▶ Investment in Telecommunications	12

Technological framework	Rank
Communications technology	58
Mobile Broadband subscribers	36
Wireless broadband	48
Internet users	49
Internet bandwidth speed	44
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

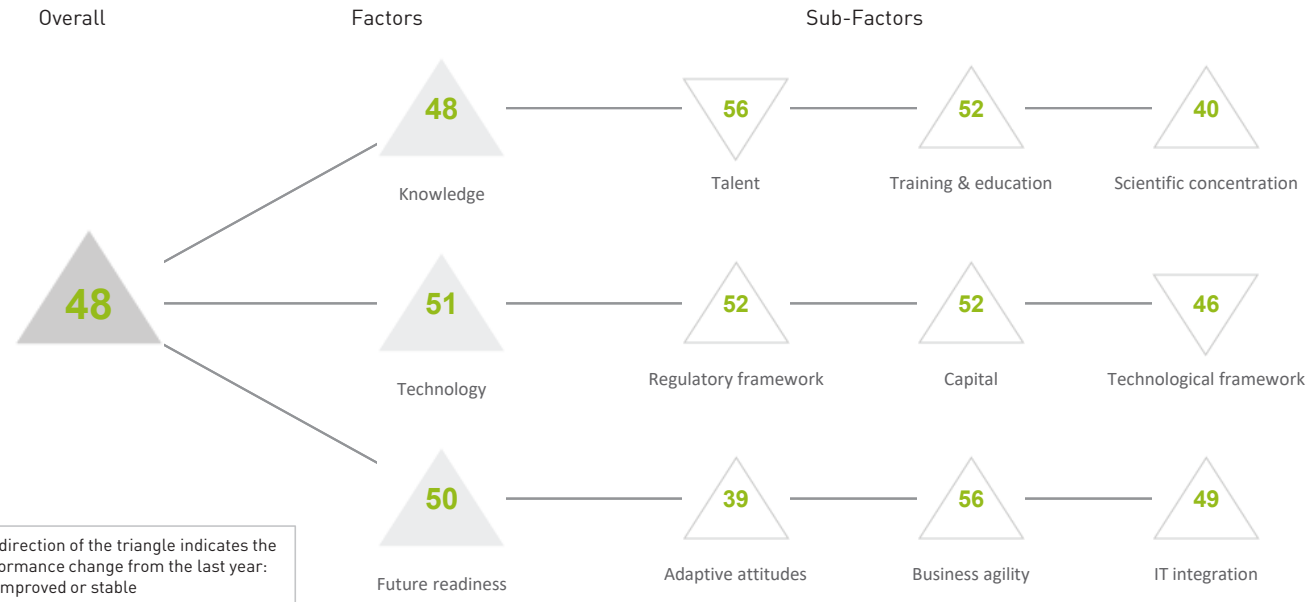
Adaptive attitudes	Rank
E-Participation	18
Internet retailing	43
Tablet possession	47
Smartphone possession	33
Attitudes toward globalization	53

Business agility	Rank
Opportunities and threats	42
World robots distribution	19
Agility of companies	50
Use of big data and analytics	60
▷ Knowledge transfer	61
Entrepreneurial fear of failure	27

IT integration	Rank
E-Government	47
Public-private partnerships	55
Cyber security	59
Software piracy	36
Government cyber security capacity	25
Privacy protection by law content	29

BULGARIA

OVERALL PERFORMANCE (63 countries)

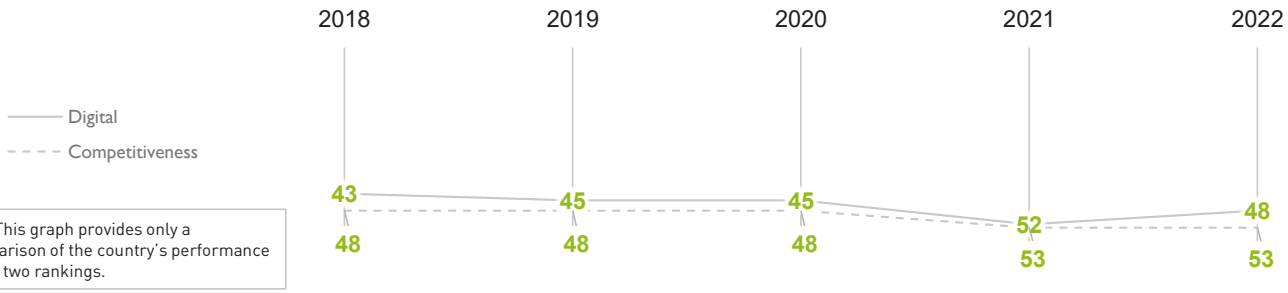


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	42
International experience	56
▷ Foreign highly-skilled personnel	61
Management of cities	51
Digital/Technological skills	26
Net flow of international students	52

Training & education	Rank
▷ Employee training	59
Total public expenditure on education	48
Higher education achievement	48
▶ Pupil-teacher ratio (tertiary education)	13
Graduates in Sciences	48
Women with degrees	35

Scientific concentration	Rank
Total expenditure on R&D (%)	43
Total R&D personnel per capita	35
▶ Female researchers	11
R&D productivity by publication	45
Scientific and technical employment	37
▶ 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
Starting a business	46
Enforcing contracts	31
Immigration laws	58
Development & application of tech.	53
Scientific research legislation	53
Intellectual property rights	55

Capital	Rank
IT & media stock market capitalization	43
Funding for technological development	47
Banking and financial services	52
Country credit rating	42
Venture capital	50
Investment in Telecommunications	37

Technological framework	Rank
Communications technology	35
Mobile Broadband subscribers	37
Wireless broadband	21
Internet users	55
Internet bandwidth speed	38
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

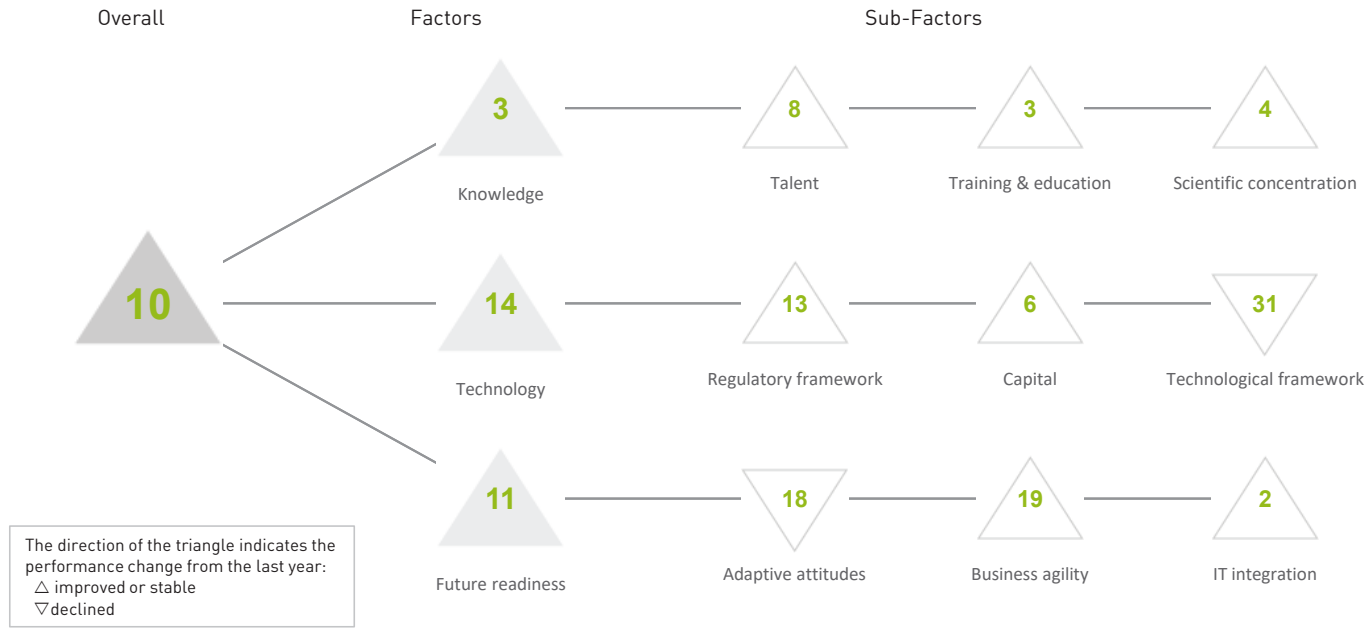
Adaptive attitudes	Rank
E-Participation	22
Internet retailing	47
Tablet possession	45
Smartphone possession	23
Attitudes toward globalization	50

Business agility	Rank
▷ Opportunities and threats	60
World robots distribution	44
▷ Agility of companies	62
Use of big data and analytics	54
Knowledge transfer	57
▶ Entrepreneurial fear of failure	06

IT integration	Rank
E-Government	39
Public-private partnerships	51
Cyber security	53
Software piracy	51
▷ Government cyber security capacity	59
▶ Privacy protection by law content	20

CANADA

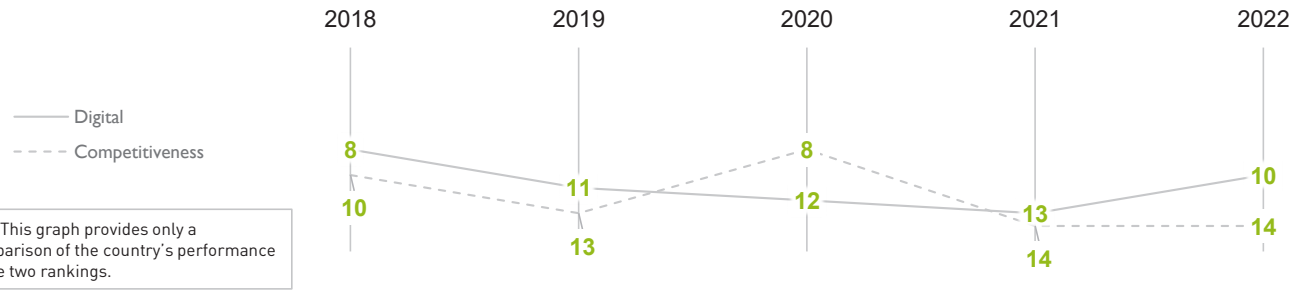
OVERALL PERFORMANCE (63 countries)



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

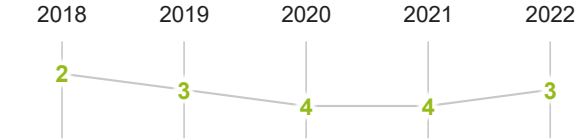
COMPETITIVENESS & DIGITAL RANKINGS



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
Educational assessment PISA - Math	11
International experience	22
Foreign highly-skilled personnel	11
Management of cities	19
Digital/Technological skills	14
Net flow of international students	05

Training & education	Rank
Employee training	10
▷ Total public expenditure on education	32
Higher education achievement	05
Pupil-teacher ratio (tertiary education)	08
Graduates in Sciences	28
▶ Women with degrees	01

Scientific concentration	Rank
Total expenditure on R&D (%)	24
Total R&D personnel per capita	22
Female researchers	19
R&D productivity by publication	10
▶ Scientific and technical employment	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
▶ Starting a business	02
▷ Enforcing contracts	49
Immigration laws	05
Development & application of tech.	12
Scientific research legislation	08
Intellectual property rights	23

Capital	Rank
IT & media stock market capitalization	19
Funding for technological development	15
Banking and financial services	13
Country credit rating	10
Venture capital	18
Investment in Telecommunications	11

Technological framework	Rank
Communications technology	30
Mobile Broadband subscribers	34
▷ Wireless broadband	53
Internet users	14
Internet bandwidth speed	18
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

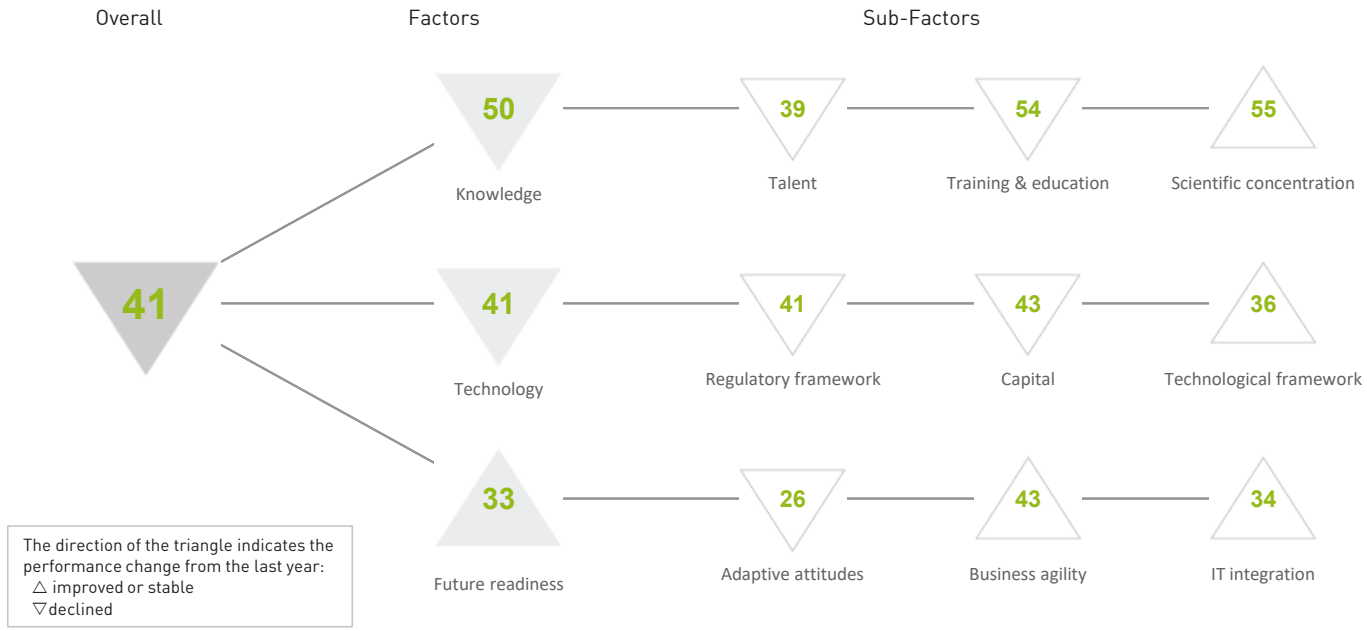
Adaptive attitudes	Rank
E-Participation	16
▶ Internet retailing	04
Tablet possession	22
▷ Smartphone possession	55
Attitudes toward globalization	24

Business agility	Rank
Opportunities and threats	18
World robots distribution	13
Agility of companies	18
Use of big data and analytics	04
Knowledge transfer	15
▷ Entrepreneurial fear of failure	47

IT integration	Rank
E-Government	26
▶ Public-private partnerships	03
Cyber security	12
Software piracy	13
Government cyber security capacity	04
Privacy protection by law content	15

CHILE

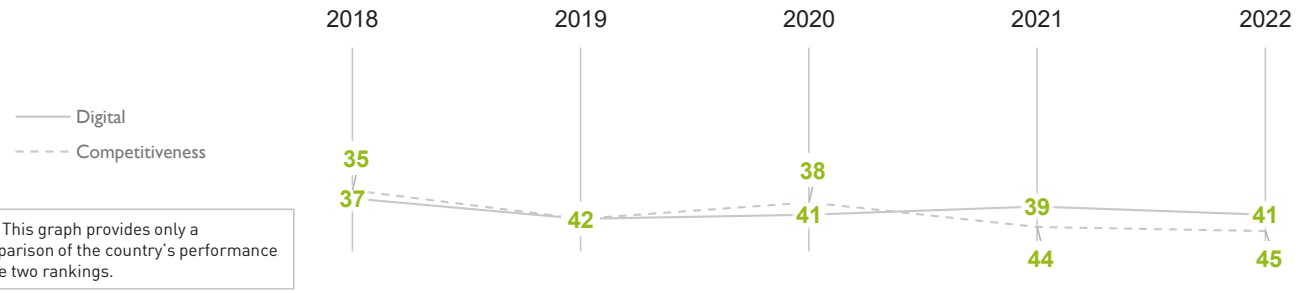
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
	Educational assessment PISA - Math	47
	International experience	18
▶	Foreign highly-skilled personnel	12
▷	Management of cities	55
	Digital/Technological skills	31
	Net flow of international students	45

	Training & education	Rank
▷	Employee training	56
	Total public expenditure on education	23
	Higher education achievement	46
	Pupil-teacher ratio (tertiary education)	-
	Graduates in Sciences	45
	Women with degrees	47

	Scientific concentration	Rank
	Total expenditure on R&D (%)	53
	Total R&D personnel per capita	48
	Female researchers	33
	R&D productivity by publication	20
	Scientific and technical employment	38
▷	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
	Starting a business	30
	Enforcing contracts	37
▶	Immigration laws	09
	Development & application of tech.	52
▷	Scientific research legislation	58
	Intellectual property rights	48

	Capital	Rank
▷	IT & media stock market capitalization	53
	Funding for technological development	52
	Banking and financial services	25
	Country credit rating	32
	Venture capital	44
▶	Investment in Telecommunications	18

	Technological framework	Rank
	Communications technology	26
	Mobile Broadband subscribers	32
	Wireless broadband	41
	Internet users	41
	Internet bandwidth speed	25
	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

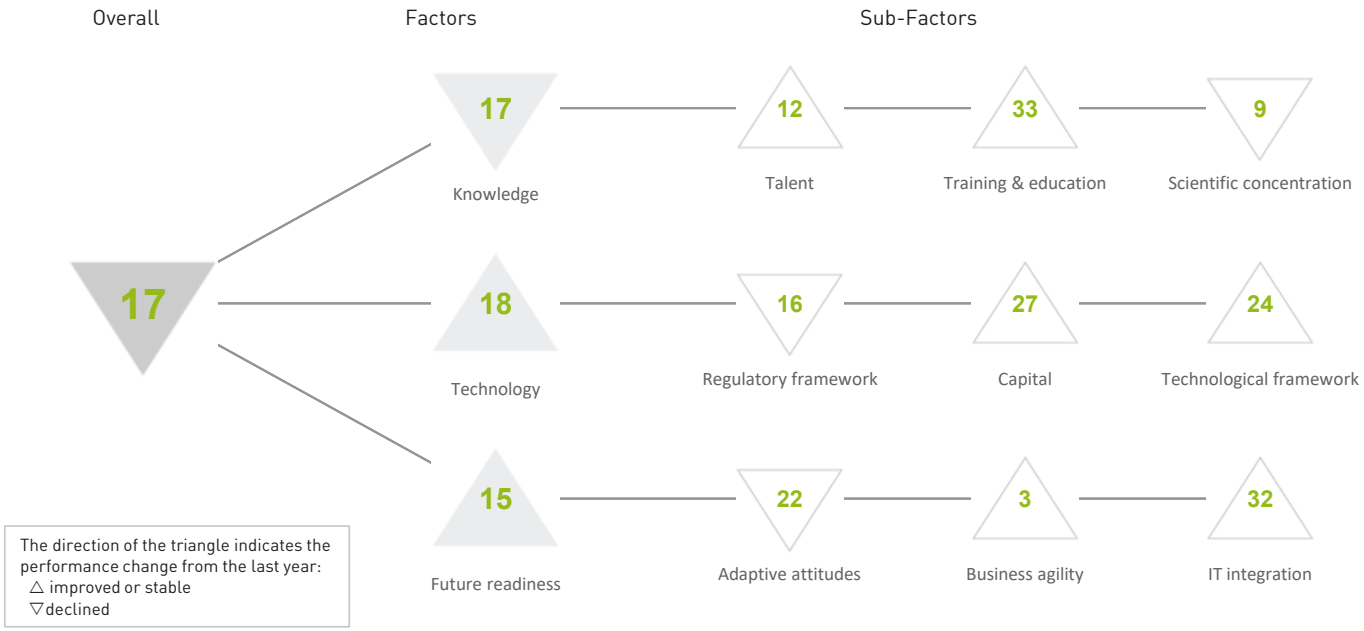
	Adaptive attitudes	Rank
	E-Participation	27
	Internet retailing	34
	Tablet possession	34
▶	Smartphone possession	06
	Attitudes toward globalization	19

	Business agility	Rank
	Opportunities and threats	25
	World robots distribution	48
	Agility of companies	26
	Use of big data and analytics	45
	Knowledge transfer	52
	Entrepreneurial fear of failure	32

	IT integration	Rank
	E-Government	31
	Public-private partnerships	23
	Cyber security	42
	Software piracy	47
▶	Government cyber security capacity	18
	Privacy protection by law content	36

CHINA

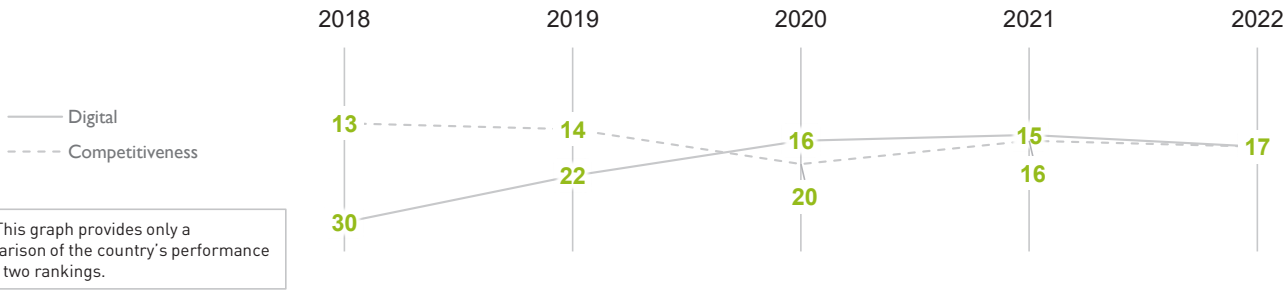
OVERALL PERFORMANCE (63 countries)



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
▶ Educational assessment PISA - Math	01
International experience	47
Foreign highly-skilled personnel	35
Management of cities	08
Digital/Technological skills	12
Net flow of international students	46

Training & education	Rank
Employee training	11
▷ Total public expenditure on education	53
Higher education achievement	16
Pupil-teacher ratio (tertiary education)	40
Graduates in Sciences	-
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	14
Total R&D personnel per capita	36
▷ Female researchers	51
▶ R&D productivity by publication	01
Scientific and technical employment	49
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
Starting a business	16
Enforcing contracts	05
Immigration laws	36
Development & application of tech.	16
Scientific research legislation	19
Intellectual property rights	36

Capital	Rank
IT & media stock market capitalization	24
Funding for technological development	17
Banking and financial services	40
Country credit rating	26
Venture capital	31
Investment in Telecommunications	34

Technological framework	Rank
Communications technology	11
Mobile Broadband subscribers	05
Wireless broadband	20
▷ Internet users	53
Internet bandwidth speed	33
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

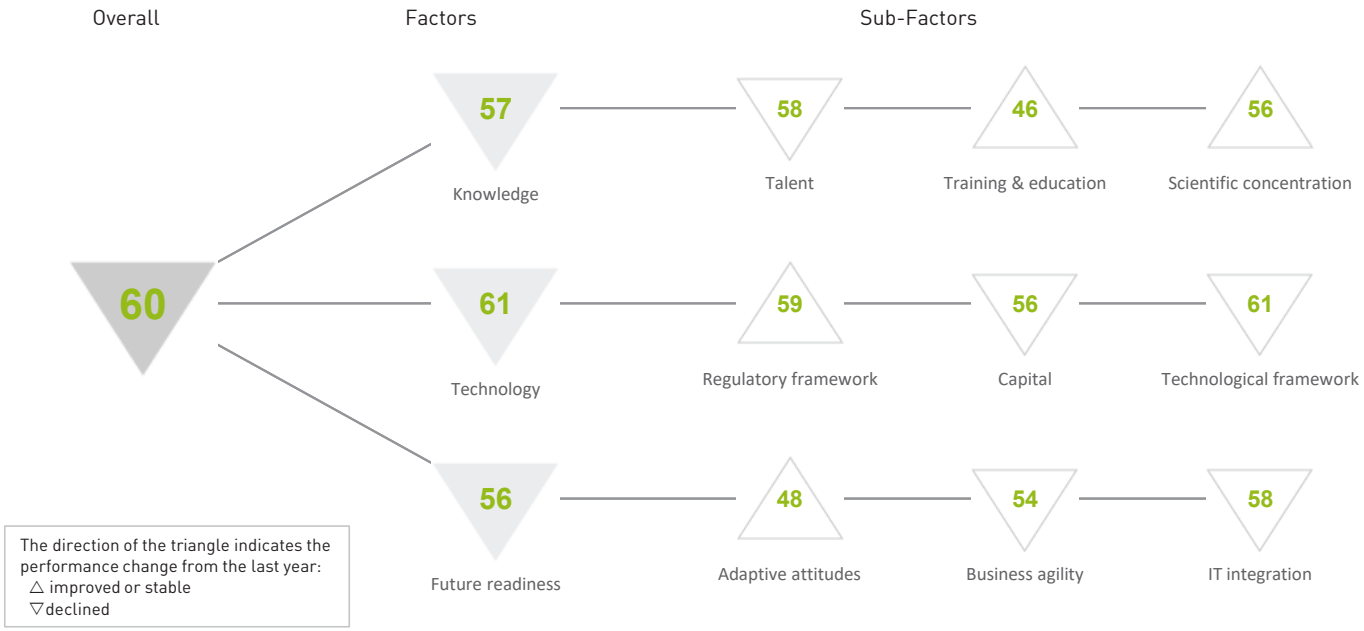
Adaptive attitudes	Rank
E-Participation	09
Internet retailing	25
Tablet possession	38
Smartphone possession	43
Attitudes toward globalization	12

Business agility	Rank
Opportunities and threats	13
▶ World robots distribution	01
Agility of companies	22
Use of big data and analytics	05
Knowledge transfer	20
Entrepreneurial fear of failure	25

IT integration	Rank
E-Government	40
Public-private partnerships	06
Cyber security	10
▷ Software piracy	56
▶ Government cyber security capacity	03
▷ Privacy protection by law content	59

COLOMBIA

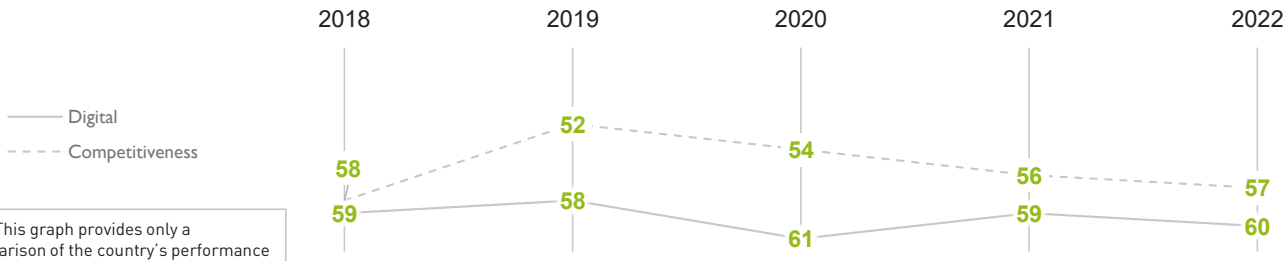
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	52
International experience	51
Foreign highly-skilled personnel	48
Management of cities	45
Digital/Technological skills	53
Net flow of international students	49

Training & education	Rank
Employee training	41
Total public expenditure on education	40
Higher education achievement	50
▶ Pupil-teacher ratio (tertiary education)	31
Graduates in Sciences	30
Women with degrees	46

Scientific concentration	Rank
Total expenditure on R&D (%)	56
Total R&D personnel per capita	46
Female researchers	29
▶ R&D productivity by publication	14
Scientific and technical employment	48
▷ 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
Starting a business	39
▷ Enforcing contracts	63
Immigration laws	48
Development & application of tech.	47
Scientific research legislation	50
Intellectual property rights	51

Capital	Rank
IT & media stock market capitalization	57
Funding for technological development	49
Banking and financial services	59
Country credit rating	52
Venture capital	54
▶ Investment in Telecommunications	03

Technological framework	Rank
Communications technology	57
▷ Mobile Broadband subscribers	60
▷ Wireless broadband	62
Internet users	56
Internet bandwidth speed	55
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

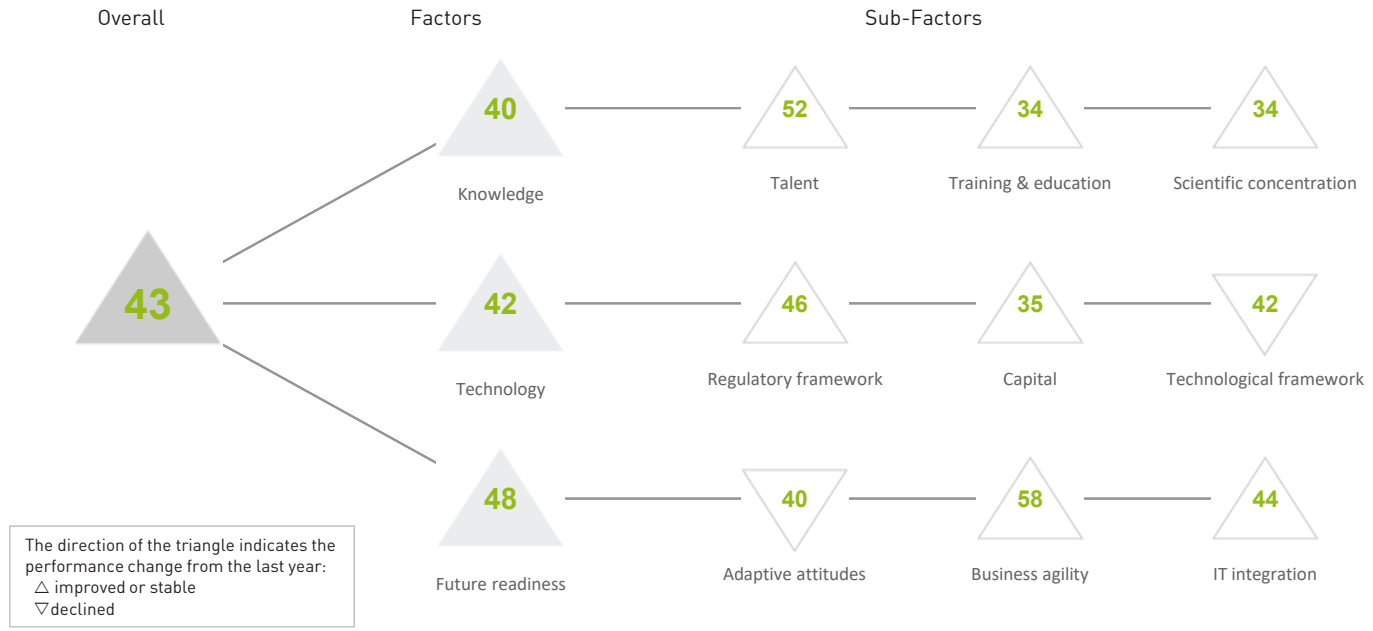
Adaptive attitudes	Rank
▶ E-Participation	26
Internet retailing	54
Tablet possession	52
▶ Smartphone possession	31
Attitudes toward globalization	41

Business agility	Rank
Opportunities and threats	59
World robots distribution	49
Agility of companies	41
Use of big data and analytics	36
Knowledge transfer	43
Entrepreneurial fear of failure	37

IT integration	Rank
E-Government	52
Public-private partnerships	37
Cyber security	57
Software piracy	40
▷ Government cyber security capacity	63
Privacy protection by law content	52

CROATIA

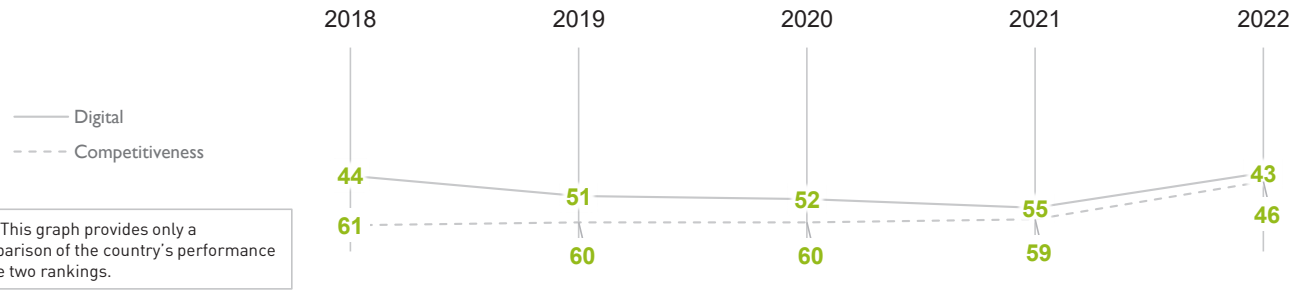
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	36
▷ International experience	57
▷ Foreign highly-skilled personnel	59
Management of cities	48
Digital/Technological skills	32
Net flow of international students	50

Training & education	Rank
Employee training	49
Total public expenditure on education	21
Higher education achievement	42
▶ Pupil-teacher ratio (tertiary education)	07
▶ Graduates in Sciences	20
Women with degrees	42

Scientific concentration	Rank
Total expenditure on R&D (%)	34
Total R&D personnel per capita	34
▶ Female researchers	10
R&D productivity by publication	49
Scientific and technical employment	34
▶ 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
Starting a business	47
Enforcing contracts	23
Immigration laws	44
▷ Development & application of tech.	56
Scientific research legislation	47
Intellectual property rights	46

Capital	Rank
IT & media stock market capitalization	22
Funding for technological development	46
Banking and financial services	37
Country credit rating	50
Venture capital	42
▶ Investment in Telecommunications	05

Technological framework	Rank
Communications technology	32
Mobile Broadband subscribers	23
Wireless broadband	50
Internet users	38
Internet bandwidth speed	47
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

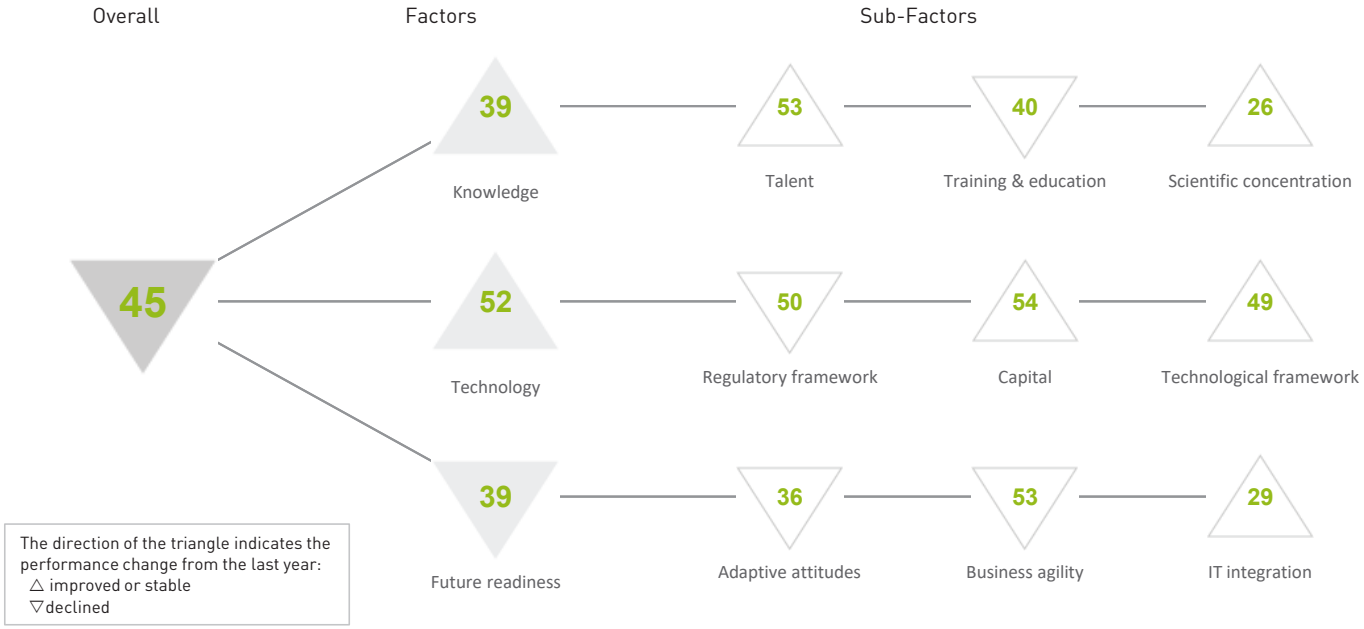
Adaptive attitudes	Rank
E-Participation	22
Internet retailing	45
Tablet possession	34
Smartphone possession	40
▷ Attitudes toward globalization	57

Business agility	Rank
Opportunities and threats	53
World robots distribution	47
Agility of companies	45
Use of big data and analytics	51
▷ Knowledge transfer	59
Entrepreneurial fear of failure	29

IT integration	Rank
E-Government	44
Public-private partnerships	56
Cyber security	44
Software piracy	43
Government cyber security capacity	45
Privacy protection by law content	25

CYPRUS

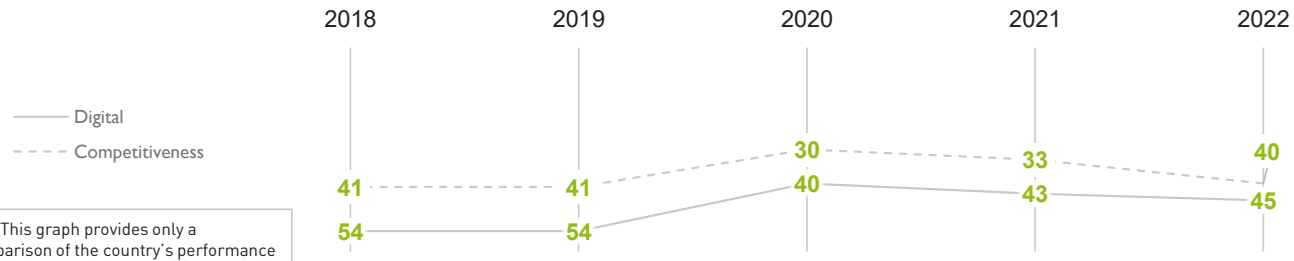
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	40
International experience	34
Foreign highly-skilled personnel	30
Management of cities	32
Digital/Technological skills	29
▷ Net flow of international students	60

Training & education	Rank
Employee training	51
▶ Total public expenditure on education	15
▶ Higher education achievement	11
Pupil-teacher ratio (tertiary education)	52
▷ Graduates in Sciences	60
Women with degrees	19

Scientific concentration	Rank
Total expenditure on R&D (%)	45
Total R&D personnel per capita	40
Female researchers	27
R&D productivity by publication	56
▶ Scientific and technical employment	04
▶ 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
Starting a business	28
▷ Enforcing contracts	58
▷ Immigration laws	60
Development & application of tech.	42
Scientific research legislation	46
Intellectual property rights	38

Capital	Rank
IT & media stock market capitalization	36
Funding for technological development	48
Banking and financial services	45
Country credit rating	54
Venture capital	57
Investment in Telecommunications	42

Technological framework	Rank
Communications technology	27
▷ Mobile Broadband subscribers	57
Wireless broadband	44
Internet users	29
Internet bandwidth speed	50
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

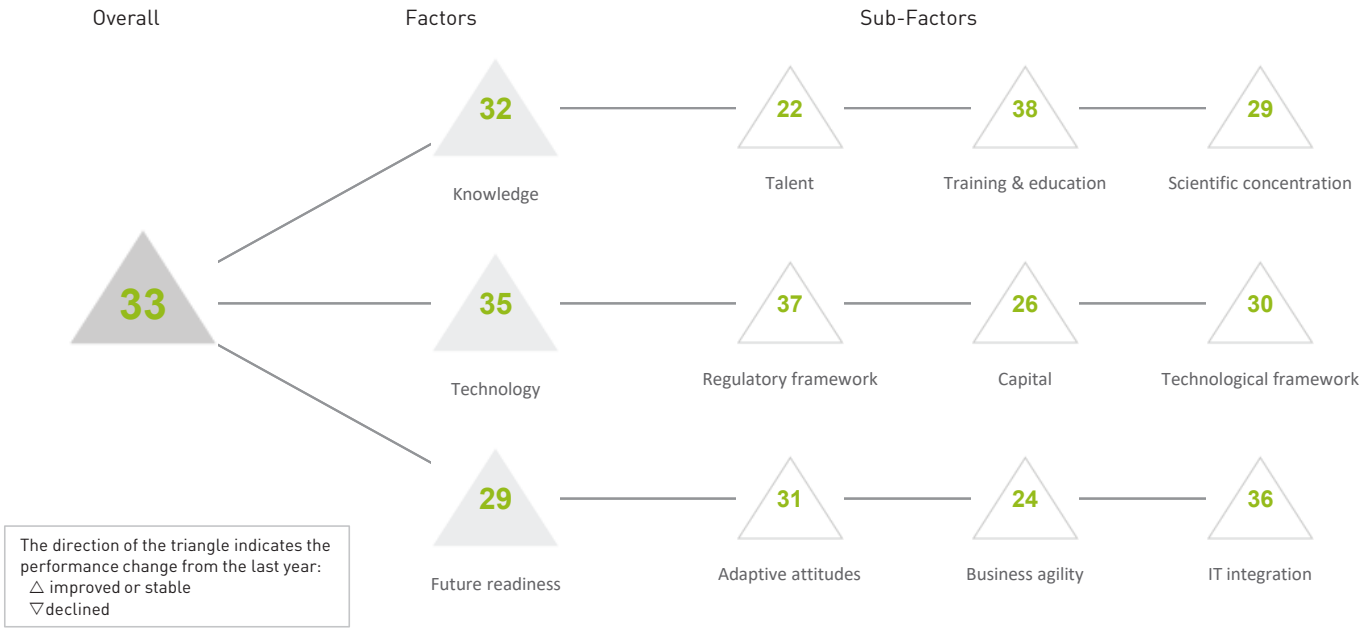
Adaptive attitudes	Rank
▶ E-Participation	14
Internet retailing	-
Tablet possession	46
Smartphone possession	-
Attitudes toward globalization	54

Business agility	Rank
Opportunities and threats	54
World robots distribution	-
Agility of companies	54
Use of big data and analytics	48
Knowledge transfer	44
Entrepreneurial fear of failure	40

IT integration	Rank
E-Government	18
Public-private partnerships	42
Cyber security	36
Software piracy	34
Government cyber security capacity	30
Privacy protection by law content	24

CZECH REPUBLIC

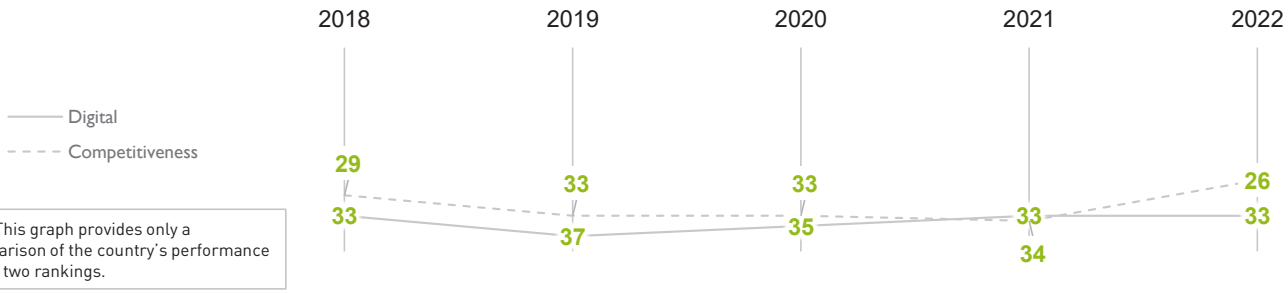
OVERALL PERFORMANCE (63 countries)



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
Educational assessment PISA - Math	21
International experience	23
Foreign highly-skilled personnel	36
Management of cities	35
Digital/Technological skills	23
▶ Net flow of international students	12

Training & education	Rank
Employee training	31
Total public expenditure on education	28
Higher education achievement	47
Pupil-teacher ratio (tertiary education)	32
Graduates in Sciences	23
Women with degrees	45

Scientific concentration	Rank
Total expenditure on R&D (%)	19
Total R&D personnel per capita	16
Female researchers	49
R&D productivity by publication	34
Scientific and technical employment	30
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
▷ Starting a business	55
▷ Enforcing contracts	51
Immigration laws	22
Development & application of tech.	38
Scientific research legislation	27
Intellectual property rights	21

Capital	Rank
IT & media stock market capitalization	27
Funding for technological development	24
▶ Banking and financial services	14
Country credit rating	22
Venture capital	25
▷ Investment in Telecommunications	52

Technological framework	Rank
Communications technology	34
▶ Mobile Broadband subscribers	07
Wireless broadband	28
Internet users	39
Internet bandwidth speed	42
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

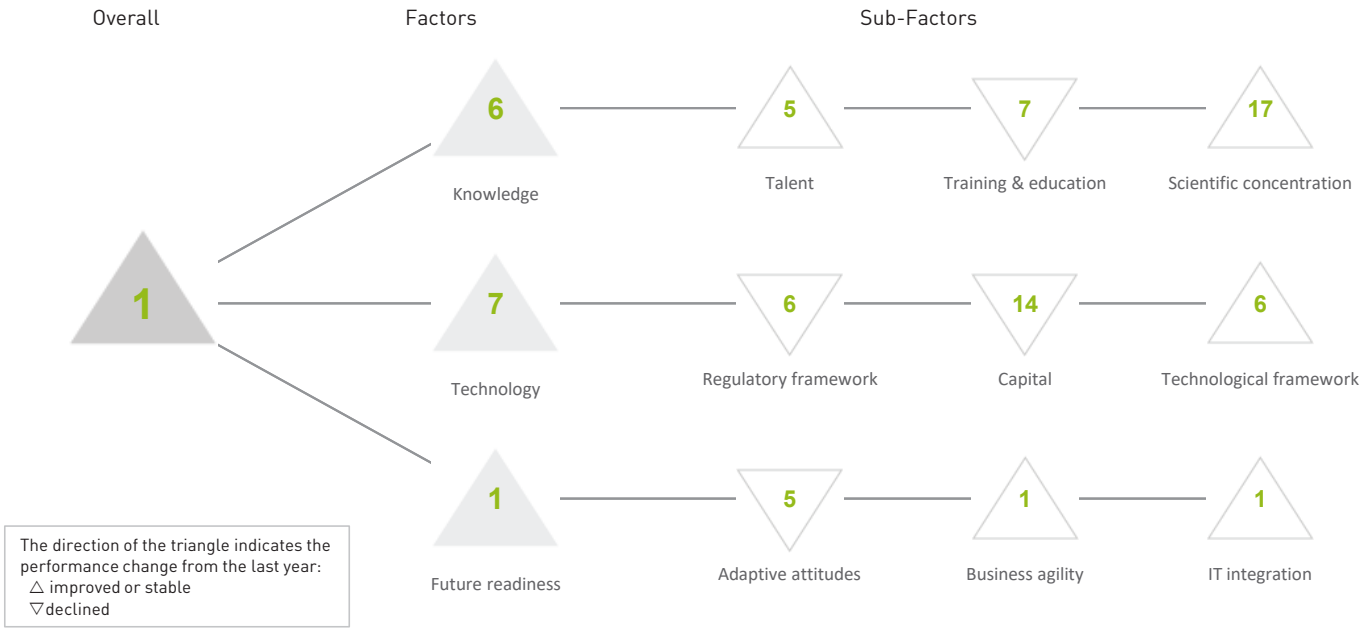
Adaptive attitudes	Rank
E-Participation	49
Internet retailing	21
Tablet possession	43
Smartphone possession	17
Attitudes toward globalization	28

Business agility	Rank
Opportunities and threats	15
World robots distribution	16
Agility of companies	19
Use of big data and analytics	33
Knowledge transfer	35
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	35
▷ Public-private partnerships	58
Cyber security	29
Software piracy	20
▷ Government cyber security capacity	50
▶ Privacy protection by law content	12

DENMARK

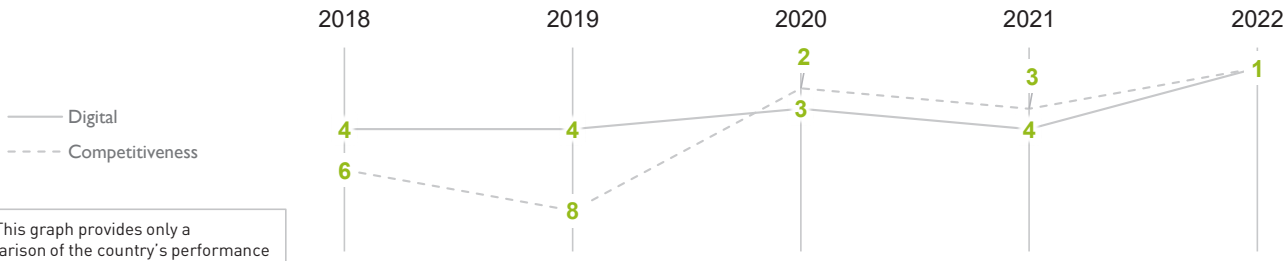
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	12
International experience	11
Foreign highly-skilled personnel	16
Management of cities	02
Digital/Technological skills	05
Net flow of international students	10

Training & education	Rank
▶ Employee training	01
Total public expenditure on education	10
Higher education achievement	26
Pupil-teacher ratio (tertiary education)	04
▷ Graduates in Sciences	38
Women with degrees	24

Scientific concentration	Rank
Total expenditure on R&D (%)	11
Total R&D personnel per capita	02
Female researchers	32
▷ R&D productivity by publication	43
Scientific and technical employment	21
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
Starting a business	25
Enforcing contracts	13
▷ Immigration laws	42
Development & application of tech.	01
Scientific research legislation	05
Intellectual property rights	03

Capital	Rank
▷ IT & media stock market capitalization	54
Funding for technological development	03
Banking and financial services	01
Country credit rating	01
Venture capital	07
▷ Investment in Telecommunications	35

Technological framework	Rank
Communications technology	03
Mobile Broadband subscribers	08
Wireless broadband	11
Internet users	07
Internet bandwidth speed	03
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

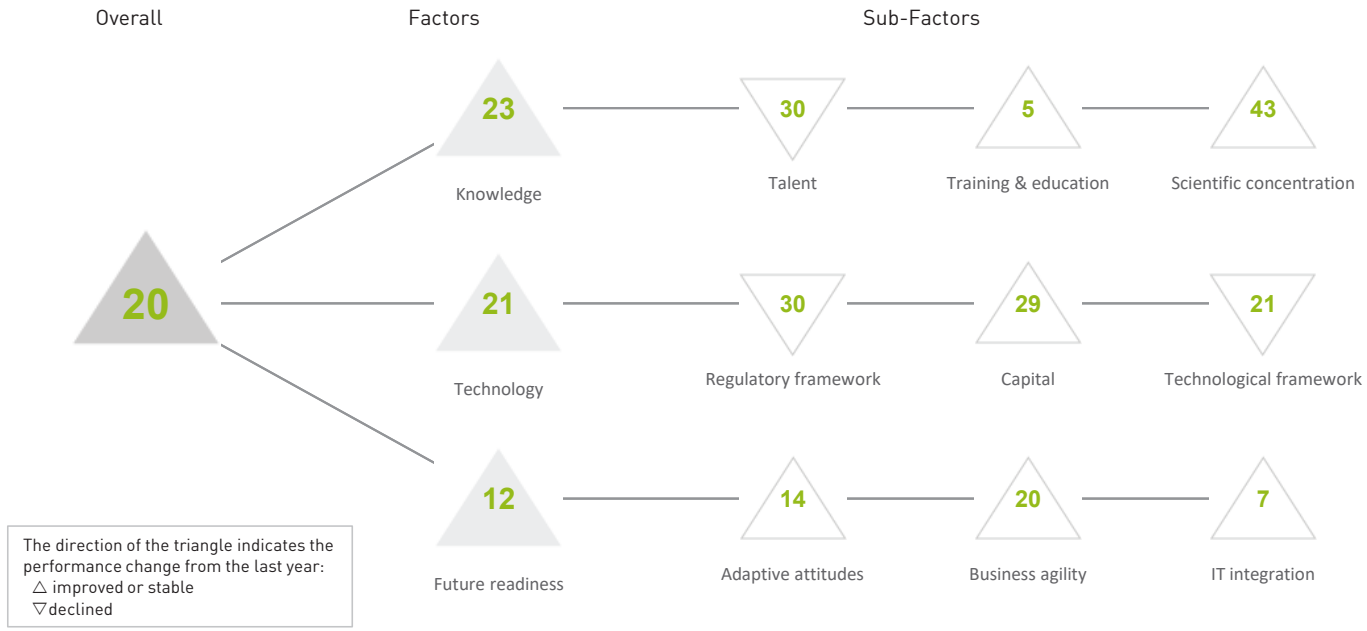
Adaptive attitudes	Rank
E-Participation	09
Internet retailing	08
Tablet possession	19
Smartphone possession	35
Attitudes toward globalization	03

Business agility	Rank
▶ Opportunities and threats	01
World robots distribution	29
▶ Agility of companies	01
Use of big data and analytics	06
Knowledge transfer	04
Entrepreneurial fear of failure	-

IT integration	Rank
▶ E-Government	01
▶ Public-private partnerships	01
Cyber security	14
Software piracy	08
Government cyber security capacity	08
Privacy protection by law content	26

ESTONIA

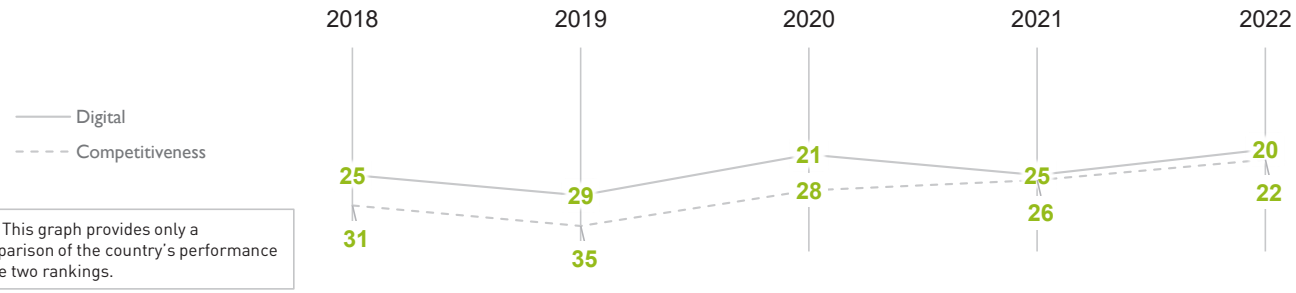
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	07
International experience	37
Foreign highly-skilled personnel	26
Management of cities	42
Digital/Technological skills	44
Net flow of international students	28

Training & education	Rank
Employee training	08
Total public expenditure on education	09
Higher education achievement	33
Pupil-teacher ratio (tertiary education)	14
Graduates in Sciences	17
Women with degrees	12

Scientific concentration	Rank
Total expenditure on R&D (%)	21
Total R&D personnel per capita	29
Female researchers	18
▷ R&D productivity by publication	59
Scientific and technical employment	29
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
Starting a business	07
Enforcing contracts	08
▷ Immigration laws	53
Development & application of tech.	23
Scientific research legislation	36
Intellectual property rights	25

Capital	Rank
▷ IT & media stock market capitalization	48
Funding for technological development	22
Banking and financial services	16
Country credit rating	24
Venture capital	10
Investment in Telecommunications	45

Technological framework	Rank
Communications technology	37
Mobile Broadband subscribers	46
▶ Wireless broadband	04
Internet users	12
Internet bandwidth speed	27
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

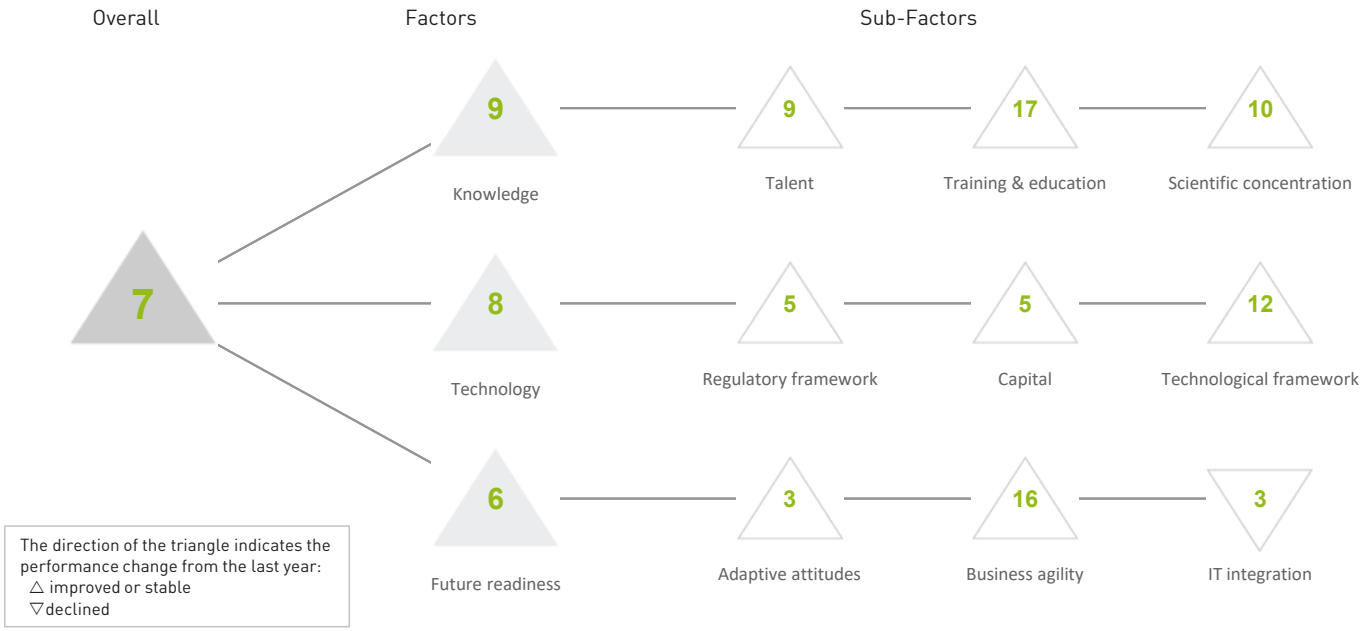
Adaptive attitudes	Rank
▶ E-Participation	01
Internet retailing	24
Tablet possession	07
Smartphone possession	13
Attitudes toward globalization	34

Business agility	Rank
Opportunities and threats	28
World robots distribution	46
Agility of companies	11
Use of big data and analytics	22
Knowledge transfer	25
▶ Entrepreneurial fear of failure	07

IT integration	Rank
▶ E-Government	03
▷ Public-private partnerships	50
Cyber security	16
Software piracy	30
▶ Government cyber security capacity	02
Privacy protection by law content	09

FINLAND

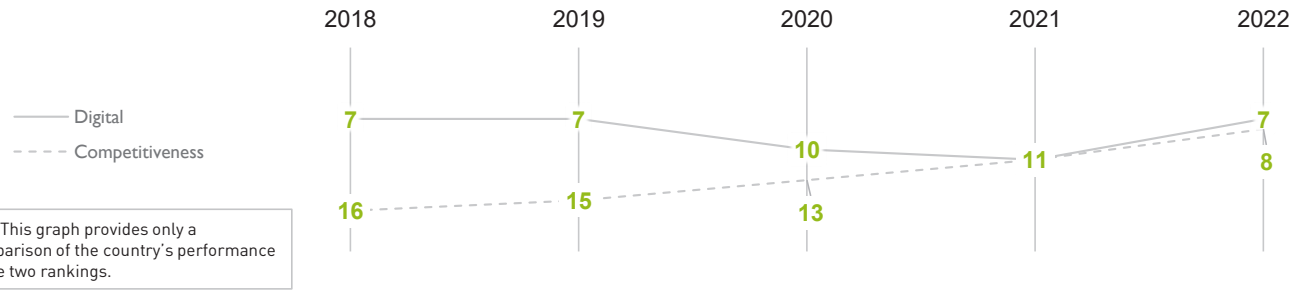
OVERALL PERFORMANCE (63 countries)



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
Educational assessment PISA - Math	15
International experience	15
▷ Foreign highly-skilled personnel	42
Management of cities	03
Digital/Technological skills	03
Net flow of international students	18

Training & education	Rank
Employee training	09
Total public expenditure on education	16
Higher education achievement	29
▷ Pupil-teacher ratio (tertiary education)	45
Graduates in Sciences	13
Women with degrees	05

Scientific concentration	Rank
Total expenditure on R&D (%)	12
Total R&D personnel per capita	05
Female researchers	36
▷ R&D productivity by publication	48
Scientific and technical employment	11
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
Starting a business	18
Enforcing contracts	33
Immigration laws	30
▶ Development & application of tech.	02
Scientific research legislation	03
▶ Intellectual property rights	01

Capital	Rank
IT & media stock market capitalization	16
▶ Funding for technological development	01
Banking and financial services	02
Country credit rating	12
Venture capital	02
▷ Investment in Telecommunications	56

Technological framework	Rank
▶ Communications technology	01
Mobile Broadband subscribers	12
Wireless broadband	07
Internet users	15
Internet bandwidth speed	30
▷ 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

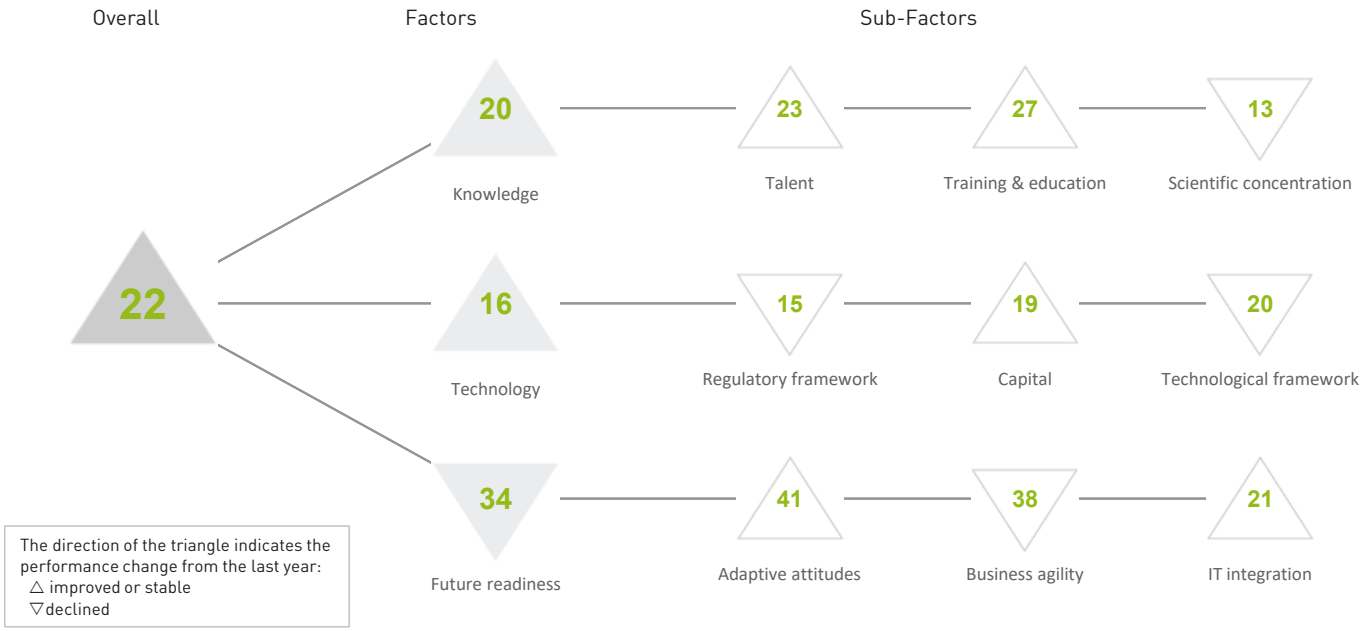
Adaptive attitudes	Rank
E-Participation	14
Internet retailing	13
Tablet possession	08
Smartphone possession	22
▶ Attitudes toward globalization	02

Business agility	Rank
Opportunities and threats	15
World robots distribution	33
Agility of companies	15
Use of big data and analytics	15
Knowledge transfer	05
Entrepreneurial fear of failure	24

IT integration	Rank
E-Government	04
Public-private partnerships	04
Cyber security	03
Software piracy	13
Government cyber security capacity	34
Privacy protection by law content	14

FRANCE

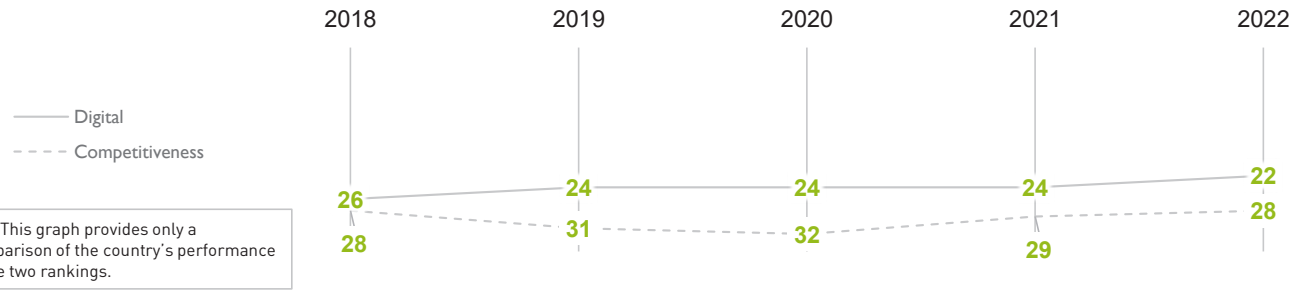
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	24
International experience	42
Foreign highly-skilled personnel	24
Management of cities	15
Digital/Technological skills	28
Net flow of international students	19

Training & education	Rank
Employee training	17
Total public expenditure on education	20
Higher education achievement	21
Pupil-teacher ratio (tertiary education)	39
Graduates in Sciences	25
Women with degrees	29

Scientific concentration	Rank
Total expenditure on R&D (%)	15
Total R&D personnel per capita	20
▷ Female researchers	46
R&D productivity by publication	17
Scientific and technical employment	15
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
Starting a business	21
Enforcing contracts	15
▶ Immigration laws	14
Development & application of tech.	36
Scientific research legislation	23
Intellectual property rights	16

Capital	Rank
IT & media stock market capitalization	30
Funding for technological development	29
Banking and financial services	33
Country credit rating	15
Venture capital	21
Investment in Telecommunications	16

Technological framework	Rank
Communications technology	18
Mobile Broadband subscribers	29
Wireless broadband	37
Internet users	27
▶ Internet bandwidth speed	13
▶ 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

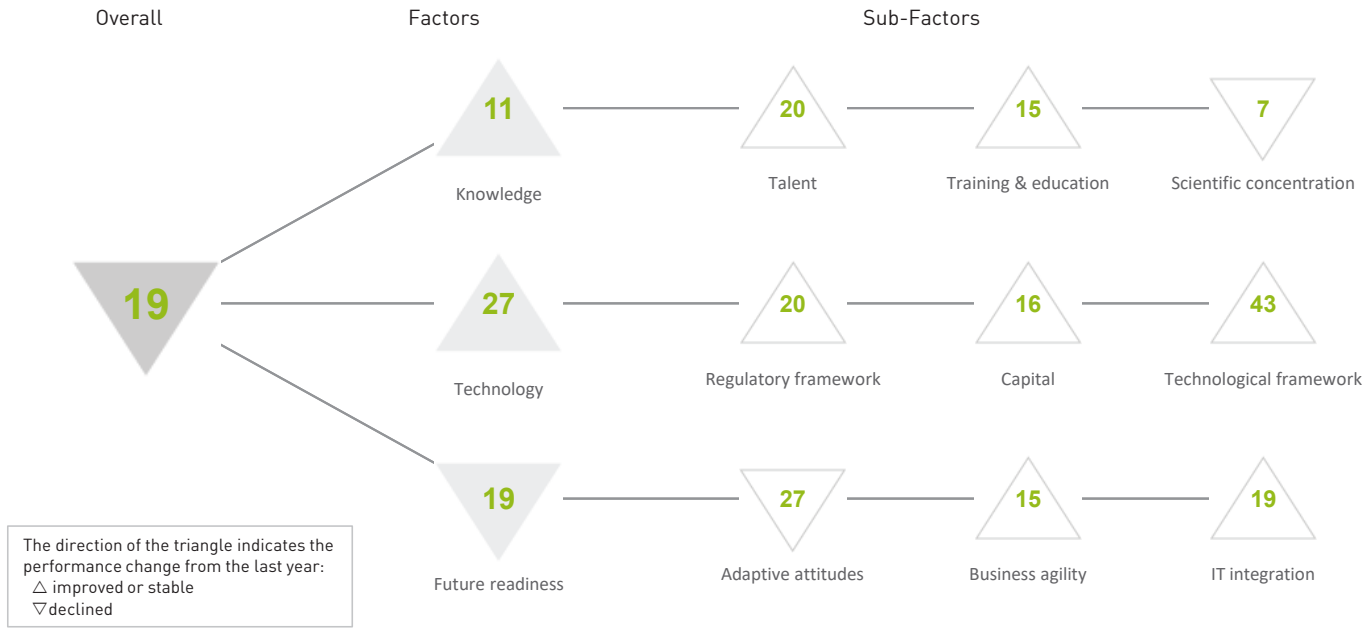
Adaptive attitudes	Rank
E-Participation	18
Internet retailing	18
▷ Tablet possession	48
Smartphone possession	20
▷ Attitudes toward globalization	63

Business agility	Rank
▷ Opportunities and threats	51
▶ World robots distribution	08
▷ Agility of companies	49
Use of big data and analytics	43
Knowledge transfer	34
Entrepreneurial fear of failure	23

IT integration	Rank
E-Government	19
Public-private partnerships	27
Cyber security	34
Software piracy	20
Government cyber security capacity	20
Privacy protection by law content	30

GERMANY

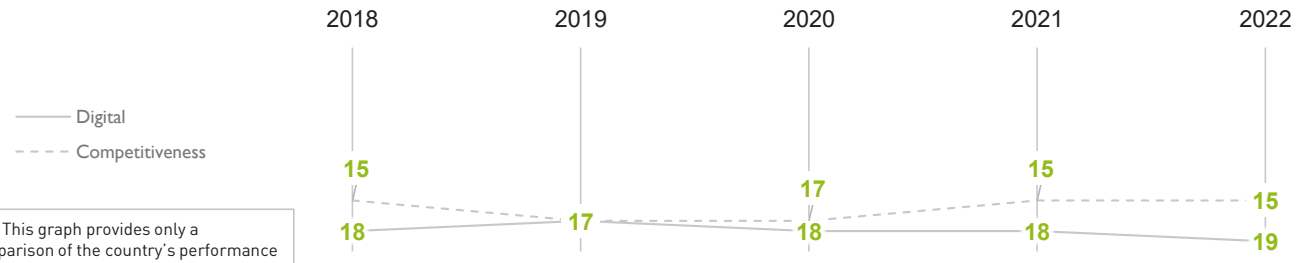
OVERALL PERFORMANCE (63 countries)



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



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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
Educational assessment PISA - Math	19
International experience	14
Foreign highly-skilled personnel	15
Management of cities	14
▷ Digital/Technological skills	52
Net flow of international students	15

Training & education	Rank
▶ Employee training	04
Total public expenditure on education	36
Higher education achievement	44
▶ Pupil-teacher ratio (tertiary education)	03
▶ Graduates in Sciences	03
Women with degrees	43

Scientific concentration	Rank
Total expenditure on R&D (%)	10
Total R&D personnel per capita	13
Female researchers	47
R&D productivity by publication	12
Scientific and technical employment	28
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
▷ Starting a business	50
Enforcing contracts	12
Immigration laws	23
Development & application of tech.	40
Scientific research legislation	17
Intellectual property rights	06

Capital	Rank
IT & media stock market capitalization	11
Funding for technological development	27
Banking and financial services	27
▶ Country credit rating	01
Venture capital	30
Investment in Telecommunications	38

Technological framework	Rank
▷ Communications technology	51
▷ Mobile Broadband subscribers	54
Wireless broadband	45
Internet users	16
Internet bandwidth speed	28
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

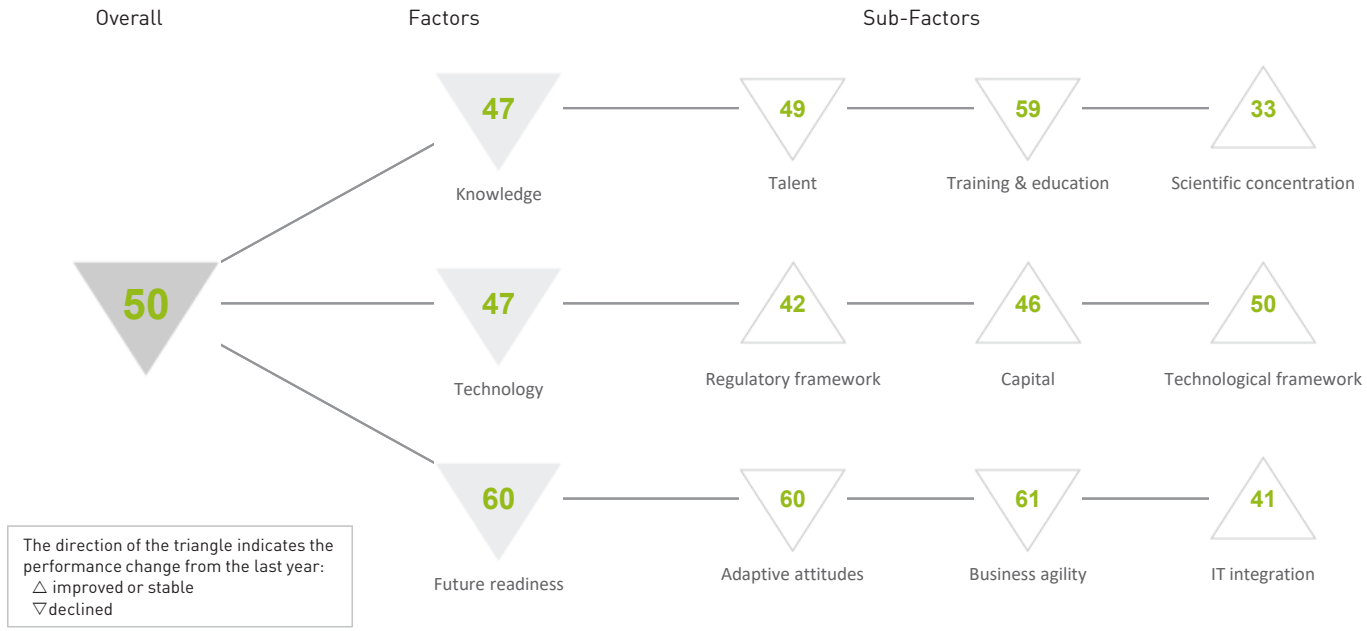
Adaptive attitudes	Rank
E-Participation	44
Internet retailing	14
Tablet possession	23
Smartphone possession	47
Attitudes toward globalization	29

Business agility	Rank
Opportunities and threats	37
World robots distribution	05
Agility of companies	34
▷ Use of big data and analytics	52
Knowledge transfer	08
Entrepreneurial fear of failure	13

IT integration	Rank
E-Government	24
Public-private partnerships	43
Cyber security	21
Software piracy	08
Government cyber security capacity	29
Privacy protection by law content	18

GREECE

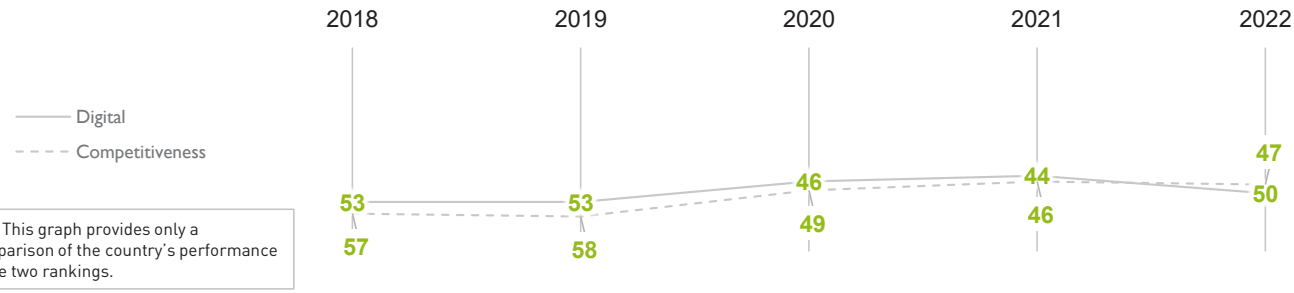
OVERALL PERFORMANCE (63 countries)



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



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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
Educational assessment PISA - Math	39
International experience	39
▷ Foreign highly-skilled personnel	57
Management of cities	44
Digital/Technological skills	47
Net flow of international students	51

Training & education	Rank
Employee training	54
Total public expenditure on education	43
Higher education achievement	32
▷ Pupil-teacher ratio (tertiary education)	58
▶ Graduates in Sciences	18
Women with degrees	36

Scientific concentration	Rank
Total expenditure on R&D (%)	28
Total R&D personnel per capita	26
Female researchers	23
R&D productivity by publication	32
▶ Scientific and technical employment	13
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
▶ Starting a business	06
▷ Enforcing contracts	59
Immigration laws	27
Development & application of tech.	45
Scientific research legislation	44
Intellectual property rights	41

Capital	Rank
▶ IT & media stock market capitalization	13
Funding for technological development	44
Banking and financial services	57
Country credit rating	55
Venture capital	49
▶ Investment in Telecommunications	22

Technological framework	Rank
Communications technology	48
Mobile Broadband subscribers	47
Wireless broadband	30
Internet users	50
Internet bandwidth speed	51
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

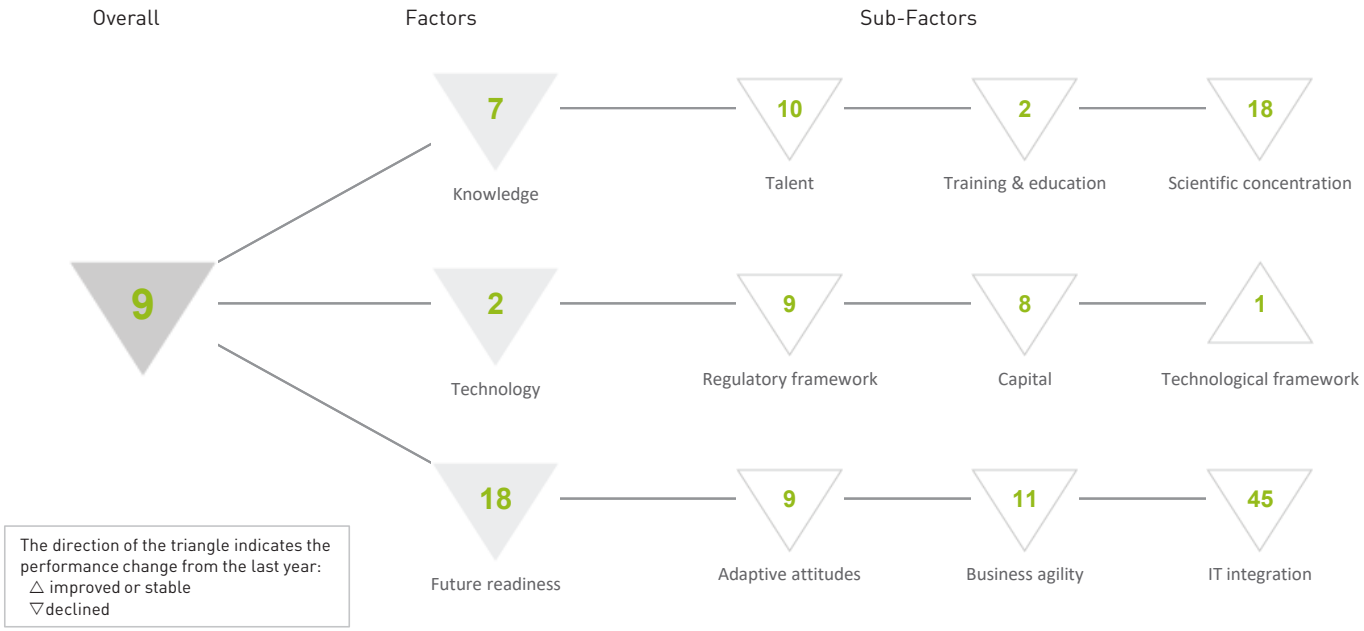
Adaptive attitudes	Rank
E-Participation	39
Internet retailing	33
Tablet possession	39
▷ Smartphone possession	59
Attitudes toward globalization	41

Business agility	Rank
Opportunities and threats	48
World robots distribution	43
Agility of companies	52
▷ Use of big data and analytics	62
Knowledge transfer	54
Entrepreneurial fear of failure	42

IT integration	Rank
E-Government	37
Public-private partnerships	39
Cyber security	48
Software piracy	53
Government cyber security capacity	35
Privacy protection by law content	35

HONG KONG SAR

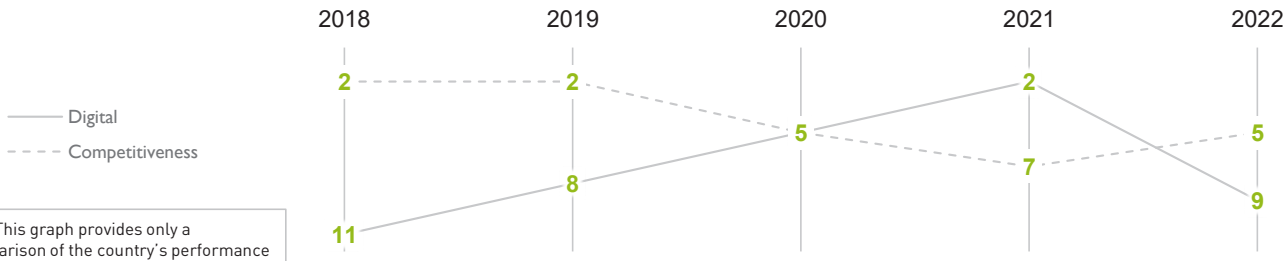
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	03
International experience	10
Foreign highly-skilled personnel	33
Management of cities	12
Digital/Technological skills	15
Net flow of international students	30

Training & education	Rank
Employee training	32
Total public expenditure on education	37
Higher education achievement	07
Pupil-teacher ratio (tertiary education)	28
▶ Graduates in Sciences	01
Women with degrees	-

Scientific concentration	Rank
▷ Total expenditure on R&D (%)	41
Total R&D personnel per capita	30
Female researchers	-
R&D productivity by publication	24
Scientific and technical employment	08
▶ 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
Starting a business	04
Enforcing contracts	24
Immigration laws	10
Development & application of tech.	14
Scientific research legislation	22
Intellectual property rights	10

Capital	Rank
IT & media stock market capitalization	05
Funding for technological development	13
Banking and financial services	07
Country credit rating	17
Venture capital	08
▷ Investment in Telecommunications	40

Technological framework	Rank
Communications technology	10
Mobile Broadband subscribers	18
Wireless broadband	05
Internet users	22
Internet bandwidth speed	07
▶ 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

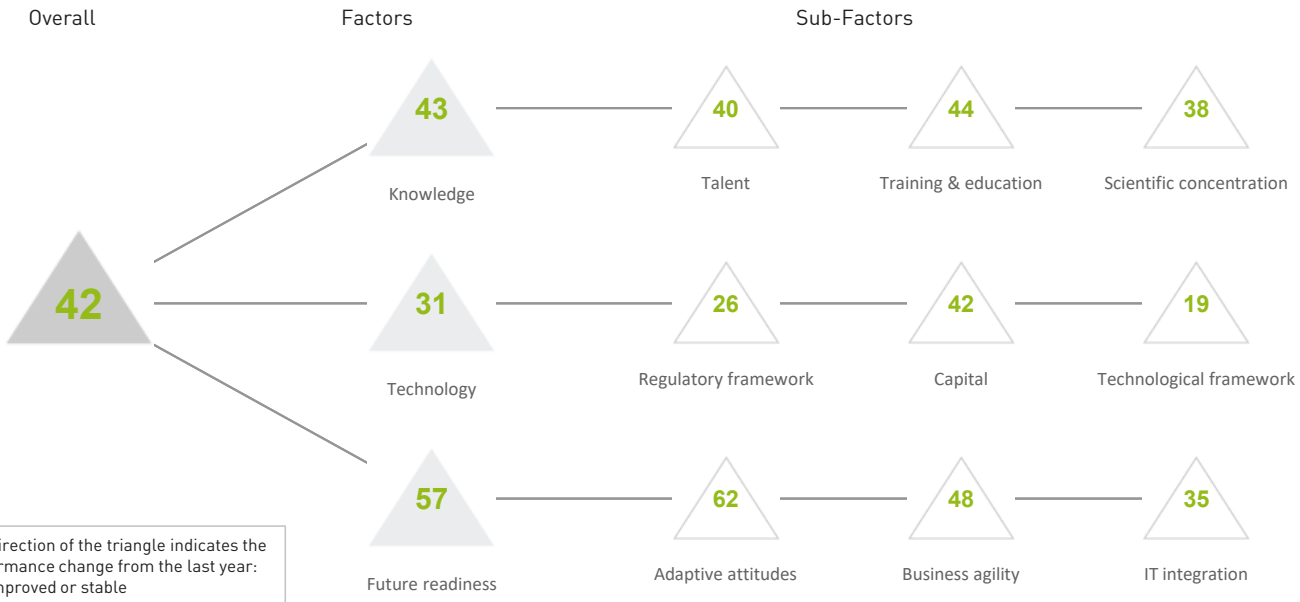
Adaptive attitudes	Rank
E-Participation	-
Internet retailing	20
Tablet possession	10
▶ Smartphone possession	01
Attitudes toward globalization	08

Business agility	Rank
▶ Opportunities and threats	02
World robots distribution	37
Agility of companies	04
Use of big data and analytics	12
Knowledge transfer	17
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	-
Public-private partnerships	14
Cyber security	07
Software piracy	28
▷ Government cyber security capacity	48
▷ Privacy protection by law content	63

HUNGARY

OVERALL PERFORMANCE (63 countries)

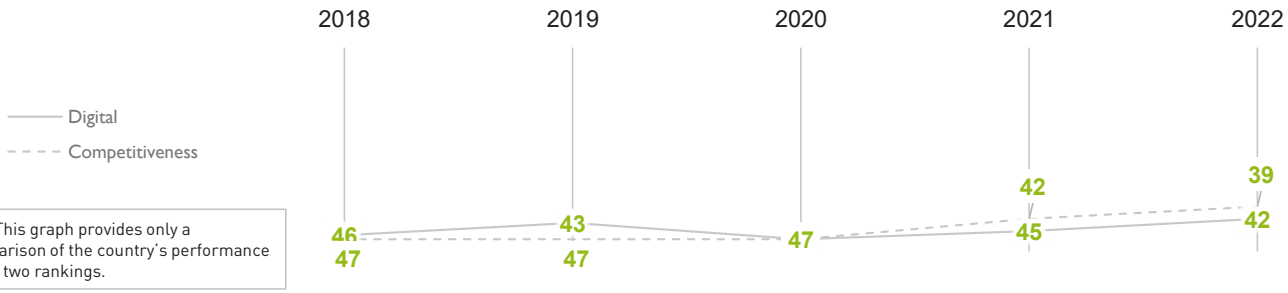


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	34
International experience	41
Foreign highly-skilled personnel	50
Management of cities	36
Digital/Technological skills	54
Net flow of international students	17

Training & education	Rank
Employee training	52
Total public expenditure on education	34
Higher education achievement	49
▶ Pupil-teacher ratio (tertiary education)	16
Graduates in Sciences	33
Women with degrees	41

Scientific concentration	Rank
Total expenditure on R&D (%)	26
Total R&D personnel per capita	24
Female researchers	44
R&D productivity by publication	46
Scientific and technical employment	31
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
Starting a business	37
Enforcing contracts	21
▶ Immigration laws	16
Development & application of tech.	30
Scientific research legislation	29
Intellectual property rights	28

Capital	Rank
IT & media stock market capitalization	39
Funding for technological development	34
Banking and financial services	44
Country credit rating	44
Venture capital	41
Investment in Telecommunications	31

Technological framework	Rank
Communications technology	29
▶ Mobile Broadband subscribers	10
Wireless broadband	51
Internet users	34
▶ Internet bandwidth speed	04
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

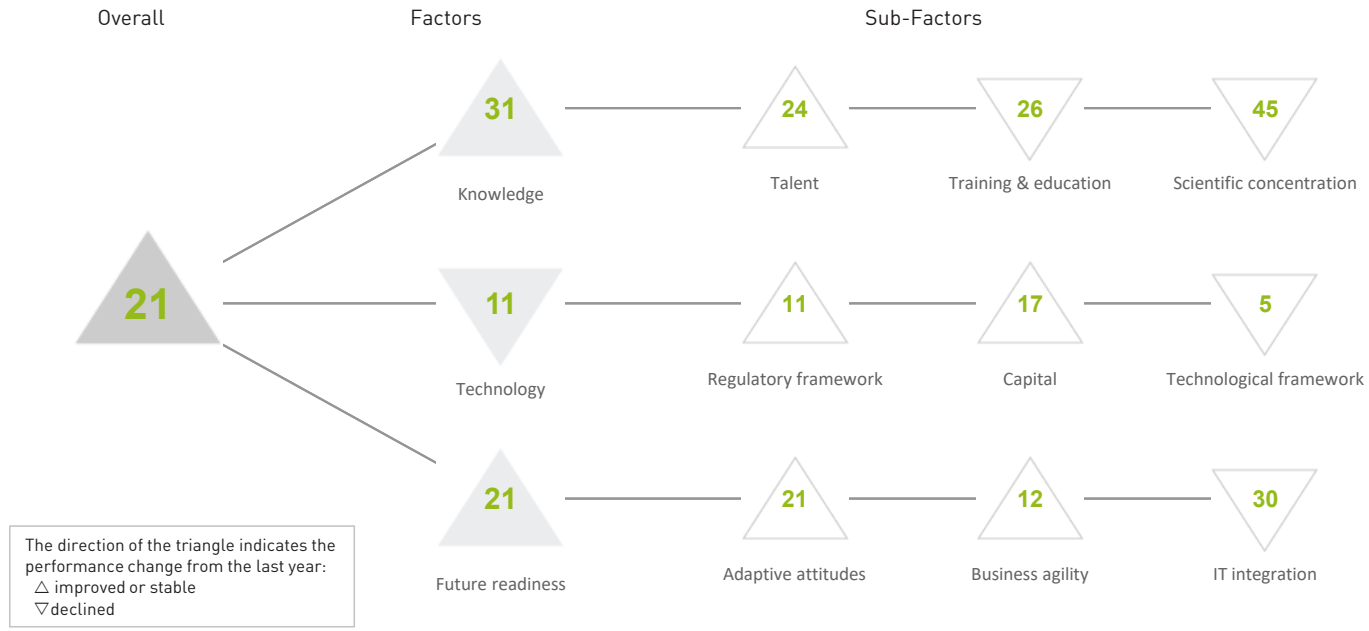
Adaptive attitudes	Rank
E-Participation	54
Internet retailing	38
Tablet possession	50
▷ Smartphone possession	58
▷ Attitudes toward globalization	62

Business agility	Rank
▷ Opportunities and threats	58
World robots distribution	26
▷ Agility of companies	55
▷ Use of big data and analytics	57
Knowledge transfer	38
▶ Entrepreneurial fear of failure	09

IT integration	Rank
E-Government	44
Public-private partnerships	36
Cyber security	47
Software piracy	27
Government cyber security capacity	24
Privacy protection by law content	28

ICELAND

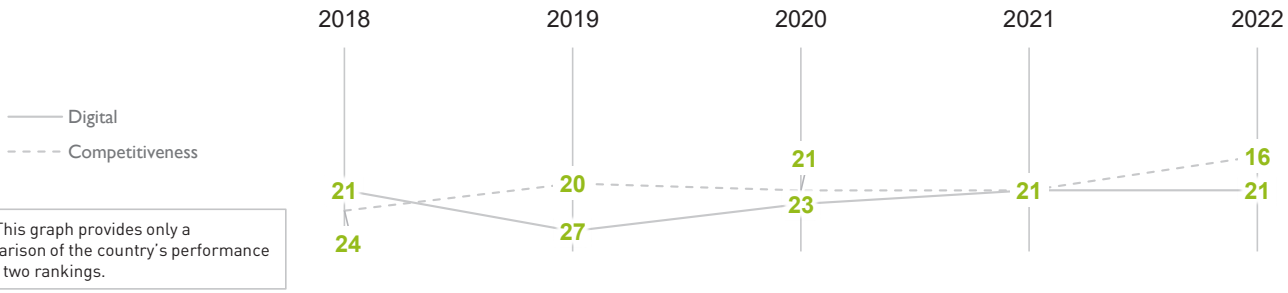
OVERALL PERFORMANCE (63 countries)



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
Educational assessment PISA - Math	25
International experience	35
Foreign highly-skilled personnel	34
Management of cities	22
▶ Digital/Technological skills	01
▷ Net flow of international students	56

Training & education	Rank
Employee training	35
▶ Total public expenditure on education	04
Higher education achievement	41
Pupil-teacher ratio (tertiary education)	36
Graduates in Sciences	46
Women with degrees	21

Scientific concentration	Rank
Total expenditure on R&D (%)	13
Total R&D personnel per capita	06
Female researchers	13
▷ R&D productivity by publication	61
Scientific and technical employment	25
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
Starting a business	32
Enforcing contracts	25
Immigration laws	06
Development & application of tech.	07
Scientific research legislation	16
Intellectual property rights	09

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	12
Banking and financial services	12
Country credit rating	32
Venture capital	19
Investment in Telecommunications	28

Technological framework	Rank
Communications technology	06
Mobile Broadband subscribers	30
Wireless broadband	09
▶ Internet users	03
Internet bandwidth speed	05
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

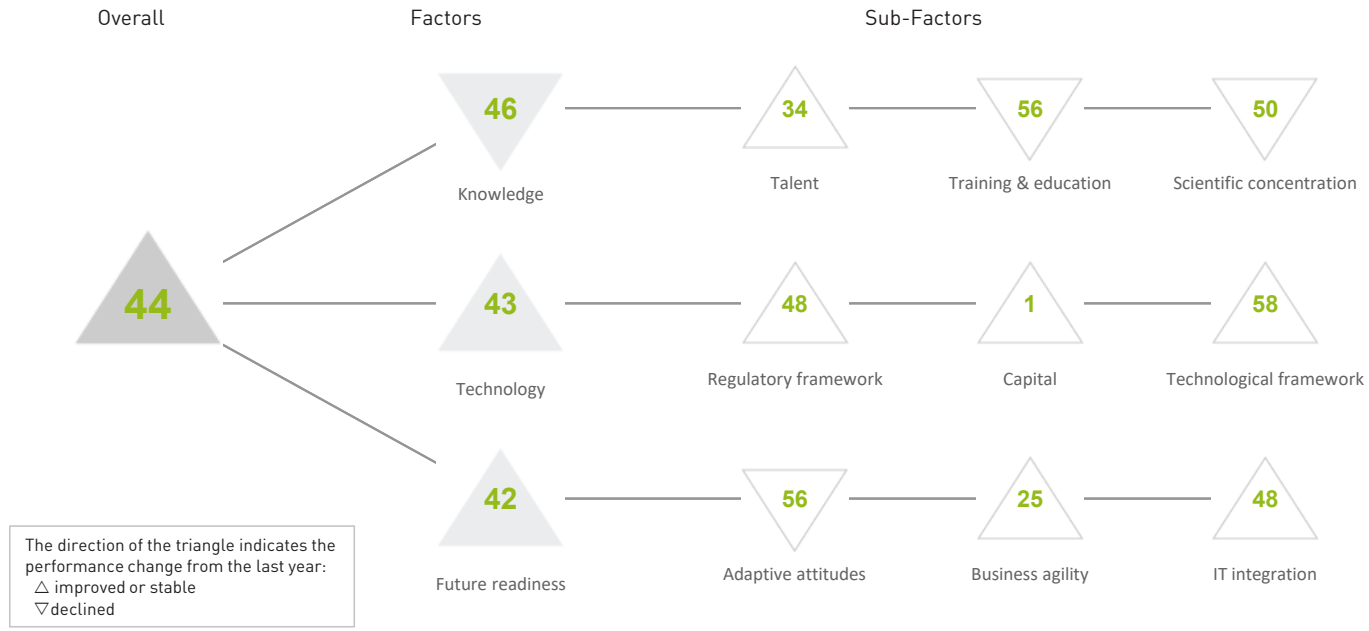
Adaptive attitudes	Rank
E-Participation	40
Internet retailing	23
Tablet possession	-
Smartphone possession	-
Attitudes toward globalization	04

Business agility	Rank
▶ Opportunities and threats	03
▷ World robots distribution	54
▶ Agility of companies	02
Use of big data and analytics	17
Knowledge transfer	18
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	12
Public-private partnerships	32
Cyber security	17
Software piracy	34
▷ Government cyber security capacity	52
Privacy protection by law content	32

INDIA

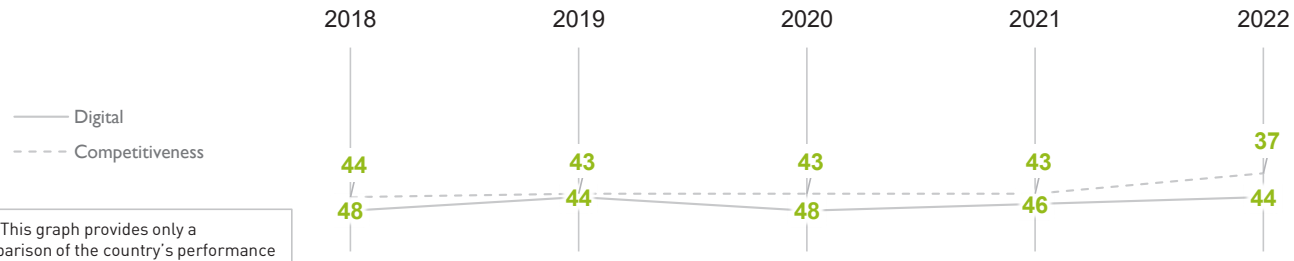
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	-
International experience	25
Foreign highly-skilled personnel	41
Management of cities	52
Digital/Technological skills	17
Net flow of international students	44

Training & education	Rank
Employee training	27
Total public expenditure on education	44
Higher education achievement	58
Pupil-teacher ratio (tertiary education)	56
▶ Graduates in Sciences	06
Women with degrees	56

Scientific concentration	Rank
Total expenditure on R&D (%)	48
Total R&D personnel per capita	52
Female researchers	-
▶ R&D productivity by publication	02
▷ Scientific and technical employment	59
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
Starting a business	56
▷ Enforcing contracts	62
Immigration laws	35
Development & application of tech.	22
Scientific research legislation	29
Intellectual property rights	40

Capital	Rank
▶ IT & media stock market capitalization	09
Funding for technological development	23
▶ Banking and financial services	11
Country credit rating	51
Venture capital	16
▶ Investment in Telecommunications	01

Technological framework	Rank
Communications technology	33
Mobile Broadband subscribers	49
▷ Wireless broadband	61
▷ Internet users	63
Internet bandwidth speed	49
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

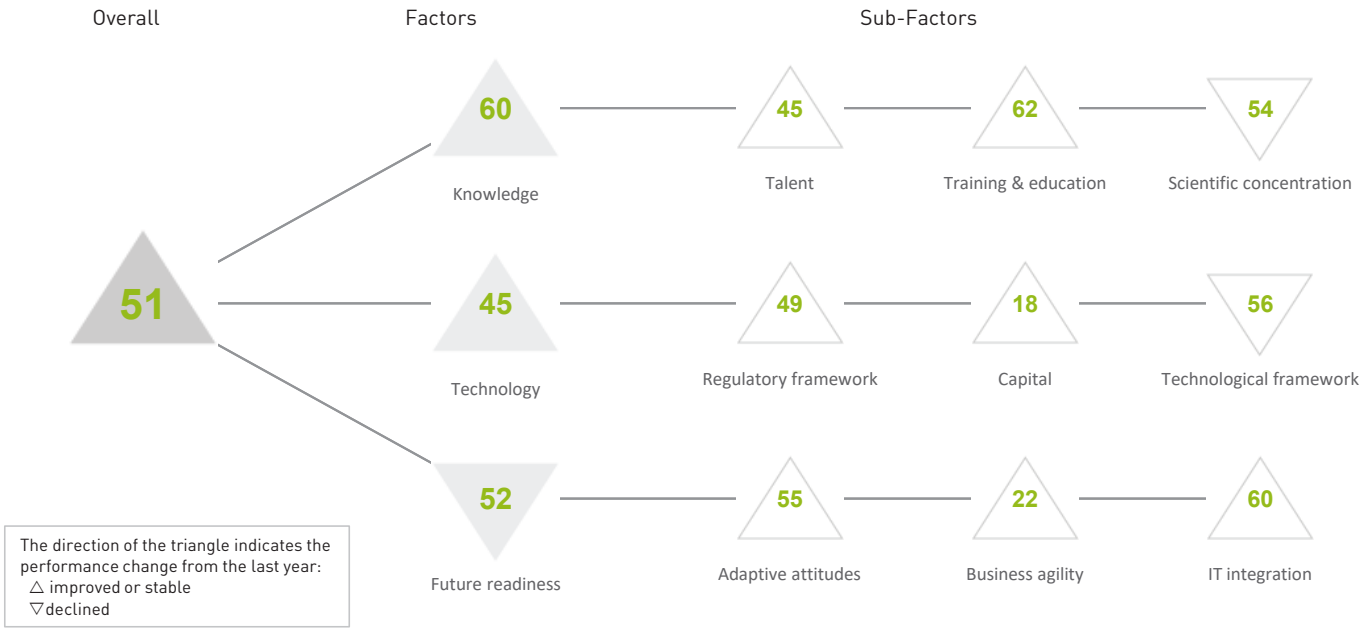
Adaptive attitudes	Rank
E-Participation	27
Internet retailing	58
▷ Tablet possession	59
Smartphone possession	52
Attitudes toward globalization	16

Business agility	Rank
Opportunities and threats	12
World robots distribution	12
Agility of companies	17
Use of big data and analytics	13
Knowledge transfer	27
Entrepreneurial fear of failure	48

IT integration	Rank
E-Government	58
Public-private partnerships	19
Cyber security	23
Software piracy	49
Government cyber security capacity	31
Privacy protection by law content	48

INDONESIA

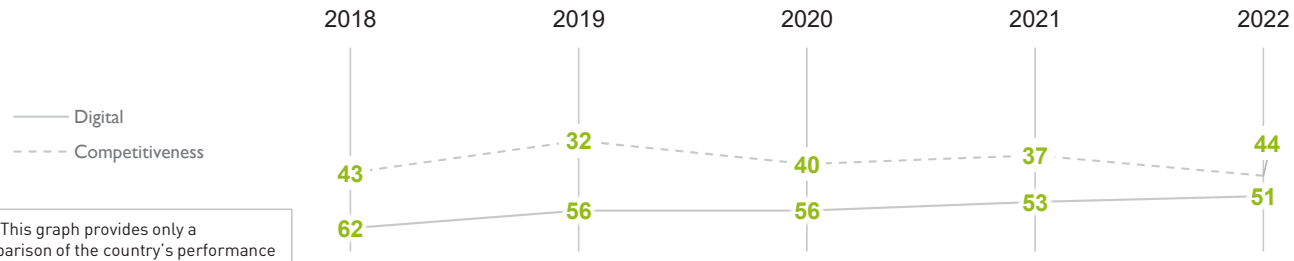
OVERALL PERFORMANCE (63 countries)



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



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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
Educational assessment PISA - Math	55
International experience	29
Foreign highly-skilled personnel	19
Management of cities	40
Digital/Technological skills	41
Net flow of international students	41

Training & education	Rank
Employee training	18
Total public expenditure on education	56
Higher education achievement	59
Pupil-teacher ratio (tertiary education)	57
Graduates in Sciences	49
Women with degrees	55

Scientific concentration	Rank
Total expenditure on R&D (%)	57
Total R&D personnel per capita	53
▶ Female researchers	14
▶ R&D productivity by publication	04
▷ Scientific and technical employment	60
▷ 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
Starting a business	59
Enforcing contracts	57
Immigration laws	18
Development & application of tech.	33
Scientific research legislation	48
Intellectual property rights	54

Capital	Rank
▶ IT & media stock market capitalization	15
Funding for technological development	35
Banking and financial services	17
Country credit rating	45
Venture capital	26
▶ Investment in Telecommunications	08

Technological framework	Rank
Communications technology	45
Mobile Broadband subscribers	43
Wireless broadband	47
▷ Internet users	59
▷ Internet bandwidth speed	61
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

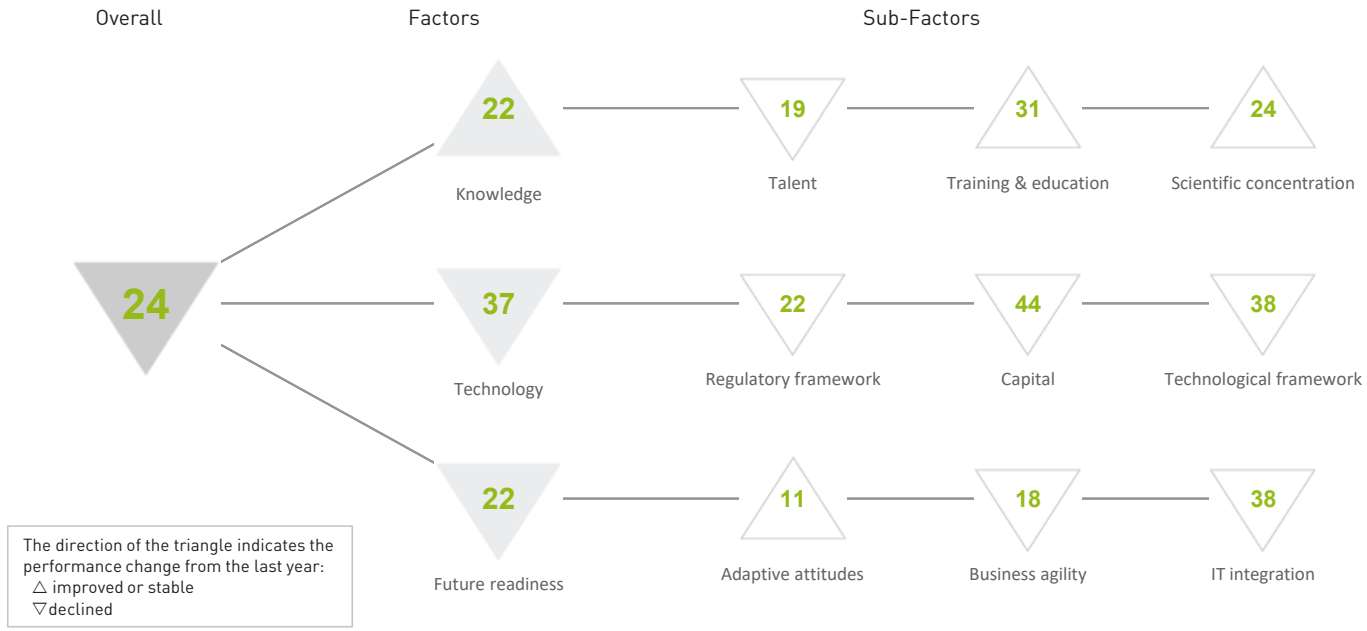
Adaptive attitudes	Rank
E-Participation	44
Internet retailing	51
Tablet possession	58
Smartphone possession	46
Attitudes toward globalization	18

Business agility	Rank
Opportunities and threats	29
World robots distribution	27
Agility of companies	33
Use of big data and analytics	26
Knowledge transfer	39
▶ Entrepreneurial fear of failure	03

IT integration	Rank
E-Government	56
Public-private partnerships	22
Cyber security	46
▷ Software piracy	61
Government cyber security capacity	58
Privacy protection by law content	57

IRELAND

OVERALL PERFORMANCE (63 countries)

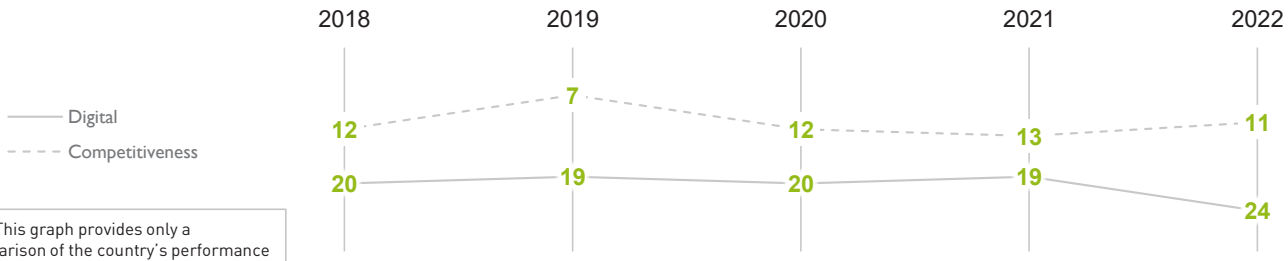


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



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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
Educational assessment PISA - Math	20
International experience	13
▶ Foreign highly-skilled personnel	09
Management of cities	38
Digital/Technological skills	34
Net flow of international students	20

Training & education	Rank
Employee training	15
▷ Total public expenditure on education	58
Higher education achievement	09
Pupil-teacher ratio (tertiary education)	48
Graduates in Sciences	27
▶ Women with degrees	09

Scientific concentration	Rank
Total expenditure on R&D (%)	35
Total R&D personnel per capita	21
Female researchers	26
R&D productivity by publication	36
Scientific and technical employment	17
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
Starting a business	12
Enforcing contracts	47
Immigration laws	24
Development & application of tech.	18
Scientific research legislation	11
Intellectual property rights	20

Capital	Rank
▷ IT & media stock market capitalization	55
Funding for technological development	20
Banking and financial services	31
Country credit rating	26
Venture capital	14
▷ Investment in Telecommunications	60

Technological framework	Rank
Communications technology	50
Mobile Broadband subscribers	45
Wireless broadband	36
Internet users	20
Internet bandwidth speed	36
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

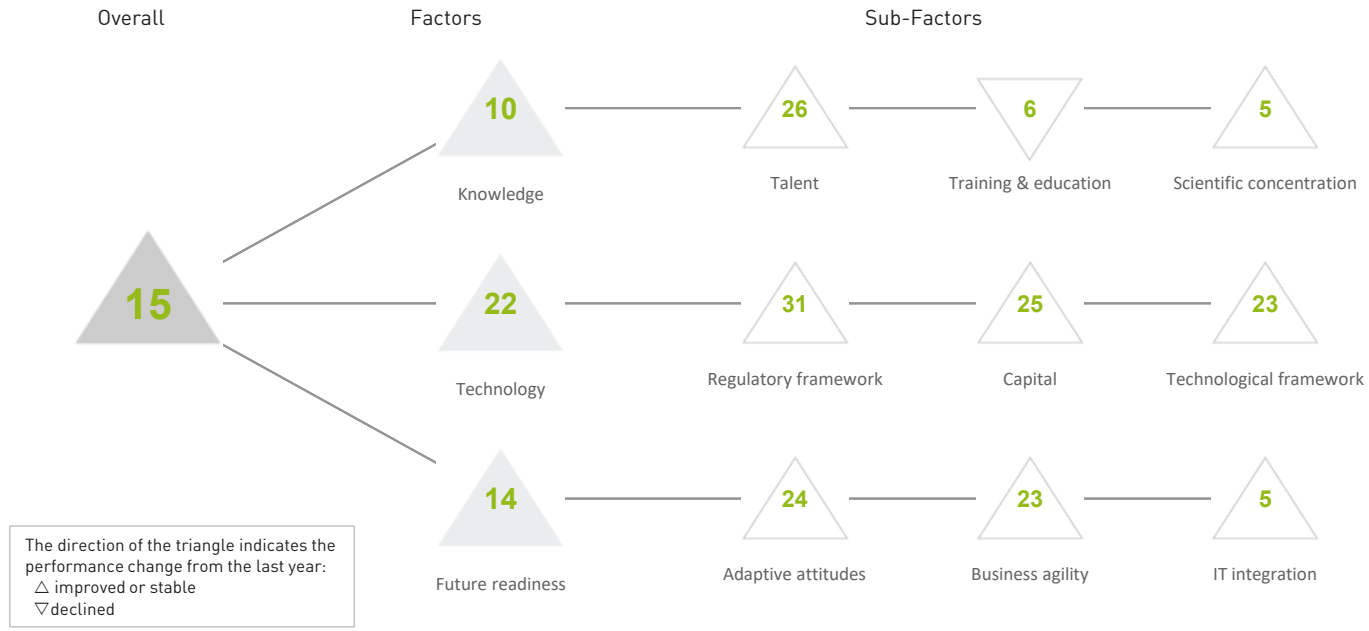
Adaptive attitudes	Rank
E-Participation	27
▶ Internet retailing	09
Tablet possession	16
Smartphone possession	29
Attitudes toward globalization	10

Business agility	Rank
▶ Opportunities and threats	06
World robots distribution	42
▶ Agility of companies	06
Use of big data and analytics	18
Knowledge transfer	13
Entrepreneurial fear of failure	39

IT integration	Rank
E-Government	25
Public-private partnerships	29
Cyber security	37
Software piracy	19
▷ Government cyber security capacity	56
▷ Privacy protection by law content	51

ISRAEL

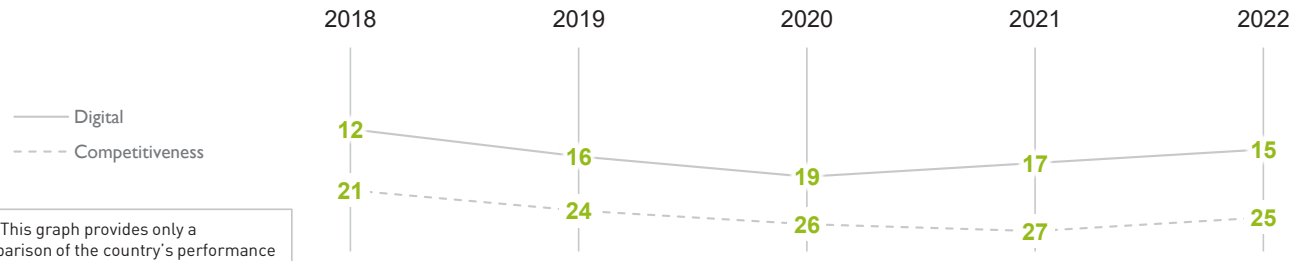
OVERALL PERFORMANCE (63 countries)



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



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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
Educational assessment PISA - Math	37
International experience	24
Foreign highly-skilled personnel	27
Management of cities	27
Digital/Technological skills	19
Net flow of international students	-

Training & education	Rank
Employee training	36
▶ Total public expenditure on education	06
Higher education achievement	25
Pupil-teacher ratio (tertiary education)	-
Graduates in Sciences	-
▶ Women with degrees	06

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	01
Total R&D personnel per capita	-
Female researchers	-
▷ R&D productivity by publication	52
▶ Scientific and technical employment	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
Starting a business	17
▷ Enforcing contracts	46
Immigration laws	37
Development & application of tech.	13
Scientific research legislation	12
Intellectual property rights	22

Capital	Rank
IT & media stock market capitalization	12
Funding for technological development	08
Banking and financial services	32
Country credit rating	25
Venture capital	22
▷ Investment in Telecommunications	58

Technological framework	Rank
▷ Communications technology	41
Mobile Broadband subscribers	24
Wireless broadband	19
Internet users	37
Internet bandwidth speed	31
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

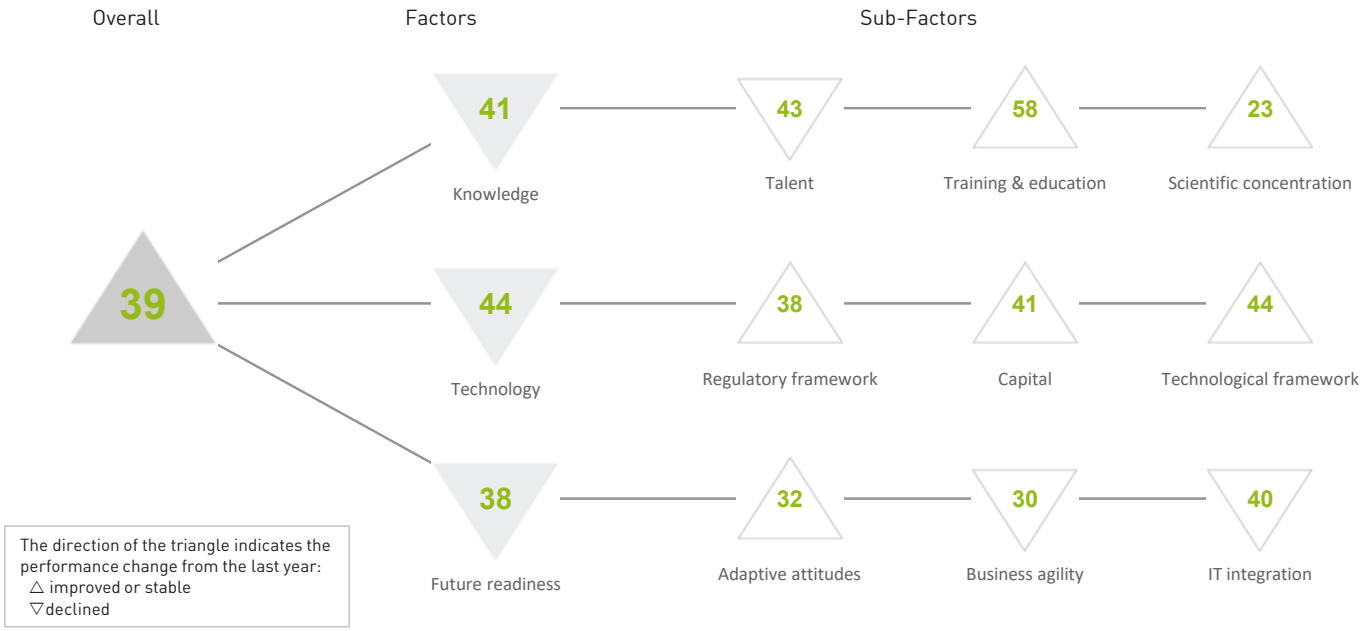
Adaptive attitudes	Rank
▷ E-Participation	50
Internet retailing	15
Tablet possession	21
Smartphone possession	32
Attitudes toward globalization	20

Business agility	Rank
Opportunities and threats	24
World robots distribution	38
Agility of companies	24
Use of big data and analytics	08
Knowledge transfer	12
Entrepreneurial fear of failure	31

IT integration	Rank
E-Government	28
Public-private partnerships	08
Cyber security	08
Software piracy	17
▶ Government cyber security capacity	01
Privacy protection by law content	22

ITALY

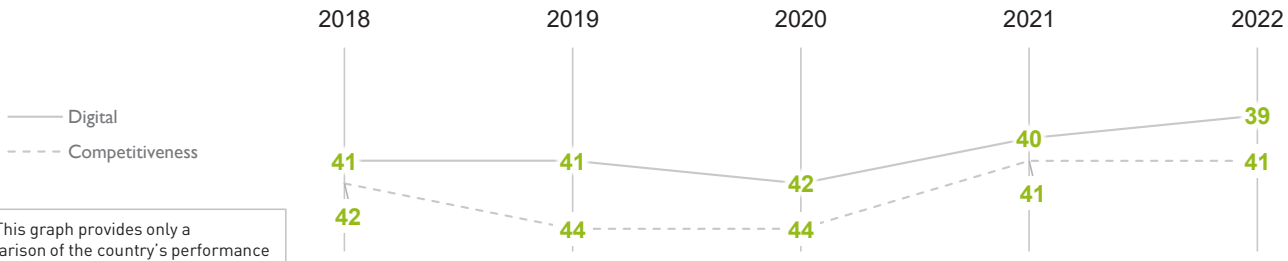
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	29
▷ International experience	50
Foreign highly-skilled personnel	46
Management of cities	39
▷ Digital/Technological skills	49
Net flow of international students	35

Training & education	Rank
Employee training	48
Total public expenditure on education	46
▷ Higher education achievement	52
Pupil-teacher ratio (tertiary education)	47
Graduates in Sciences	31
▷ Women with degrees	50

Scientific concentration	Rank
Total expenditure on R&D (%)	27
Total R&D personnel per capita	25
Female researchers	34
▶ R&D productivity by publication	07
Scientific and technical employment	16
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
Starting a business	41
▷ Enforcing contracts	55
▶ Immigration laws	08
Development & application of tech.	44
Scientific research legislation	41
Intellectual property rights	24

Capital	Rank
IT & media stock market capitalization	41
Funding for technological development	39
Banking and financial services	49
Country credit rating	48
Venture capital	43
▶ Investment in Telecommunications	13

Technological framework	Rank
Communications technology	43
Mobile Broadband subscribers	41
Wireless broadband	23
Internet users	43
Internet bandwidth speed	43
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

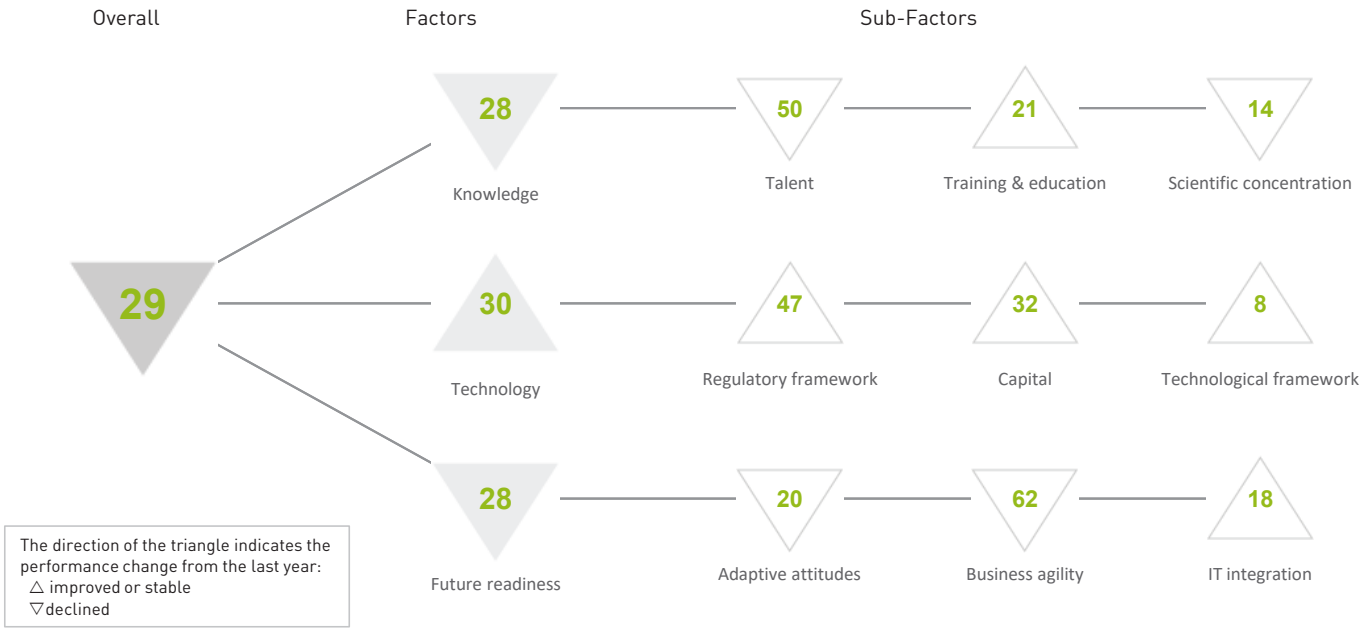
Adaptive attitudes	Rank
E-Participation	34
Internet retailing	29
Tablet possession	42
Smartphone possession	17
Attitudes toward globalization	36

Business agility	Rank
Opportunities and threats	30
▶ World robots distribution	06
Agility of companies	38
Use of big data and analytics	47
Knowledge transfer	36
Entrepreneurial fear of failure	28

IT integration	Rank
E-Government	33
Public-private partnerships	49
Cyber security	40
Software piracy	33
Government cyber security capacity	47
Privacy protection by law content	34

JAPAN

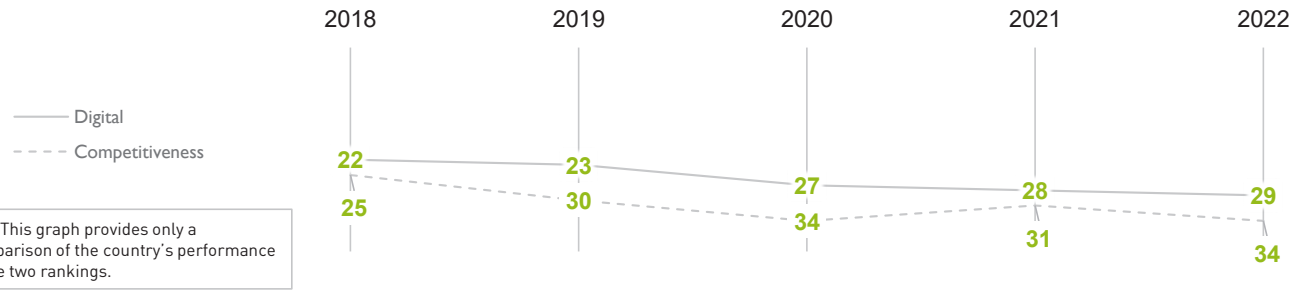
OVERALL PERFORMANCE (63 countries)



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

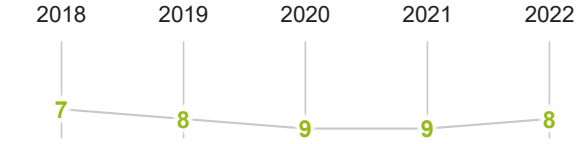
COMPETITIVENESS & DIGITAL RANKINGS



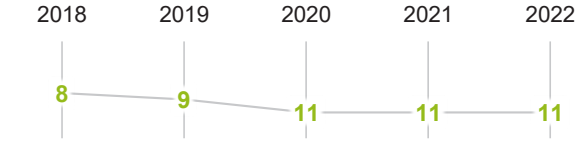
N.B. This graph provides only a comparison of the country's performance in the two rankings.

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
Educational assessment PISA - Math	05
▷ International experience	63
Foreign highly-skilled personnel	54
Management of cities	16
▷ Digital/Technological skills	62
Net flow of international students	25

Training & education	Rank
Employee training	30
Total public expenditure on education	54
Higher education achievement	08
▶ Pupil-teacher ratio (tertiary education)	01
Graduates in Sciences	42
Women with degrees	08

Scientific concentration	Rank
Total expenditure on R&D (%)	07
Total R&D personnel per capita	18
Female researchers	55
R&D productivity by publication	16
Scientific and technical employment	39
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
Starting a business	43
Enforcing contracts	35
Immigration laws	61
Development & application of tech.	41
Scientific research legislation	49
Intellectual property rights	34

Capital	Rank
IT & media stock market capitalization	10
Funding for technological development	41
Banking and financial services	35
Country credit rating	28
Venture capital	34
Investment in Telecommunications	32

Technological framework	Rank
Communications technology	42
Mobile Broadband subscribers	22
▶ Wireless broadband	02
Internet users	19
Internet bandwidth speed	19
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

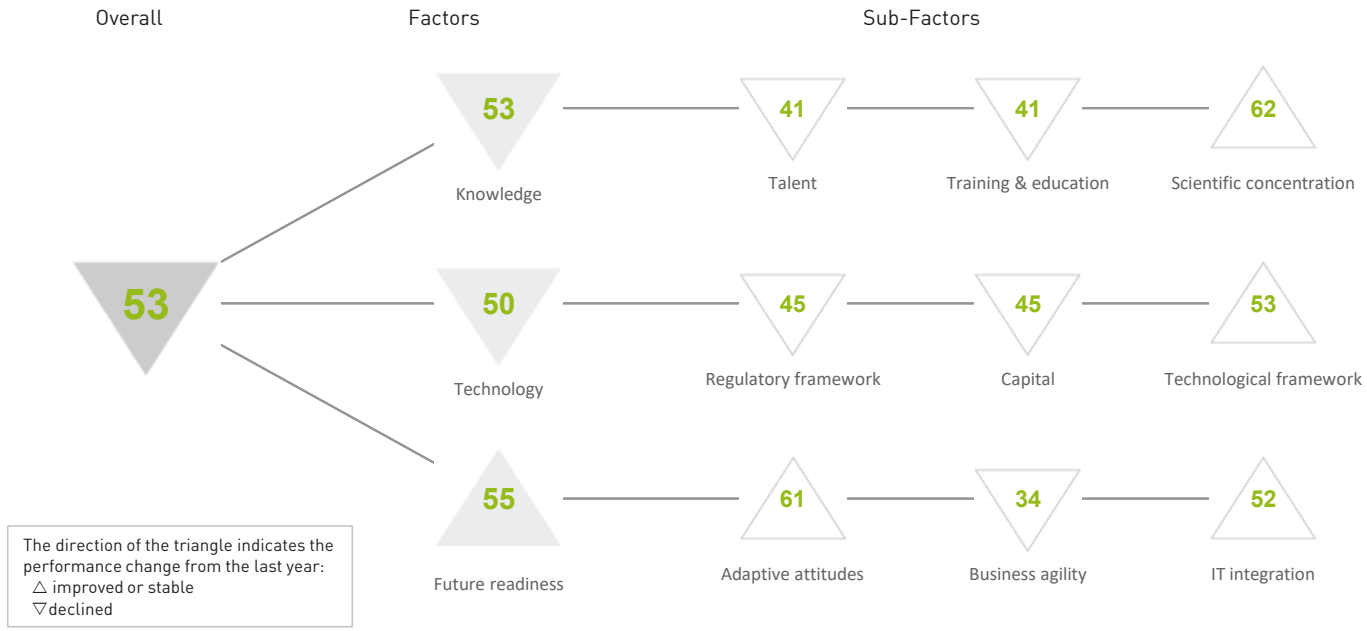
Adaptive attitudes	Rank
E-Participation	04
Internet retailing	16
Tablet possession	24
Smartphone possession	10
Attitudes toward globalization	48

Business agility	Rank
▷ Opportunities and threats	63
▶ World robots distribution	02
▷ Agility of companies	63
▷ Use of big data and analytics	63
Knowledge transfer	49
Entrepreneurial fear of failure	35

IT integration	Rank
E-Government	14
Public-private partnerships	41
Cyber security	45
▶ Software piracy	02
Government cyber security capacity	23
Privacy protection by law content	11

JORDAN

OVERALL PERFORMANCE (63 countries)

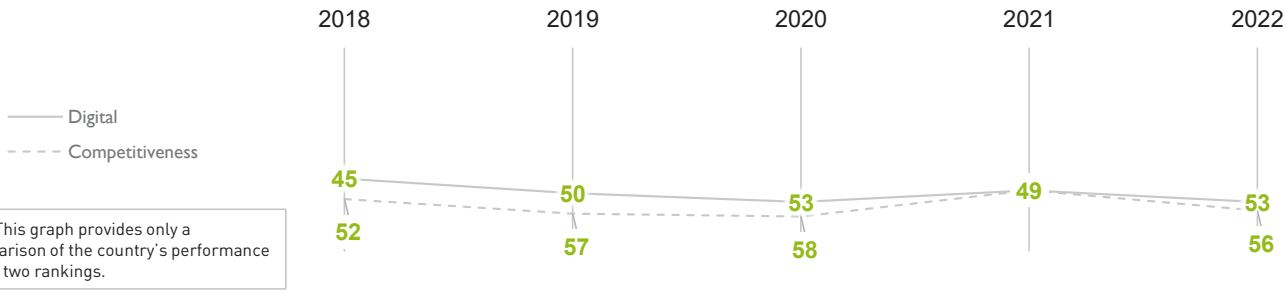


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	51
▶ International experience	16
Foreign highly-skilled personnel	39
Management of cities	53
Digital/Technological skills	21
Net flow of international students	27

Training & education	Rank
Employee training	39
▷ Total public expenditure on education	60
Higher education achievement	-
▶ Pupil-teacher ratio (tertiary education)	21
▶ Graduates in Sciences	12
Women with degrees	44

Scientific concentration	Rank
Total expenditure on R&D (%)	46
Total R&D personnel per capita	-
Female researchers	54
R&D productivity by publication	54
Scientific and technical employment	43
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
Starting a business	49
Enforcing contracts	52
Immigration laws	39
Development & application of tech.	34
Scientific research legislation	35
Intellectual property rights	47

Capital	Rank
IT & media stock market capitalization	51
Funding for technological development	36
Banking and financial services	24
Country credit rating	58
Venture capital	27
Investment in Telecommunications	24

Technological framework	Rank
Communications technology	46
Mobile Broadband subscribers	40
Wireless broadband	57
Internet users	51
Internet bandwidth speed	48
▷ 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

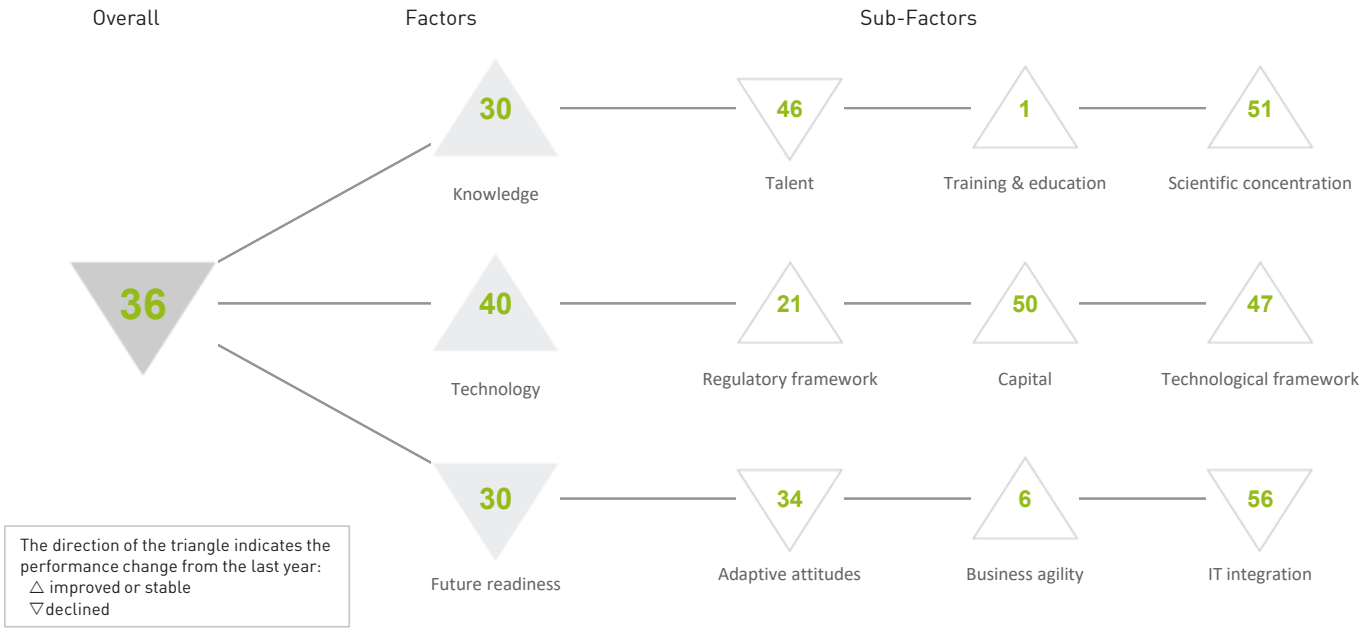
Adaptive attitudes	Rank
▷ E-Participation	60
▷ Internet retailing	60
Tablet possession	53
▶ Smartphone possession	08
Attitudes toward globalization	44

Business agility	Rank
Opportunities and threats	36
World robots distribution	-
Agility of companies	43
▶ Use of big data and analytics	10
Knowledge transfer	22
Entrepreneurial fear of failure	49

IT integration	Rank
▷ E-Government	60
Public-private partnerships	24
Cyber security	25
Software piracy	47
Government cyber security capacity	28
Privacy protection by law content	45

KAZAKHSTAN

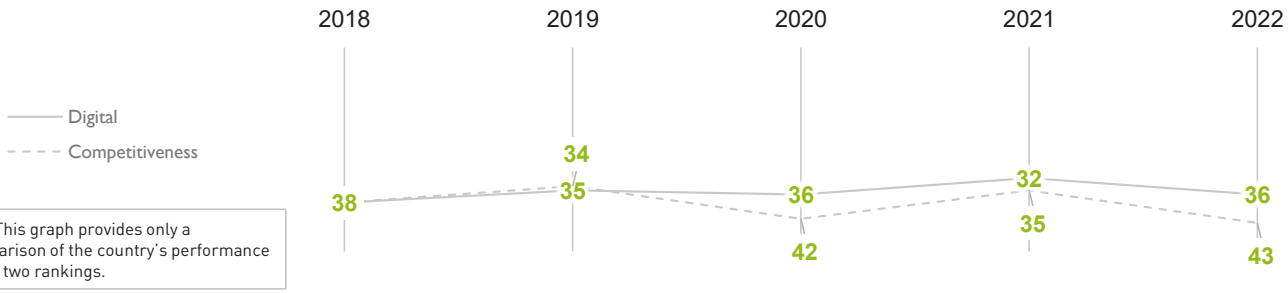
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	45
International experience	32
Foreign highly-skilled personnel	29
Management of cities	37
Digital/Technological skills	43
▷ Net flow of international students	58

Training & education	Rank
Employee training	13
Total public expenditure on education	33
▶ Higher education achievement	01
Pupil-teacher ratio (tertiary education)	33
Graduates in Sciences	29
▶ Women with degrees	02

Scientific concentration	Rank
▷ Total expenditure on R&D (%)	58
Total R&D personnel per capita	47
▶ Female researchers	03
R&D productivity by publication	19
Scientific and technical employment	53
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
Starting a business	11
▶ Enforcing contracts	04
Immigration laws	28
Development & application of tech.	28
Scientific research legislation	38
Intellectual property rights	42

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	26
Banking and financial services	39
Country credit rating	49
Venture capital	36
▷ Investment in Telecommunications	61

Technological framework	Rank
Communications technology	44
Mobile Broadband subscribers	48
Wireless broadband	56
Internet users	42
Internet bandwidth speed	53
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

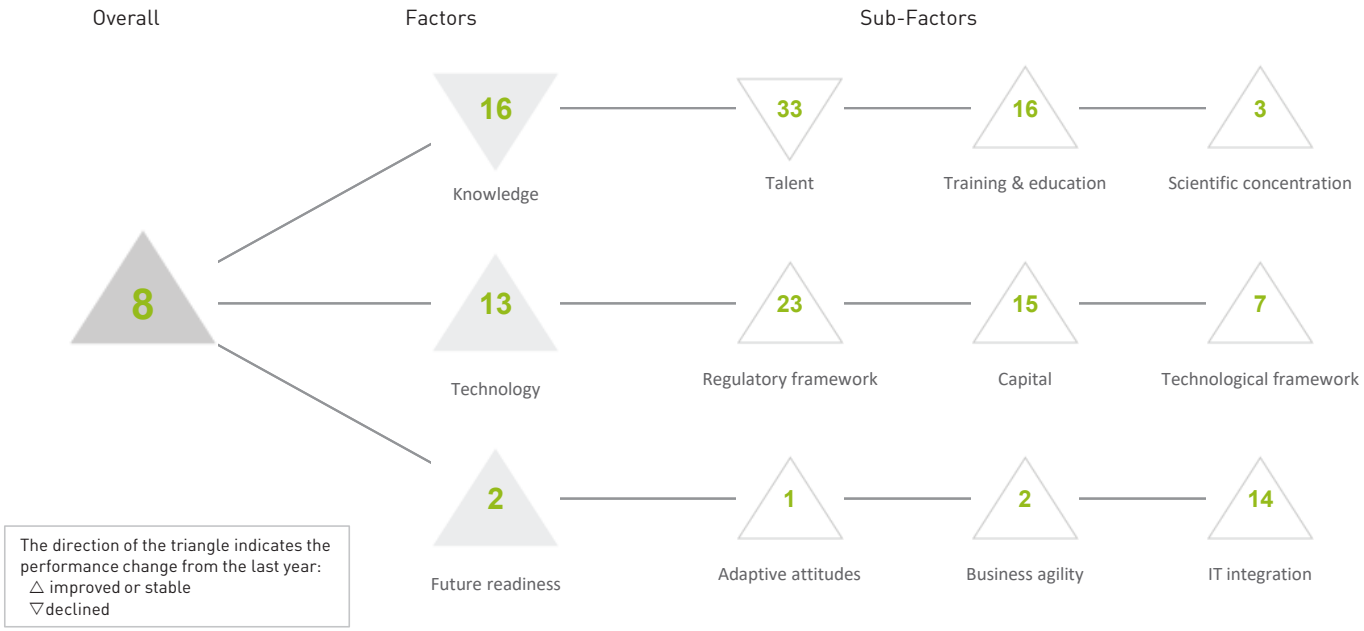
Adaptive attitudes	Rank
E-Participation	25
Internet retailing	49
Tablet possession	41
Smartphone possession	34
Attitudes toward globalization	30

Business agility	Rank
Opportunities and threats	21
World robots distribution	-
Agility of companies	35
Use of big data and analytics	09
Knowledge transfer	32
▶ Entrepreneurial fear of failure	01

IT integration	Rank
E-Government	27
Public-private partnerships	33
Cyber security	41
▷ Software piracy	59
Government cyber security capacity	39
▷ Privacy protection by law content	58

KOREA REP.

OVERALL PERFORMANCE (63 countries)

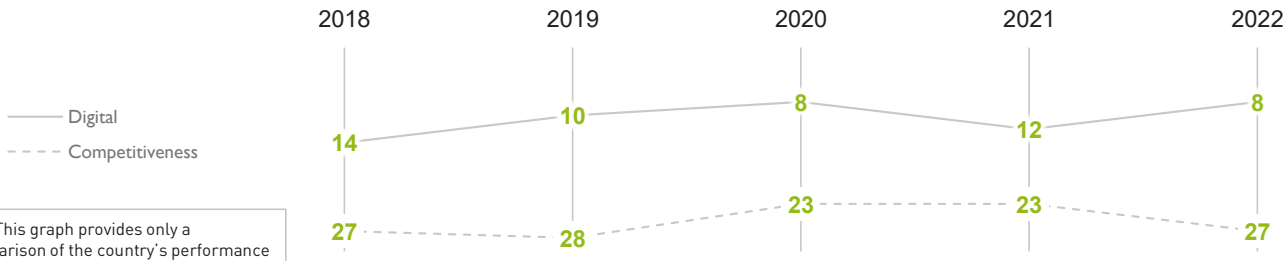


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	06
▷ International experience	59
▷ Foreign highly-skilled personnel	49
Management of cities	07
Digital/Technological skills	46
Net flow of international students	38

Training & education	Rank
Employee training	34
Total public expenditure on education	42
Higher education achievement	04
Pupil-teacher ratio (tertiary education)	30
Graduates in Sciences	11
Women with degrees	20

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	02
Total R&D personnel per capita	03
▷ Female researchers	53
R&D productivity by publication	26
Scientific and technical employment	33
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
Starting a business	19
▶ Enforcing contracts	02
Immigration laws	29
▷ Development & application of tech.	48
Scientific research legislation	31
Intellectual property rights	37

Capital	Rank
IT & media stock market capitalization	04
Funding for technological development	30
▷ Banking and financial services	47
Country credit rating	17
Venture capital	35
Investment in Telecommunications	15

Technological framework	Rank
Communications technology	12
Mobile Broadband subscribers	15
Wireless broadband	25
Internet users	08
Internet bandwidth speed	12
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

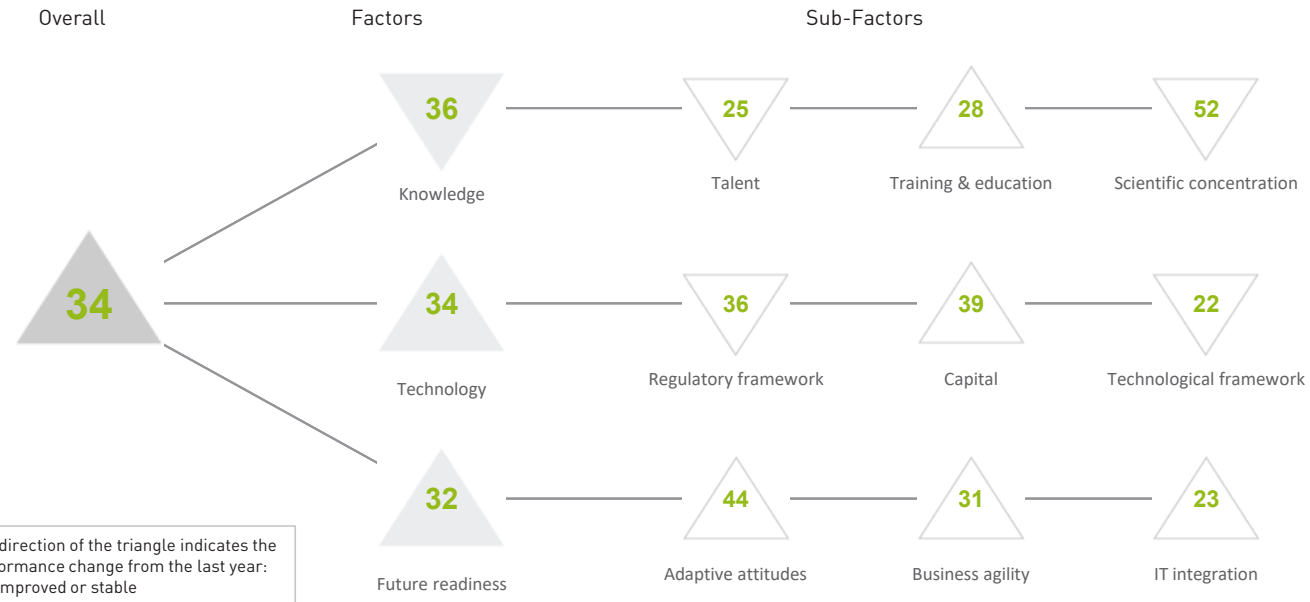
Adaptive attitudes	Rank
▶ E-Participation	01
▶ Internet retailing	01
Tablet possession	26
Smartphone possession	04
Attitudes toward globalization	11

Business agility	Rank
Opportunities and threats	35
World robots distribution	03
Agility of companies	16
Use of big data and analytics	34
Knowledge transfer	30
▶ Entrepreneurial fear of failure	02

IT integration	Rank
E-Government	02
Public-private partnerships	46
Cyber security	28
Software piracy	20
Government cyber security capacity	06
Privacy protection by law content	33

LATVIA

OVERALL PERFORMANCE (63 countries)

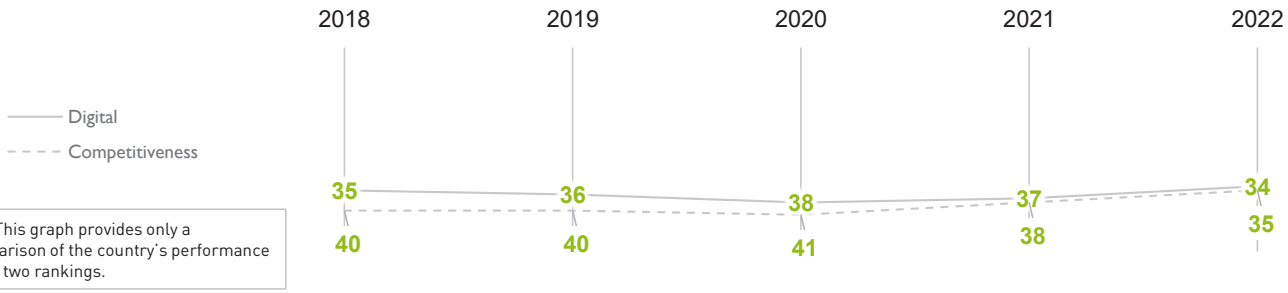


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



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PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)

POPULATIONS < 20 MILLION (36 countries)

LATVIA

▶ 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
Educational assessment PISA - Math	23
International experience	20
Foreign highly-skilled personnel	38
Management of cities	34
Digital/Technological skills	27
Net flow of international students	21

Training & education	Rank
Employee training	23
▶ Total public expenditure on education	12
Higher education achievement	30
Pupil-teacher ratio (tertiary education)	17
Graduates in Sciences	47
Women with degrees	23

Scientific concentration	Rank
Total expenditure on R&D (%)	47
Total R&D personnel per capita	37
▶ Female researchers	05
▷ R&D productivity by publication	55
Scientific and technical employment	40
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
Starting a business	15
Enforcing contracts	14
▷ Immigration laws	56
Development & application of tech.	32
Scientific research legislation	43
Intellectual property rights	35

Capital	Rank
IT & media stock market capitalization	29
Funding for technological development	33
Banking and financial services	41
Country credit rating	35
Venture capital	24
▷ Investment in Telecommunications	51

Technological framework	Rank
Communications technology	23
Mobile Broadband subscribers	21
Wireless broadband	17
Internet users	28
Internet bandwidth speed	32
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

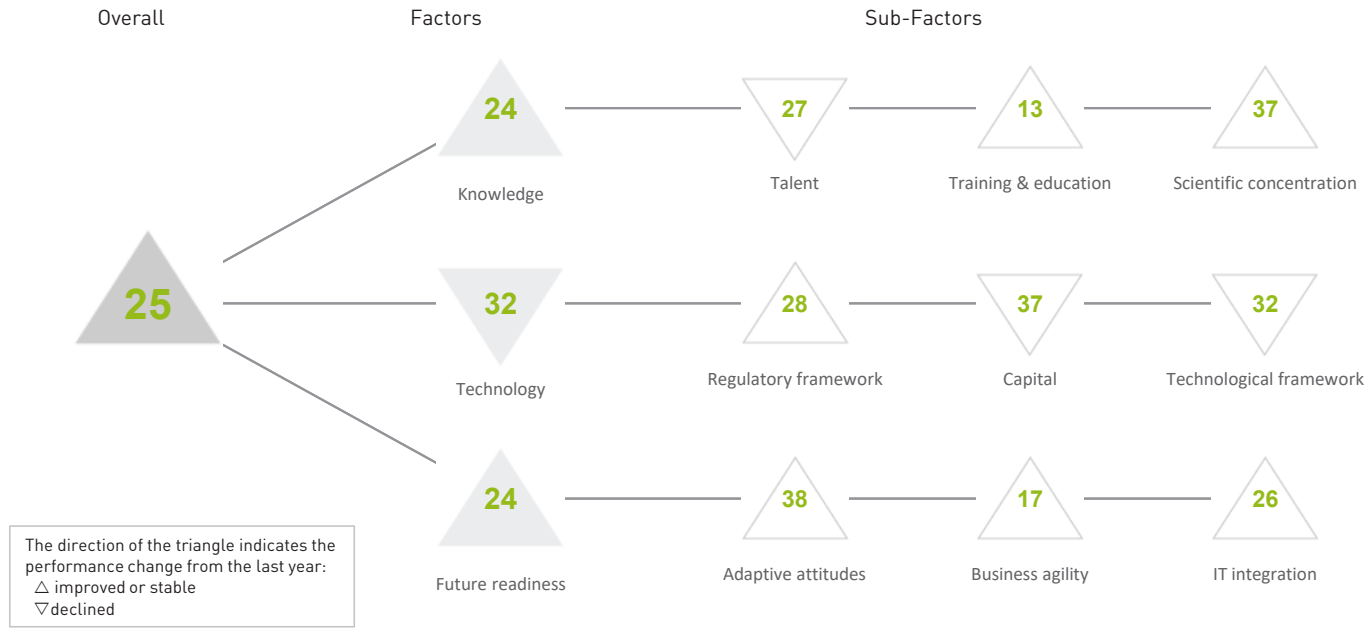
Adaptive attitudes	Rank
▷ E-Participation	58
Internet retailing	36
Tablet possession	28
Smartphone possession	14
Attitudes toward globalization	46

Business agility	Rank
Opportunities and threats	39
▷ World robots distribution	52
Agility of companies	44
Use of big data and analytics	24
Knowledge transfer	31
▶ Entrepreneurial fear of failure	12

IT integration	Rank
E-Government	43
Public-private partnerships	35
Cyber security	30
Software piracy	40
▶ Government cyber security capacity	11
▶ Privacy protection by law content	02

LITHUANIA

OVERALL PERFORMANCE (63 countries)

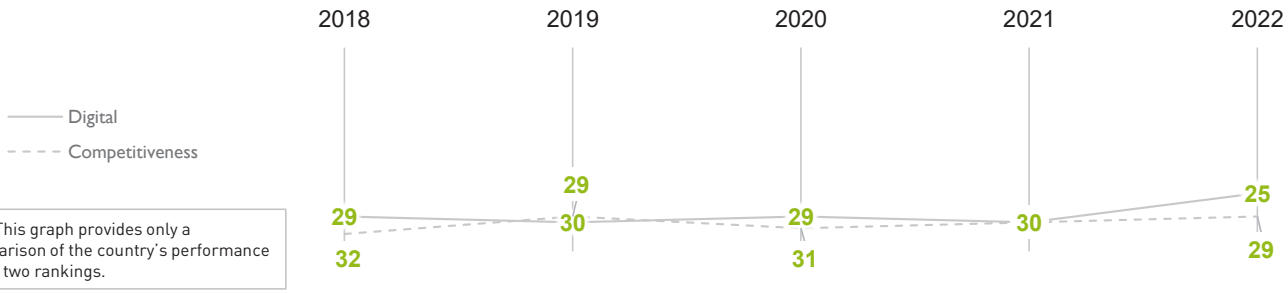


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	33
International experience	17
Foreign highly-skilled personnel	37
Management of cities	43
▶ Digital/Technological skills	02
▷ Net flow of international students	53

Training & education	Rank
Employee training	21
Total public expenditure on education	27
Higher education achievement	13
Pupil-teacher ratio (tertiary education)	10
Graduates in Sciences	21
Women with degrees	17

Scientific concentration	Rank
Total expenditure on R&D (%)	36
Total R&D personnel per capita	27
Female researchers	08
▷ R&D productivity by publication	53
Scientific and technical employment	32
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
Starting a business	20
▶ Enforcing contracts	07
▷ Immigration laws	57
Development & application of tech.	26
Scientific research legislation	26
Intellectual property rights	30

Capital	Rank
IT & media stock market capitalization	08
Funding for technological development	25
Banking and financial services	42
Country credit rating	29
Venture capital	29
▷ Investment in Telecommunications	59

Technological framework	Rank
▶ Communications technology	05
▷ Mobile Broadband subscribers	50
Wireless broadband	16
Internet users	32
Internet bandwidth speed	21
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

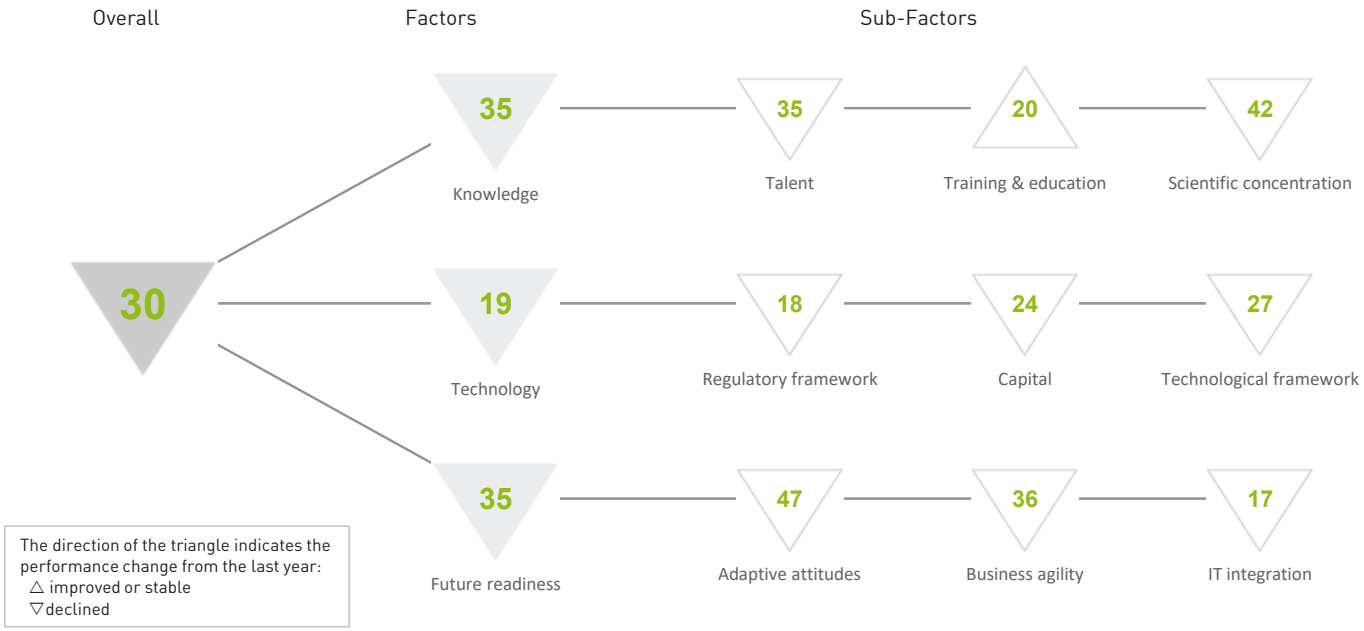
Adaptive attitudes	Rank
E-Participation	48
Internet retailing	30
Tablet possession	36
Smartphone possession	42
Attitudes toward globalization	26

Business agility	Rank
▶ Opportunities and threats	04
World robots distribution	45
▶ Agility of companies	05
Use of big data and analytics	21
Knowledge transfer	37
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	20
Public-private partnerships	34
Cyber security	19
Software piracy	43
Government cyber security capacity	32
Privacy protection by law content	08

LUXEMBOURG

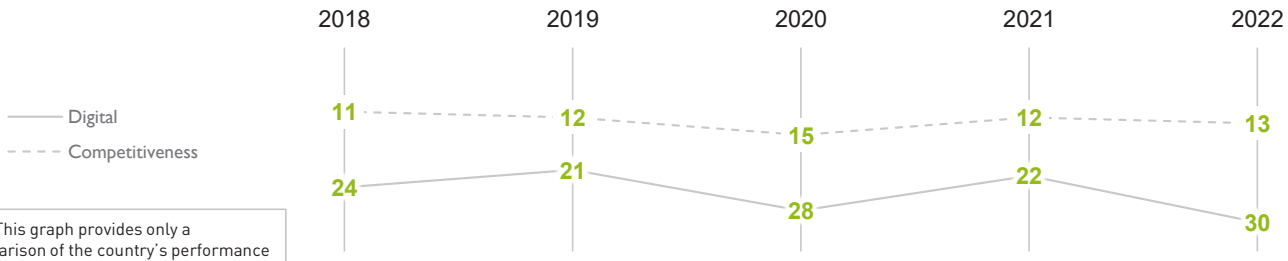
OVERALL PERFORMANCE (63 countries)



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



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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
Educational assessment PISA - Math	31
International experience	08
Foreign highly-skilled personnel	07
Management of cities	13
Digital/Technological skills	38
▷ Net flow of international students	59

Training & education	Rank
Employee training	29
Total public expenditure on education	31
Higher education achievement	10
Pupil-teacher ratio (tertiary education)	09
Graduates in Sciences	51
Women with degrees	11

Scientific concentration	Rank
Total expenditure on R&D (%)	38
Total R&D personnel per capita	11
Female researchers	50
▷ R&D productivity by publication	60
Scientific and technical employment	19
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
Starting a business	34
Enforcing contracts	17
Immigration laws	11
Development & application of tech.	20
Scientific research legislation	20
Intellectual property rights	15

Capital	Rank
▶ IT & media stock market capitalization	02
Funding for technological development	32
Banking and financial services	46
▶ Country credit rating	01
Venture capital	40
▷ Investment in Telecommunications	62

Technological framework	Rank
Communications technology	19
▷ Mobile Broadband subscribers	53
Wireless broadband	29
▶ Internet users	05
Internet bandwidth speed	06
▷ 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

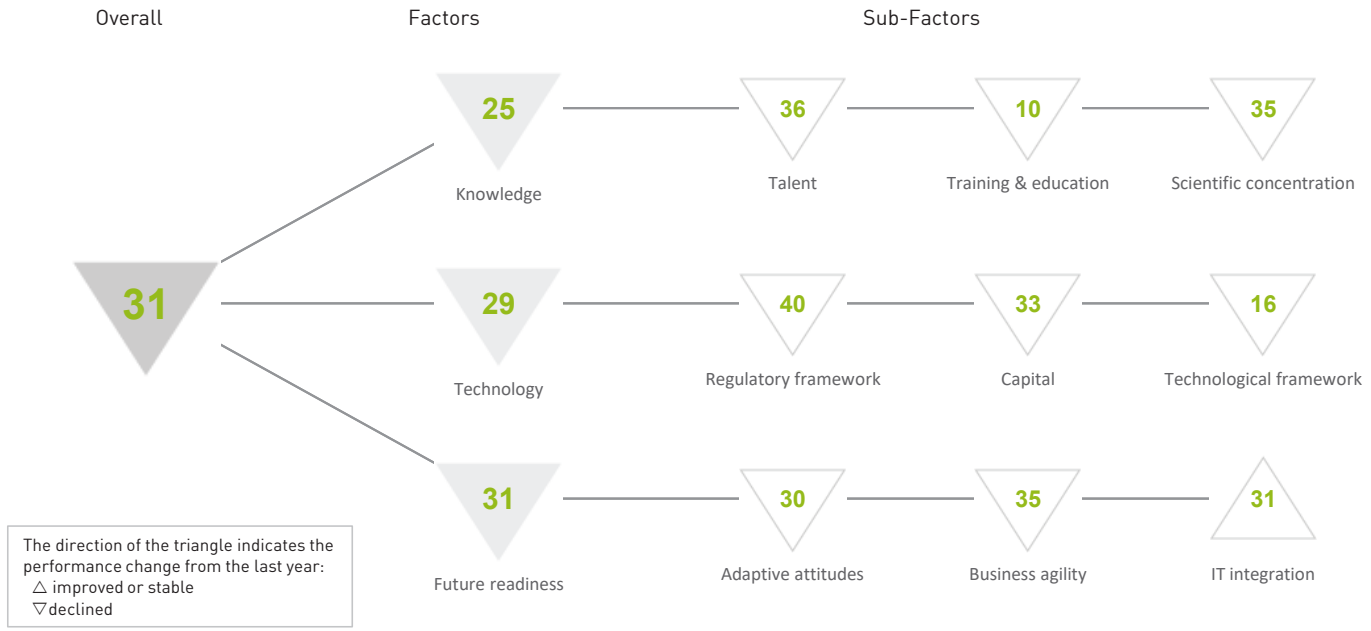
Adaptive attitudes	Rank
E-Participation	52
Internet retailing	-
Tablet possession	-
Smartphone possession	-
Attitudes toward globalization	38

Business agility	Rank
Opportunities and threats	50
World robots distribution	-
Agility of companies	30
Use of big data and analytics	46
Knowledge transfer	24
Entrepreneurial fear of failure	20

IT integration	Rank
E-Government	30
Public-private partnerships	28
Cyber security	24
▶ Software piracy	04
Government cyber security capacity	36
▶ Privacy protection by law content	04

MALAYSIA

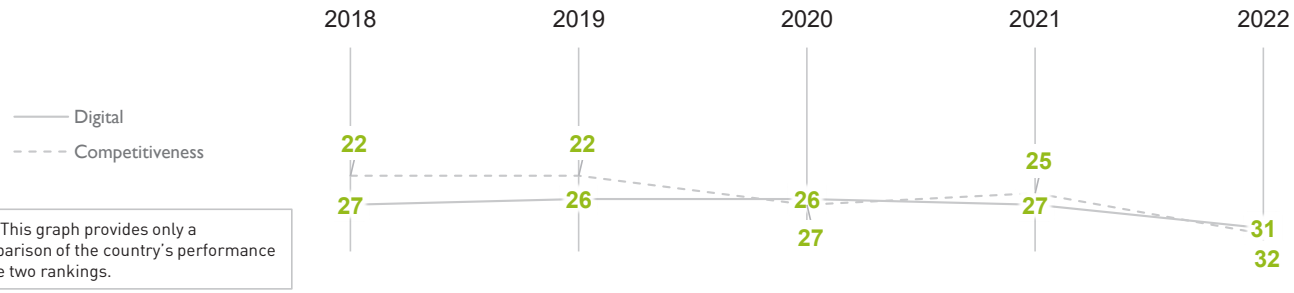
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

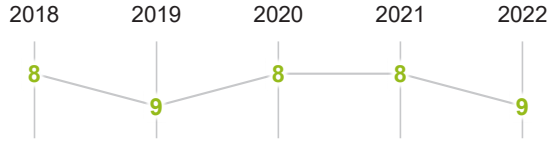
	2018	2019	2020	2021	2022
OVERALL	27	26	26	27	31
Knowledge	17	19	19	22	25
Technology	22	19	20	26	29
Future readiness	29	28	32	29	31

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
Educational assessment PISA - Math	41
International experience	31
Foreign highly-skilled personnel	31
Management of cities	33
Digital/Technological skills	37
Net flow of international students	33

Training & education	Rank
Employee training	40
Total public expenditure on education	41
Higher education achievement	40
Pupil-teacher ratio (tertiary education)	26
▶ Graduates in Sciences	02
▶ Women with degrees	04

Scientific concentration	Rank
Total expenditure on R&D (%)	40
Total R&D personnel per capita	38
▶ Female researchers	07
R&D productivity by publication	22
▷ Scientific and technical employment	46
High-tech patent grants	45
Robots in Education and R&D	26

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
▷ Starting a business	51
Enforcing contracts	27
Immigration laws	46
Development & application of tech.	31
Scientific research legislation	34
Intellectual property rights	44

Capital	Rank
IT & media stock market capitalization	18
Funding for technological development	31
Banking and financial services	36
Country credit rating	38
Venture capital	33
Investment in Telecommunications	27

Technological framework	Rank
▷ Communications technology	49
Mobile Broadband subscribers	26
Wireless broadband	22
Internet users	26
Internet bandwidth speed	35
▶ 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

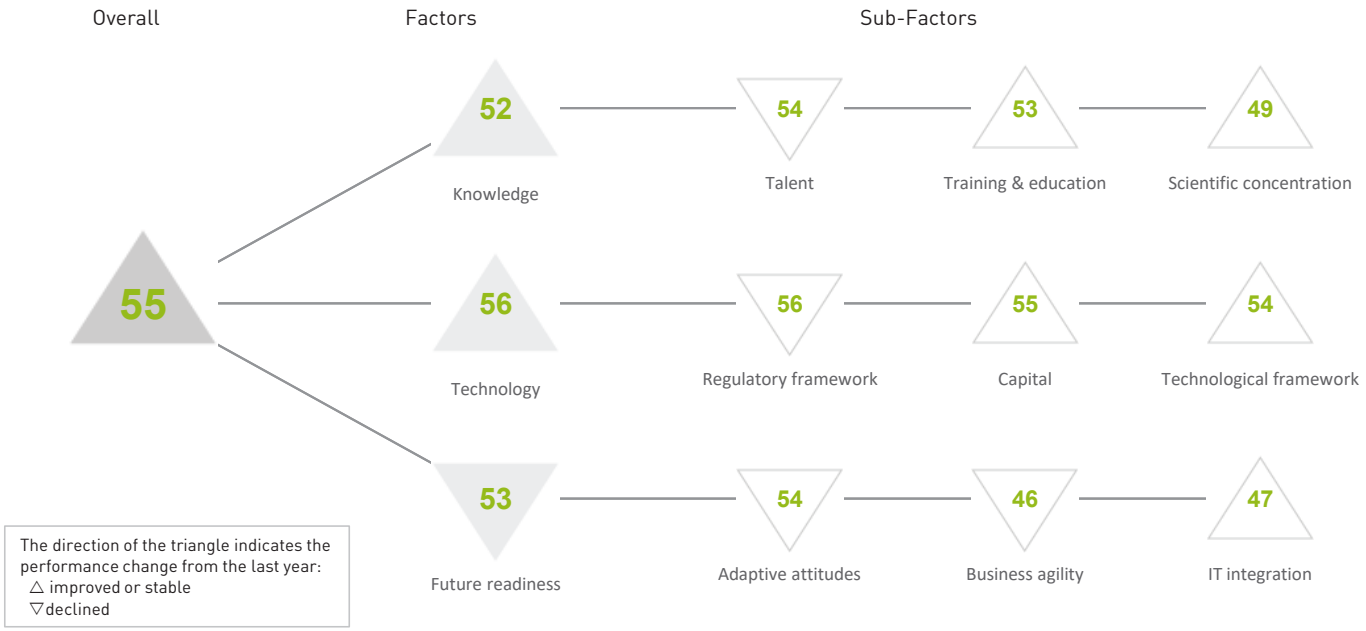
Adaptive attitudes	Rank
E-Participation	27
▷ Internet retailing	46
Tablet possession	30
Smartphone possession	08
Attitudes toward globalization	37

Business agility	Rank
Opportunities and threats	40
World robots distribution	22
Agility of companies	42
Use of big data and analytics	29
Knowledge transfer	27
Entrepreneurial fear of failure	26

IT integration	Rank
E-Government	41
Public-private partnerships	20
Cyber security	33
Software piracy	45
▶ Government cyber security capacity	05
▷ Privacy protection by law content	55

MEXICO

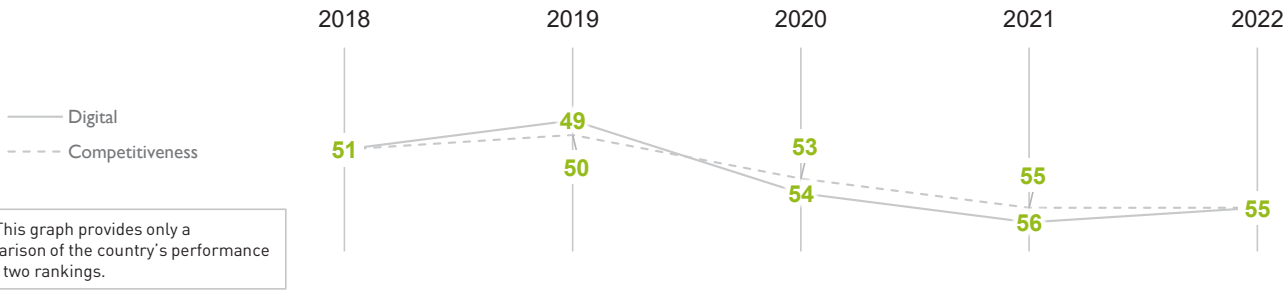
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

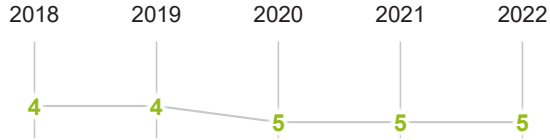
	2018	2019	2020	2021	2022
OVERALL	51	49	54	56	55
Knowledge	54	52	52	54	52
Technology	46	52	56	57	56
Future readiness	50	49	52	51	53

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
Educational assessment PISA - Math	49
International experience	36
Foreign highly-skilled personnel	47
Management of cities	57
Digital/Technological skills	48
Net flow of international students	37

Training & education	Rank
Employee training	43
Total public expenditure on education	55
Higher education achievement	54
▶ Pupil-teacher ratio (tertiary education)	15
Graduates in Sciences	24
Women with degrees	53

Scientific concentration	Rank
Total expenditure on R&D (%)	55
Total R&D personnel per capita	50
Female researchers	41
▶ R&D productivity by publication	05
Scientific and technical employment	44
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
Starting a business	44
Enforcing contracts	32
Immigration laws	49
▷ Development & application of tech.	58
▷ Scientific research legislation	61
Intellectual property rights	57

Capital	Rank
IT & media stock market capitalization	20
▷ Funding for technological development	61
▷ Banking and financial services	58
Country credit rating	47
Venture capital	58
Investment in Telecommunications	29

Technological framework	Rank
Communications technology	56
Mobile Broadband subscribers	42
Wireless broadband	55
Internet users	54
Internet bandwidth speed	52
▶ 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

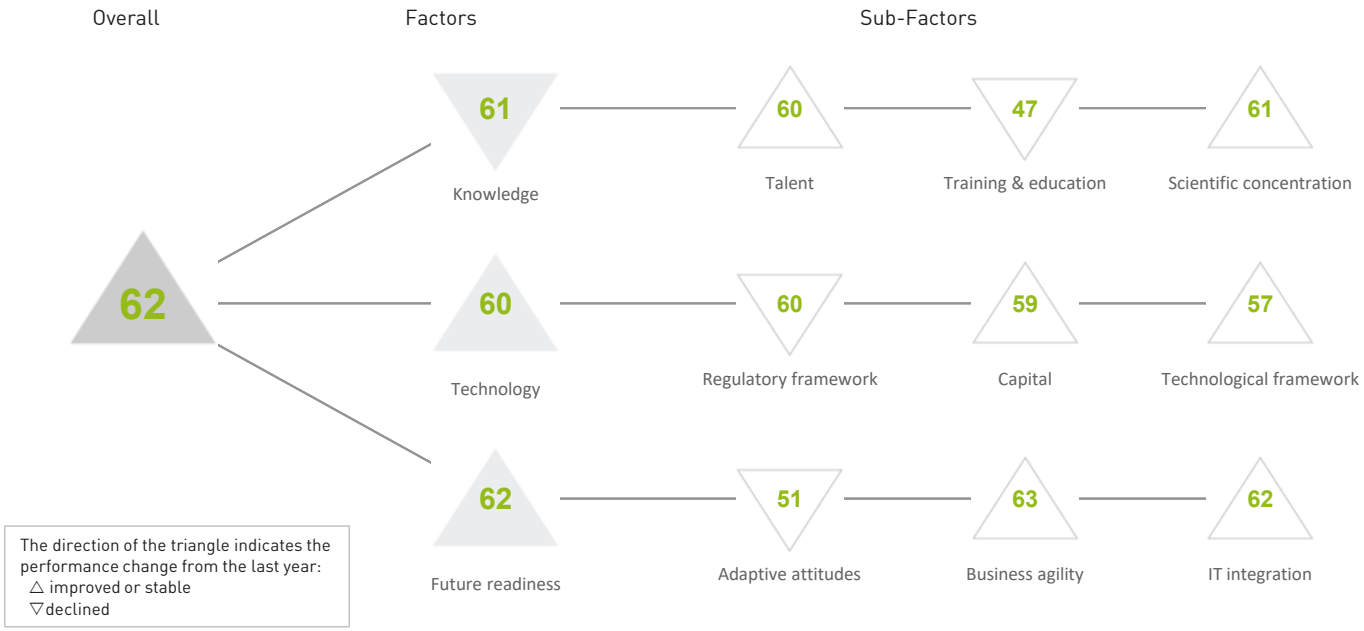
Adaptive attitudes	Rank
E-Participation	34
Internet retailing	44
Tablet possession	49
Smartphone possession	57
Attitudes toward globalization	25

Business agility	Rank
Opportunities and threats	46
▶ World robots distribution	09
Agility of companies	47
Use of big data and analytics	56
Knowledge transfer	50
Entrepreneurial fear of failure	34

IT integration	Rank
E-Government	50
Public-private partnerships	53
▷ Cyber security	60
Software piracy	42
Government cyber security capacity	37
Privacy protection by law content	20

MONGOLIA

OVERALL PERFORMANCE (63 countries)

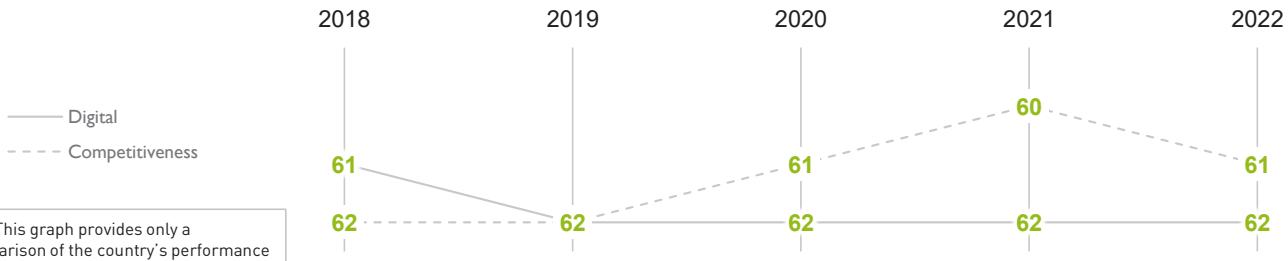


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	-
International experience	61
Foreign highly-skilled personnel	58
Management of cities	62
Digital/Technological skills	58
Net flow of international students	57

Training & education	Rank
▶ Employee training	16
Total public expenditure on education	45
Higher education achievement	51
Pupil-teacher ratio (tertiary education)	53
Graduates in Sciences	35
Women with degrees	31

Scientific concentration	Rank
Total expenditure on R&D (%)	60
Total R&D personnel per capita	42
▶ Female researchers	09
R&D productivity by publication	58
Scientific and technical employment	56
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
Starting a business	42
Enforcing contracts	43
Immigration laws	51
Development & application of tech.	61
Scientific research legislation	62
▷ Intellectual property rights	62

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	60
Banking and financial services	61
Country credit rating	61
Venture capital	61
▶ Investment in Telecommunications	02

Technological framework	Rank
Communications technology	52
▷ Mobile Broadband subscribers	62
Wireless broadband	45
Internet users	52
Internet bandwidth speed	59
▶ 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

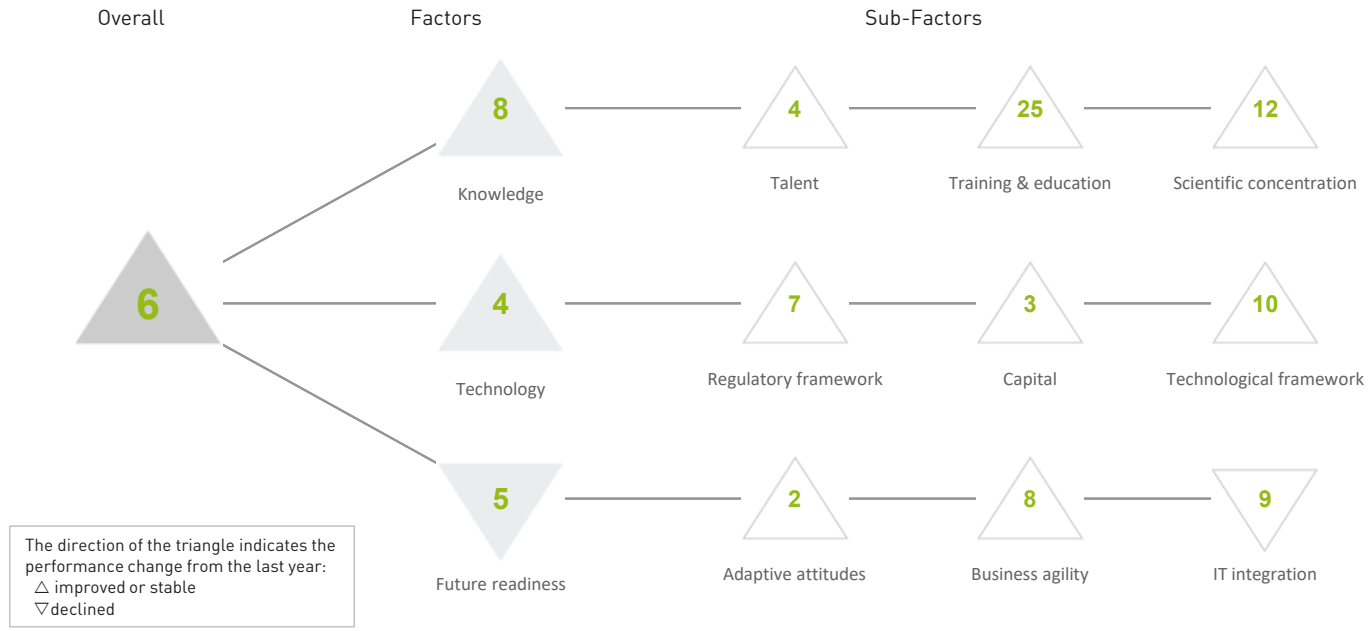
Adaptive attitudes	Rank
E-Participation	57
Internet retailing	59
Tablet possession	-
▶ Smartphone possession	02
Attitudes toward globalization	56

Business agility	Rank
Opportunities and threats	62
World robots distribution	-
Agility of companies	58
Use of big data and analytics	59
▷ Knowledge transfer	63
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	57
▷ Public-private partnerships	63
▷ Cyber security	62
Software piracy	-
Government cyber security capacity	55
Privacy protection by law content	44

NETHERLANDS

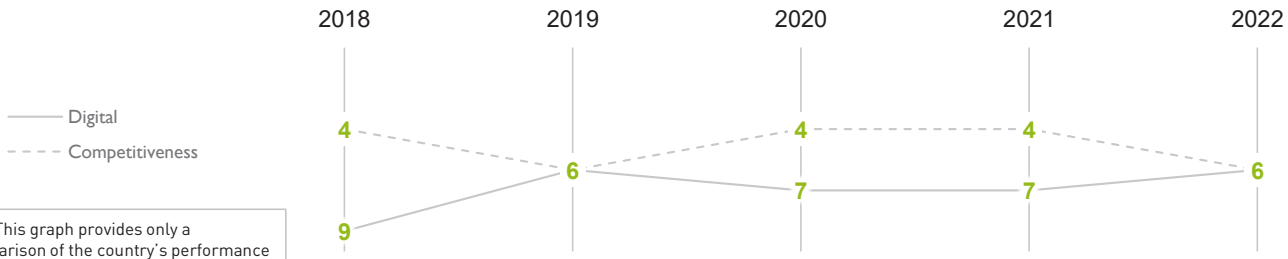
OVERALL PERFORMANCE (63 countries)



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



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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
Educational assessment PISA - Math	08
International experience	06
▶ Foreign highly-skilled personnel	02
Management of cities	09
Digital/Technological skills	06
Net flow of international students	08

Training & education	Rank
Employee training	05
Total public expenditure on education	25
Higher education achievement	18
Pupil-teacher ratio (tertiary education)	23
▷ Graduates in Sciences	53
Women with degrees	25

Scientific concentration	Rank
Total expenditure on R&D (%)	16
Total R&D personnel per capita	07
▷ Female researchers	48
R&D productivity by publication	27
Scientific and technical employment	03
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
Starting a business	13
▷ Enforcing contracts	44
Immigration laws	03
Development & application of tech.	06
Scientific research legislation	06
Intellectual property rights	05

Capital	Rank
▶ IT & media stock market capitalization	03
Funding for technological development	06
Banking and financial services	15
▶ Country credit rating	01
Venture capital	04
▷ Investment in Telecommunications	47

Technological framework	Rank
▶ Communications technology	02
Mobile Broadband subscribers	14
Wireless broadband	35
Internet users	13
Internet bandwidth speed	11
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

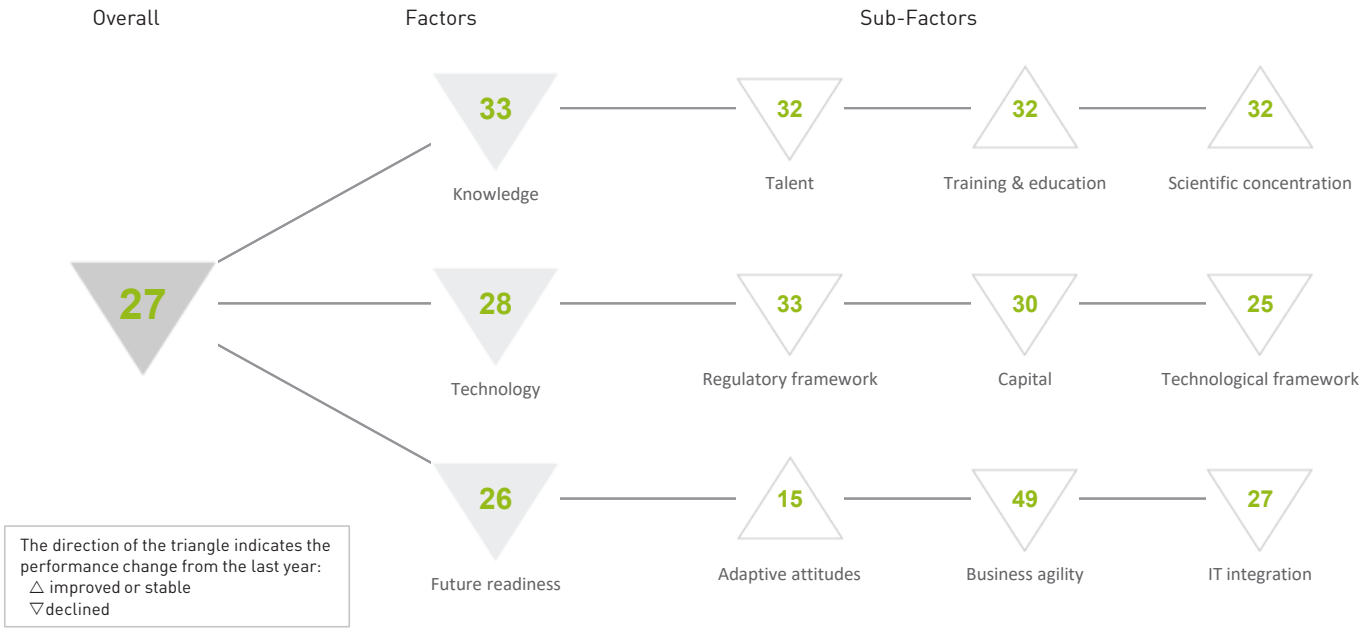
Adaptive attitudes	Rank
E-Participation	09
Internet retailing	07
Tablet possession	15
Smartphone possession	25
Attitudes toward globalization	06

Business agility	Rank
Opportunities and threats	09
World robots distribution	20
Agility of companies	12
Use of big data and analytics	16
▶ Knowledge transfer	02
Entrepreneurial fear of failure	11

IT integration	Rank
E-Government	10
Public-private partnerships	05
Cyber security	20
Software piracy	13
▷ Government cyber security capacity	40
Privacy protection by law content	07

NEW ZEALAND

OVERALL PERFORMANCE (63 countries)

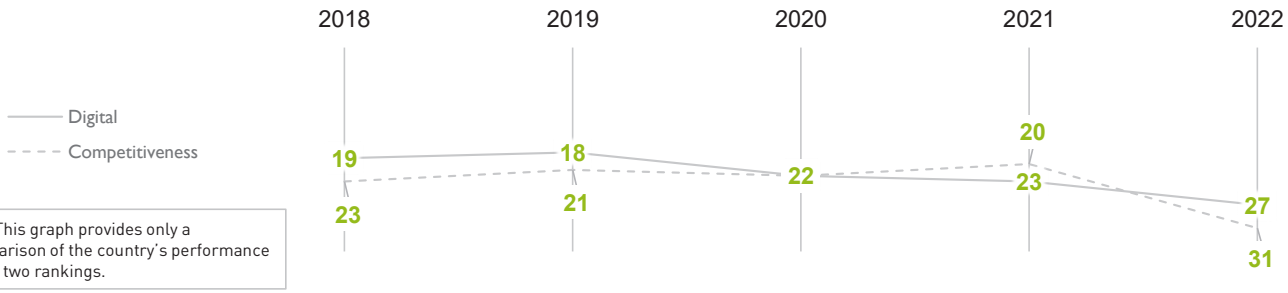


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



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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
	Educational assessment PISA - Math	26
▷	International experience	58
	Foreign highly-skilled personnel	28
▷	Management of cities	54
	Digital/Technological skills	51
▶	Net flow of international students	03

Training & education	Rank
Employee training	42
Total public expenditure on education	13
Higher education achievement	31
Pupil-teacher ratio (tertiary education)	35
Graduates in Sciences	36
Women with degrees	26

Scientific concentration	Rank
Total expenditure on R&D (%)	30
Total R&D personnel per capita	15
Female researchers	-
R&D productivity by publication	40
Scientific and technical employment	12
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
▶	Starting a business	01
	Enforcing contracts	19
▷	Immigration laws	63
	Development & application of tech.	37
	Scientific research legislation	32
	Intellectual property rights	17

Capital	Rank
IT & media stock market capitalization	33
Funding for technological development	45
Banking and financial services	30
Country credit rating	12
Venture capital	37
Investment in Telecommunications	21

Technological framework	Rank
Communications technology	31
Mobile Broadband subscribers	44
Wireless broadband	15
Internet users	23
Internet bandwidth speed	17
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

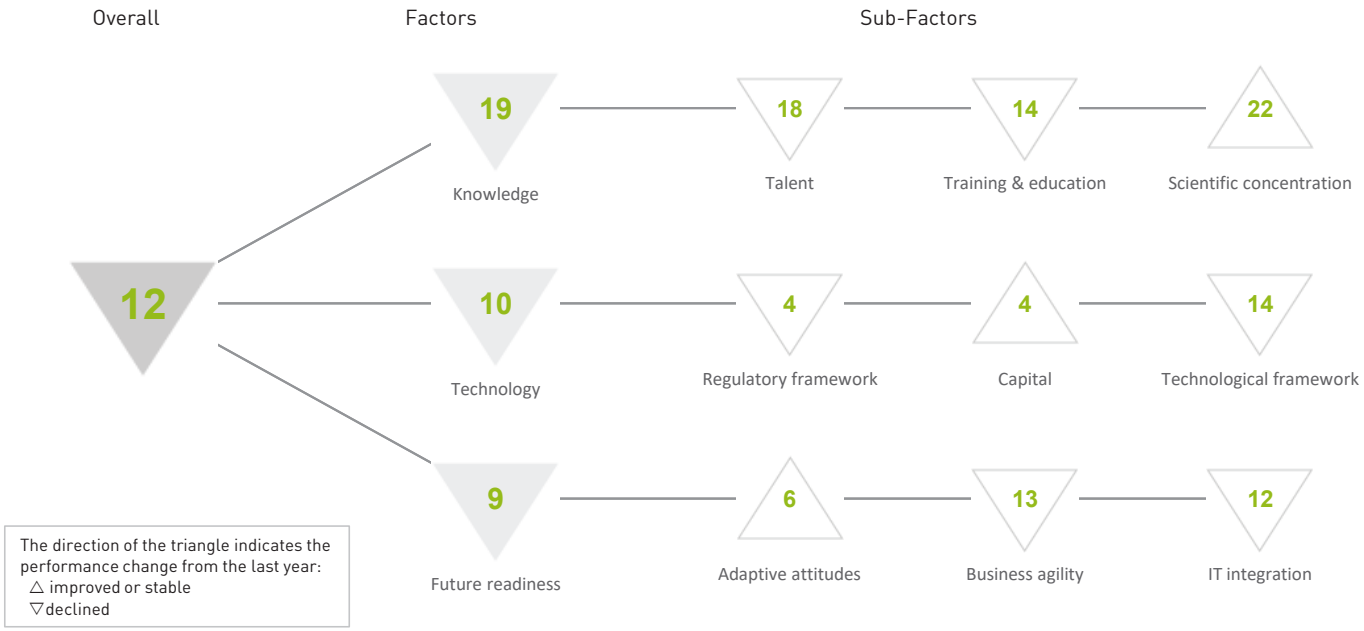
	Adaptive attitudes	Rank
▶	E-Participation	04
	Internet retailing	19
	Tablet possession	14
	Smartphone possession	35
	Attitudes toward globalization	21

Business agility	Rank
Opportunities and threats	38
World robots distribution	41
Agility of companies	48
Use of big data and analytics	39
Knowledge transfer	40
Entrepreneurial fear of failure	-

	IT integration	Rank
▶	E-Government	08
▷	Public-private partnerships	54
▷	Cyber security	52
▶	Software piracy	02
	Government cyber security capacity	19
	Privacy protection by law content	39

NORWAY

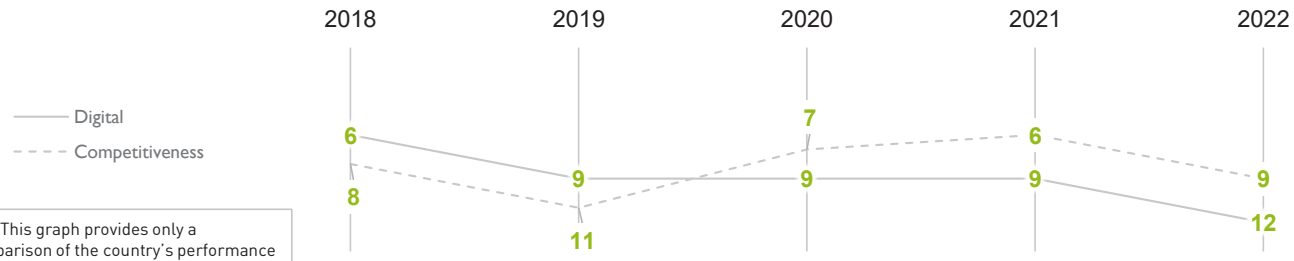
OVERALL PERFORMANCE (63 countries)



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

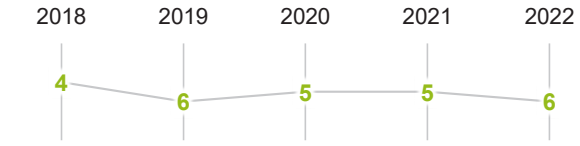
COMPETITIVENESS & DIGITAL RANKINGS



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	18
International experience	21
Foreign highly-skilled personnel	14
Management of cities	24
Digital/Technological skills	08
▷ Net flow of international students	48

Training & education	Rank
Employee training	12
Total public expenditure on education	14
Higher education achievement	20
Pupil-teacher ratio (tertiary education)	05
▷ Graduates in Sciences	43
Women with degrees	16

Scientific concentration	Rank
Total expenditure on R&D (%)	17
Total R&D personnel per capita	10
Female researchers	25
▷ R&D productivity by publication	42
Scientific and technical employment	22
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
Starting a business	14
▶ Enforcing contracts	03
Immigration laws	12
Development & application of tech.	19
Scientific research legislation	18
Intellectual property rights	11

Capital	Rank
IT & media stock market capitalization	23
Funding for technological development	10
▶ Banking and financial services	04
▶ Country credit rating	01
Venture capital	05
Investment in Telecommunications	33

Technological framework	Rank
Communications technology	25
Mobile Broadband subscribers	20
Wireless broadband	34
Internet users	06
Internet bandwidth speed	16
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

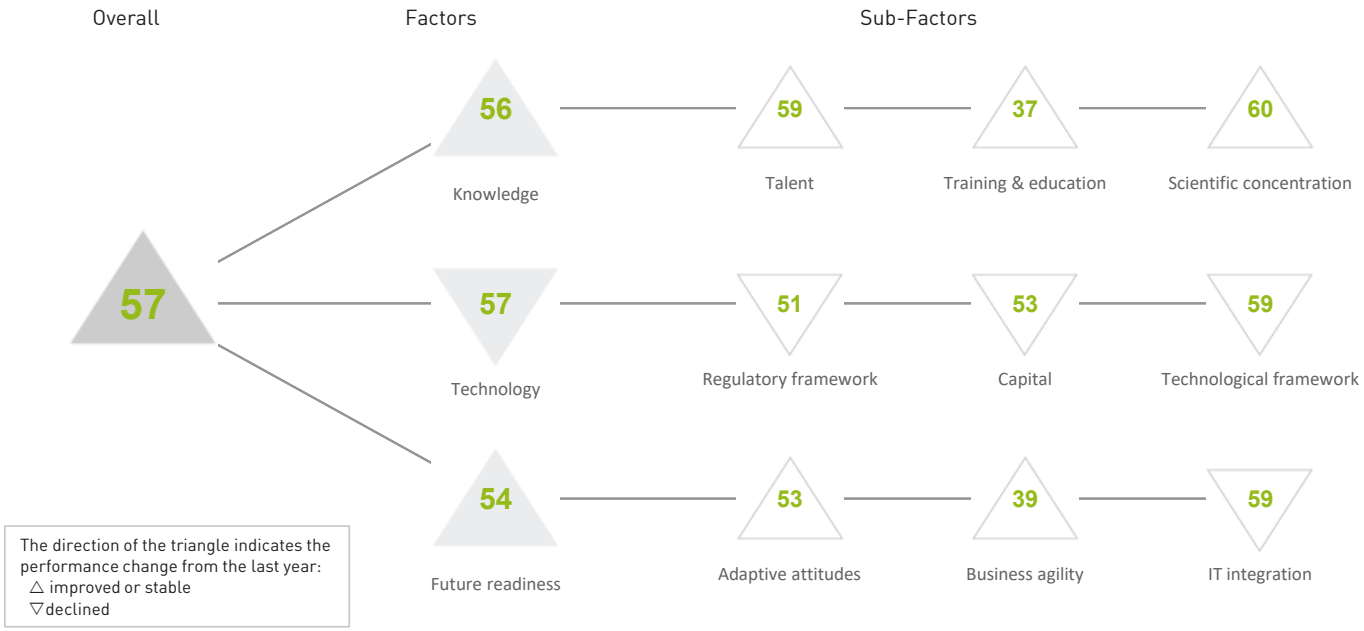
Adaptive attitudes	Rank
E-Participation	18
Internet retailing	06
▶ Tablet possession	03
Smartphone possession	12
Attitudes toward globalization	31

Business agility	Rank
Opportunities and threats	10
▷ World robots distribution	40
Agility of companies	13
Use of big data and analytics	07
Knowledge transfer	09
Entrepreneurial fear of failure	15

IT integration	Rank
E-Government	13
Public-private partnerships	16
Cyber security	18
Software piracy	10
▷ Government cyber security capacity	44
▶ Privacy protection by law content	05

PERU

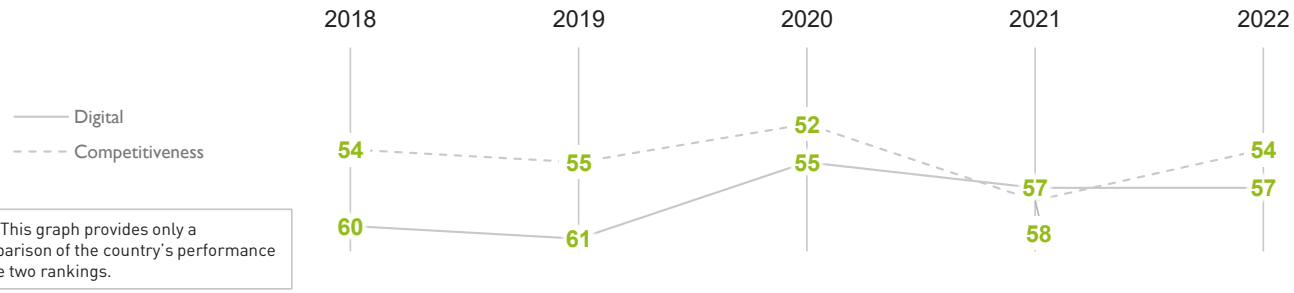
OVERALL PERFORMANCE (63 countries)



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)

PERU

▶ 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
Educational assessment PISA - Math	50
International experience	38
Foreign highly-skilled personnel	40
▷ Management of cities	59
Digital/Technological skills	59
Net flow of international students	-

Training & education	Rank
Employee training	53
Total public expenditure on education	47
▶ Higher education achievement	06
Pupil-teacher ratio (tertiary education)	51
▶ Graduates in Sciences	10
Women with degrees	38

Scientific concentration	Rank
▷ Total expenditure on R&D (%)	59
Total R&D personnel per capita	-
Female researchers	45
R&D productivity by publication	28
Scientific and technical employment	52
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
Starting a business	54
Enforcing contracts	45
▶ Immigration laws	19
Development & application of tech.	55
Scientific research legislation	56
Intellectual property rights	58

Capital	Rank
IT & media stock market capitalization	56
Funding for technological development	56
Banking and financial services	53
Country credit rating	40
Venture capital	47
▶ Investment in Telecommunications	09

Technological framework	Rank
▷ Communications technology	61
Mobile Broadband subscribers	56
▷ Wireless broadband	60
Internet users	57
Internet bandwidth speed	56
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

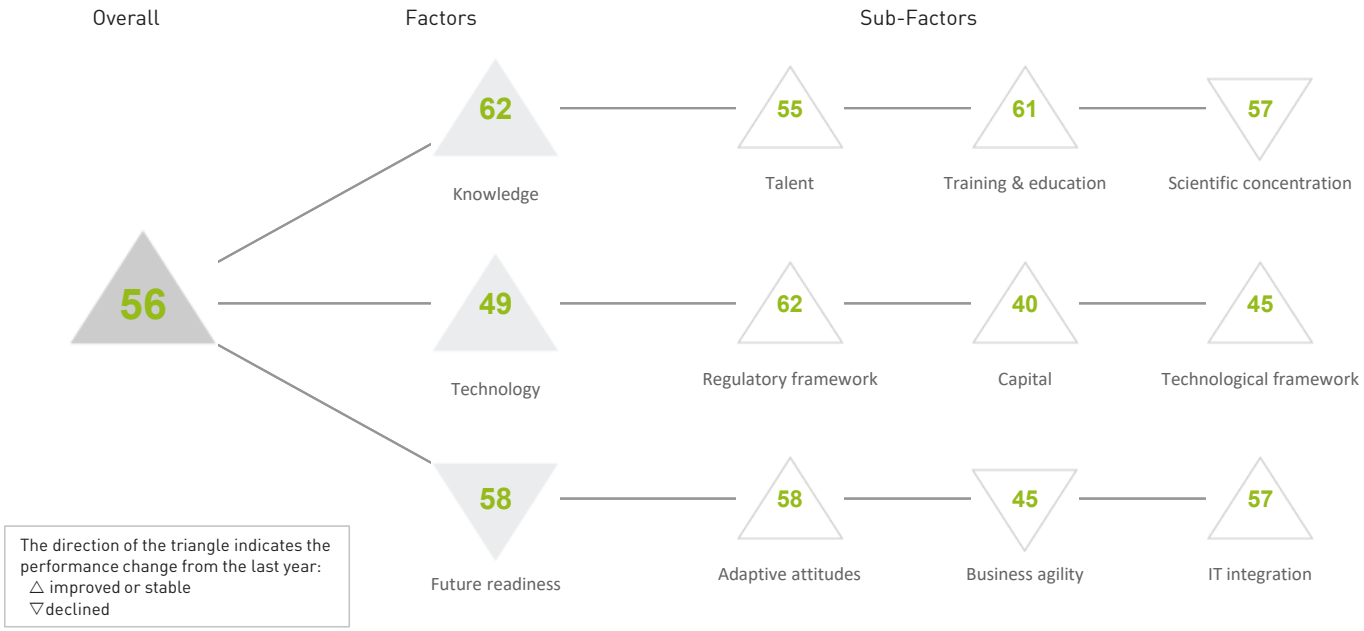
Adaptive attitudes	Rank
E-Participation	43
Internet retailing	53
Tablet possession	54
Smartphone possession	37
Attitudes toward globalization	32

Business agility	Rank
Opportunities and threats	45
World robots distribution	53
Agility of companies	51
Use of big data and analytics	53
Knowledge transfer	45
▶ Entrepreneurial fear of failure	04

IT integration	Rank
E-Government	53
Public-private partnerships	45
Cyber security	58
Software piracy	54
▷ Government cyber security capacity	62
Privacy protection by law content	53

PHILIPPINES

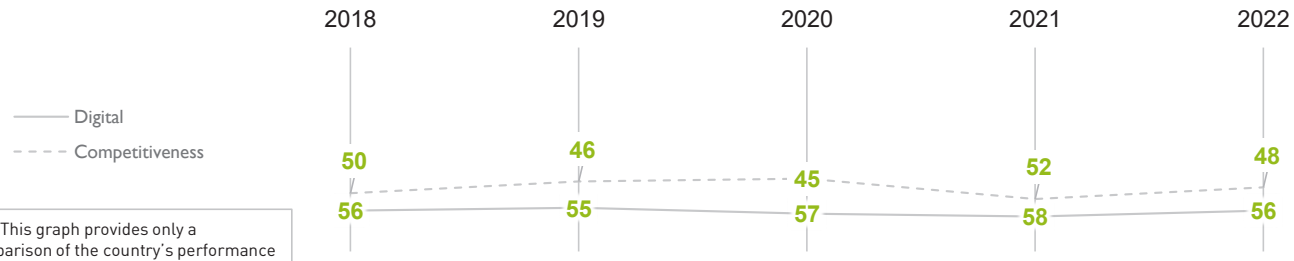
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	57
International experience	30
Foreign highly-skilled personnel	45
Management of cities	41
Digital/Technological skills	42
Net flow of international students	39

Training & education	Rank
Employee training	38
▷ Total public expenditure on education	59
Higher education achievement	57
Pupil-teacher ratio (tertiary education)	54
▶ Graduates in Sciences	14
Women with degrees	57

Scientific concentration	Rank
Total expenditure on R&D (%)	54
Total R&D personnel per capita	51
▶ Female researchers	04
R&D productivity by publication	37
▷ Scientific and technical employment	58
High-tech patent grants	37
Robots in Education and R&D	51

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
▷ Starting a business	62
▷ Enforcing contracts	61
Immigration laws	31
Development & application of tech.	46
Scientific research legislation	51
Intellectual property rights	53

Capital	Rank
IT & media stock market capitalization	28
Funding for technological development	50
Banking and financial services	34
Country credit rating	43
Venture capital	53
▶ Investment in Telecommunications	10

Technological framework	Rank
▷ Communications technology	60
Mobile Broadband subscribers	51
Wireless broadband	31
Internet users	58
Internet bandwidth speed	58
▶ 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

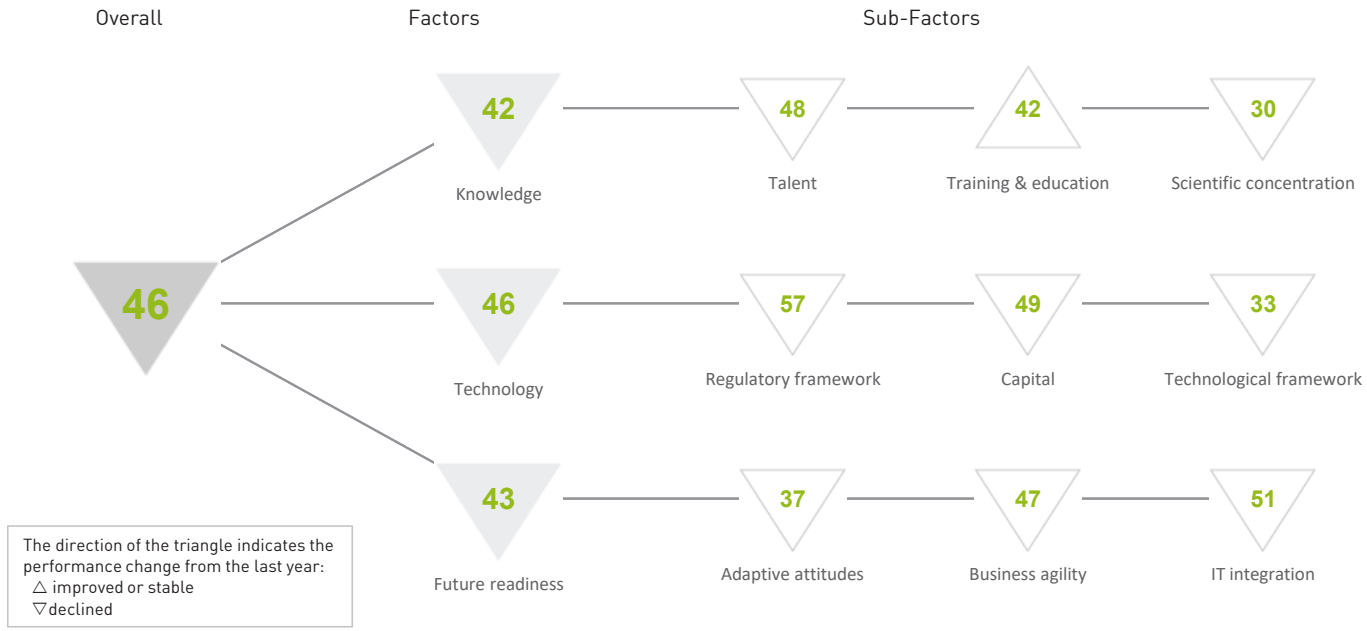
Adaptive attitudes	Rank
E-Participation	44
Internet retailing	55
Tablet possession	55
Smartphone possession	54
▶ Attitudes toward globalization	27

Business agility	Rank
Opportunities and threats	31
World robots distribution	39
Agility of companies	40
Use of big data and analytics	38
Knowledge transfer	47
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	54
Public-private partnerships	31
Cyber security	54
Software piracy	55
Government cyber security capacity	53
Privacy protection by law content	42

POLAND

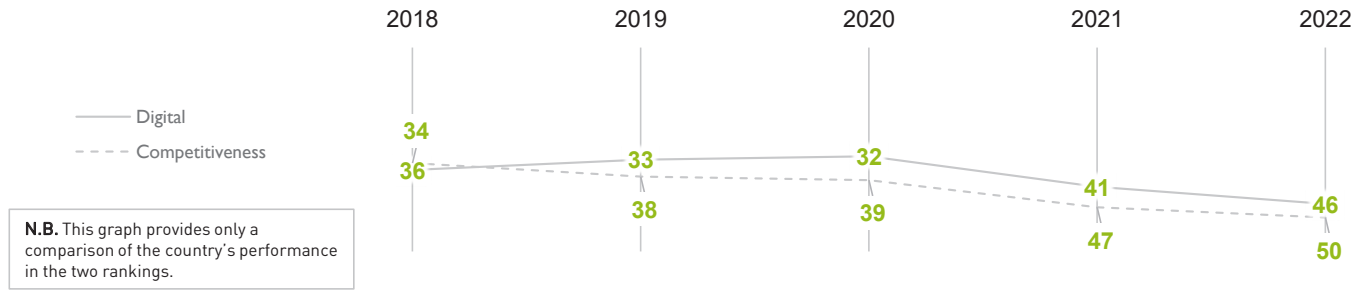
OVERALL PERFORMANCE (63 countries)



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

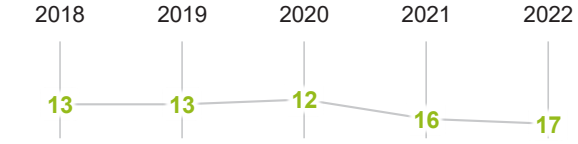
COMPETITIVENESS & DIGITAL RANKINGS



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
▶	Educational assessment PISA - Math	09
	International experience	54
	Foreign highly-skilled personnel	53
	Management of cities	47
▷	Digital/Technological skills	61
	Net flow of international students	32

	Training & education	Rank
▷	Employee training	60
	Total public expenditure on education	26
	Higher education achievement	35
	Pupil-teacher ratio (tertiary education)	27
	Graduates in Sciences	44
	Women with degrees	33

	Scientific concentration	Rank
	Total expenditure on R&D (%)	32
	Total R&D personnel per capita	31
	Female researchers	28
	R&D productivity by publication	18
	Scientific and technical employment	36
	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
	Starting a business	53
	Enforcing contracts	38
▷	Immigration laws	59
▷	Development & application of tech.	60
	Scientific research legislation	55
	Intellectual property rights	52

	Capital	Rank
	IT & media stock market capitalization	34
	Funding for technological development	54
	Banking and financial services	55
	Country credit rating	36
	Venture capital	48
	Investment in Telecommunications	39

	Technological framework	Rank
	Communications technology	54
	Mobile Broadband subscribers	27
▶	Wireless broadband	03
	Internet users	45
	Internet bandwidth speed	23
	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

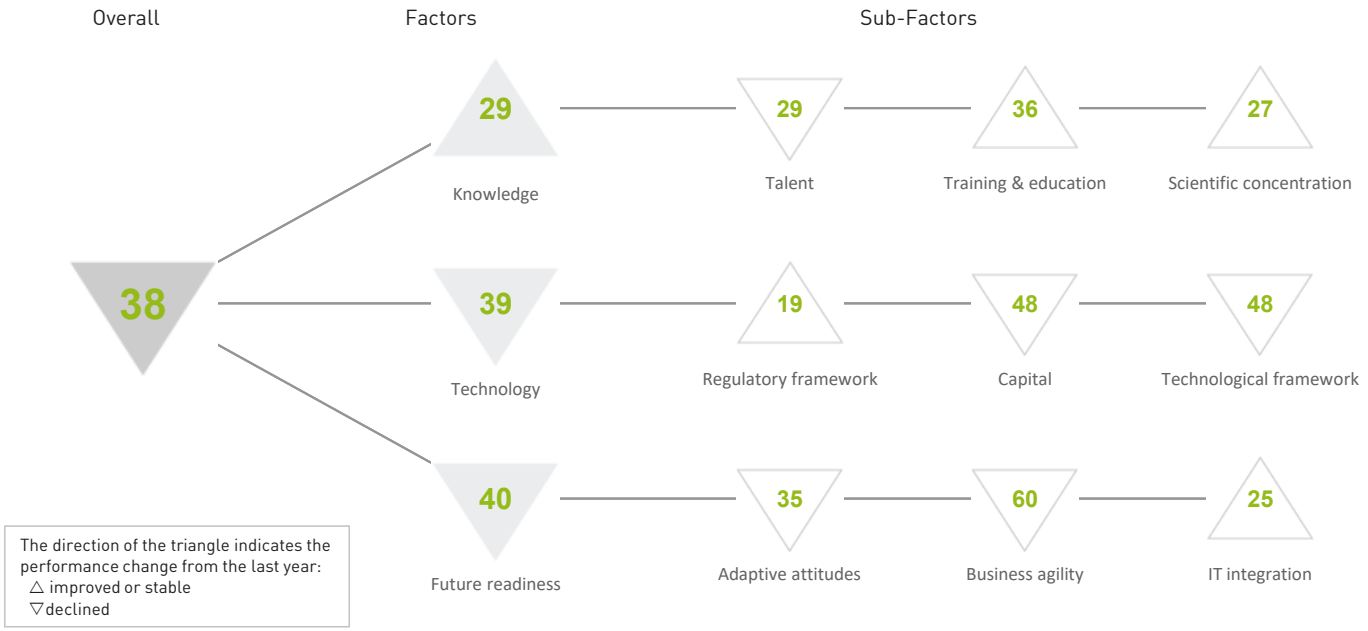
	Adaptive attitudes	Rank
▶	E-Participation	09
	Internet retailing	27
▶	Tablet possession	13
	Smartphone possession	56
	Attitudes toward globalization	58

	Business agility	Rank
	Opportunities and threats	43
	World robots distribution	17
	Agility of companies	36
	Use of big data and analytics	50
	Knowledge transfer	55
	Entrepreneurial fear of failure	21

	IT integration	Rank
	E-Government	23
▷	Public-private partnerships	61
	Cyber security	55
	Software piracy	36
	Government cyber security capacity	49
	Privacy protection by law content	41

PORTUGAL

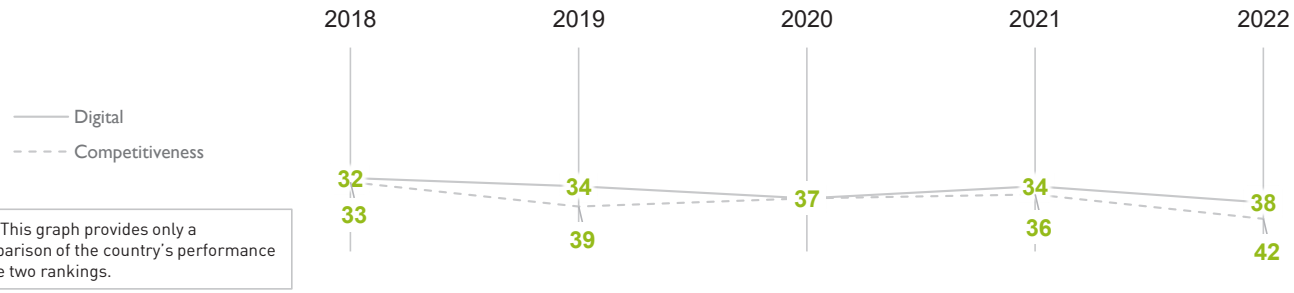
OVERALL PERFORMANCE (63 countries)



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

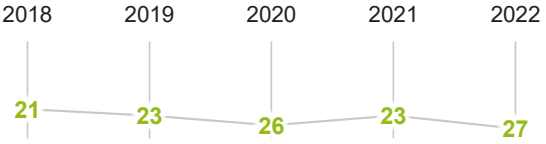
COMPETITIVENESS & DIGITAL RANKINGS



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	27
International experience	48
Foreign highly-skilled personnel	32
Management of cities	23
Digital/Technological skills	20
Net flow of international students	23

Training & education	Rank
▷ Employee training	61
Total public expenditure on education	30
Higher education achievement	36
▶ Pupil-teacher ratio (tertiary education)	11
▶ Graduates in Sciences	15
Women with degrees	39

Scientific concentration	Rank
Total expenditure on R&D (%)	25
Total R&D personnel per capita	23
Female researchers	17
R&D productivity by publication	29
Scientific and technical employment	26
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
Starting a business	31
Enforcing contracts	29
▶ Immigration laws	02
Development & application of tech.	29
Scientific research legislation	28
Intellectual property rights	29

Capital	Rank
IT & media stock market capitalization	42
Funding for technological development	42
Banking and financial services	43
Country credit rating	46
Venture capital	46
Investment in Telecommunications	44

Technological framework	Rank
▶ Communications technology	08
▷ Mobile Broadband subscribers	58
▷ Wireless broadband	52
Internet users	47
Internet bandwidth speed	22
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

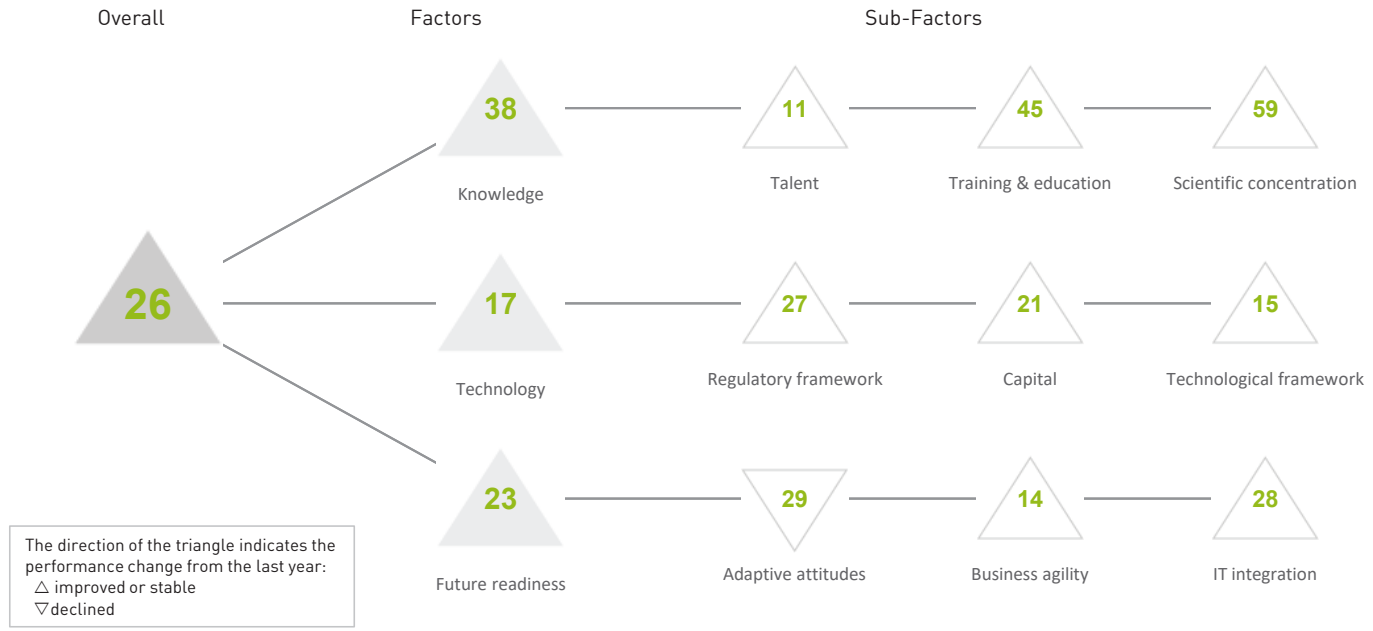
Adaptive attitudes	Rank
E-Participation	34
Internet retailing	35
Tablet possession	32
Smartphone possession	51
Attitudes toward globalization	22

Business agility	Rank
Opportunities and threats	52
World robots distribution	31
▷ Agility of companies	59
▷ Use of big data and analytics	61
Knowledge transfer	41
Entrepreneurial fear of failure	44

IT integration	Rank
E-Government	32
Public-private partnerships	39
Cyber security	50
Software piracy	28
Government cyber security capacity	16
▶ Privacy protection by law content	01

QATAR

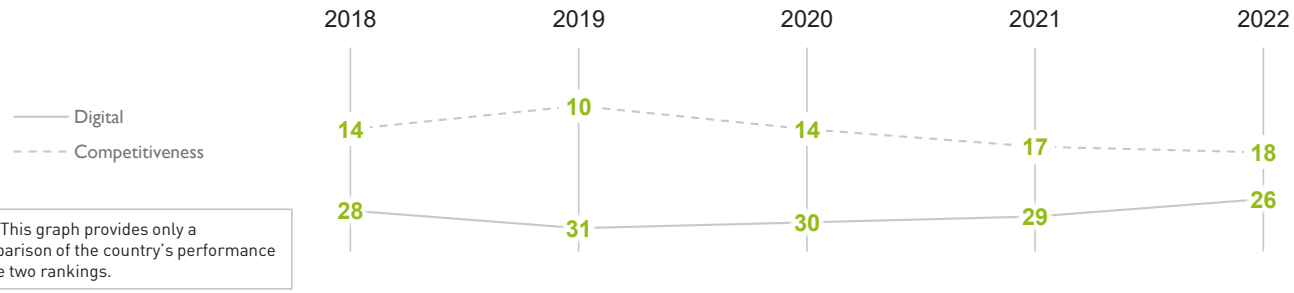
OVERALL PERFORMANCE (63 countries)



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
Educational assessment PISA - Math	48
▶ International experience	02
Foreign highly-skilled personnel	04
Management of cities	06
Digital/Technological skills	11
Net flow of international students	24

Training & education	Rank
Employee training	19
▷ Total public expenditure on education	57
Higher education achievement	53
Pupil-teacher ratio (tertiary education)	29
Graduates in Sciences	32
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	49
Total R&D personnel per capita	45
Female researchers	35
R&D productivity by publication	51
▷ Scientific and technical employment	57
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
Starting a business	45
▷ Enforcing contracts	54
Immigration laws	13
Development & application of tech.	11
Scientific research legislation	09
Intellectual property rights	18

Capital	Rank
IT & media stock market capitalization	44
Funding for technological development	07
Banking and financial services	08
Country credit rating	22
Venture capital	12
Investment in Telecommunications	46

Technological framework	Rank
Communications technology	16
▶ Mobile Broadband subscribers	02
Wireless broadband	06
▶ Internet users	02
Internet bandwidth speed	39
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

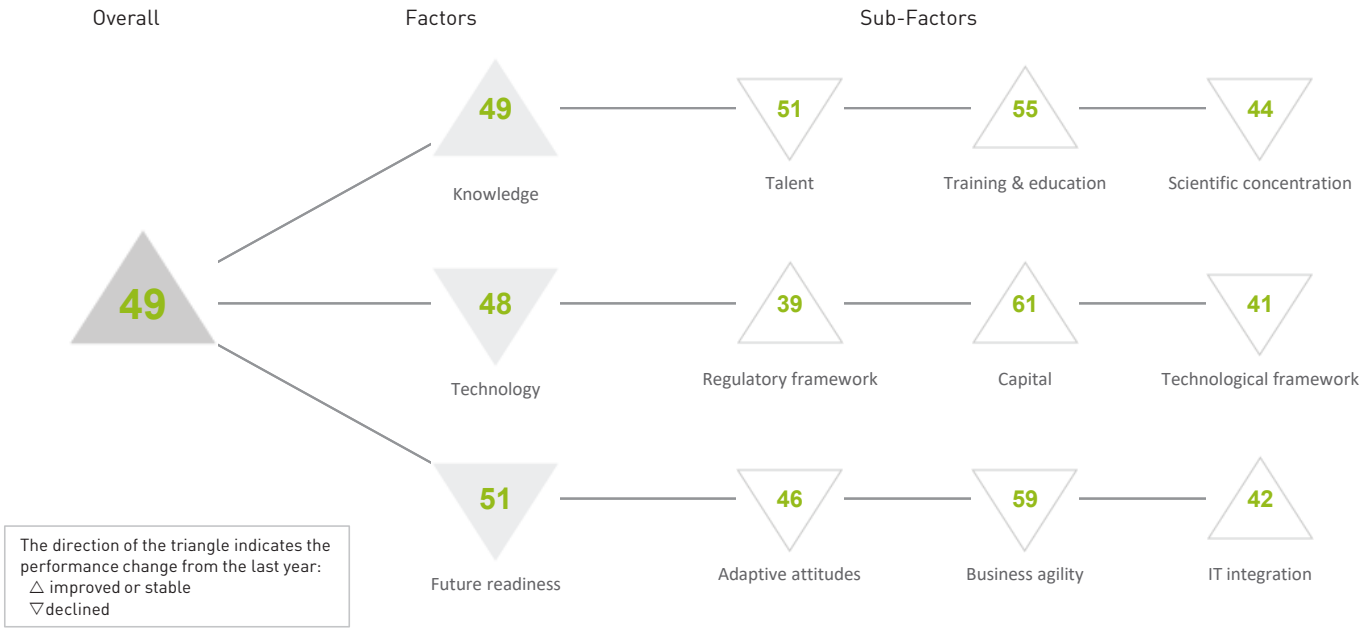
Adaptive attitudes	Rank
▷ E-Participation	55
Internet retailing	52
Tablet possession	05
Smartphone possession	03
Attitudes toward globalization	17

Business agility	Rank
Opportunities and threats	11
▷ World robots distribution	56
Agility of companies	23
▶ Use of big data and analytics	03
Knowledge transfer	11
Entrepreneurial fear of failure	14

IT integration	Rank
E-Government	51
Public-private partnerships	12
▶ Cyber security	01
Software piracy	38
Government cyber security capacity	13
Privacy protection by law content	47

ROMANIA

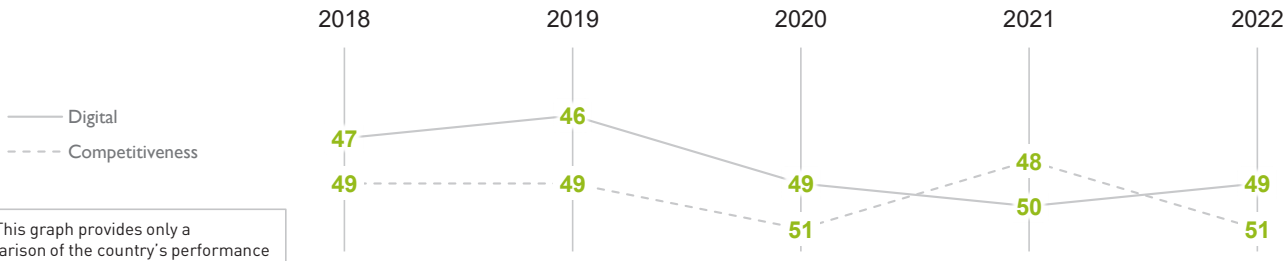
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	44
International experience	55
Foreign highly-skilled personnel	51
Management of cities	56
Digital/Technological skills	22
Net flow of international students	42

Training & education	Rank
Employee training	47
Total public expenditure on education	51
Higher education achievement	55
Pupil-teacher ratio (tertiary education)	46
▶ Graduates in Sciences	09
Women with degrees	52

Scientific concentration	Rank
Total expenditure on R&D (%)	51
Total R&D personnel per capita	44
▶ Female researchers	12
R&D productivity by publication	21
Scientific and technical employment	47
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
Starting a business	38
▶ Enforcing contracts	18
Immigration laws	25
Development & application of tech.	50
Scientific research legislation	52
Intellectual property rights	49

Capital	Rank
IT & media stock market capitalization	52
Funding for technological development	53
▷ Banking and financial services	60
Country credit rating	52
▷ Venture capital	59
Investment in Telecommunications	54

Technological framework	Rank
Communications technology	20
Mobile Broadband subscribers	55
Wireless broadband	39
Internet users	48
▶ Internet bandwidth speed	08
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

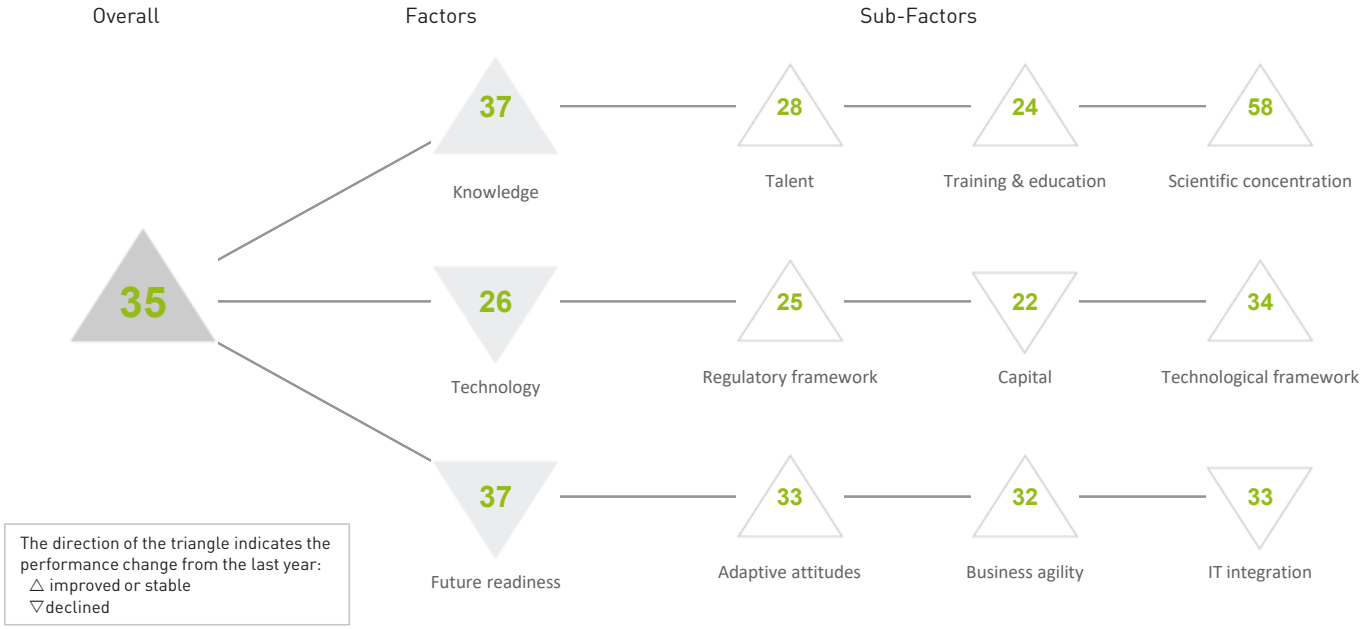
Adaptive attitudes	Rank
E-Participation	38
Internet retailing	40
Tablet possession	37
Smartphone possession	49
Attitudes toward globalization	52

Business agility	Rank
▷ Opportunities and threats	57
World robots distribution	35
Agility of companies	56
Use of big data and analytics	37
▷ Knowledge transfer	58
Entrepreneurial fear of failure	36

IT integration	Rank
E-Government	48
▷ Public-private partnerships	60
Cyber security	32
Software piracy	52
▶ Government cyber security capacity	14
Privacy protection by law content	38

SAUDI ARABIA

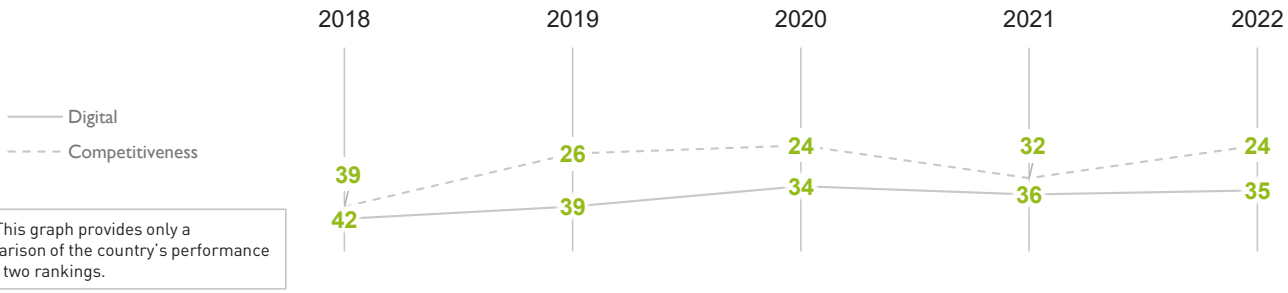
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
▷ Educational assessment PISA - Math	56
▶ International experience	08
Foreign highly-skilled personnel	10
Management of cities	26
▶ Digital/Technological skills	07
Net flow of international students	36

Training & education	Rank
Employee training	14
▶ Total public expenditure on education	03
Higher education achievement	28
Pupil-teacher ratio (tertiary education)	43
Graduates in Sciences	40
Women with degrees	34

Scientific concentration	Rank
Total expenditure on R&D (%)	50
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	13
▷ Scientific and technical employment	54
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
Starting a business	22
Enforcing contracts	36
Immigration laws	38
Development & application of tech.	10
Scientific research legislation	25
Intellectual property rights	26

Capital	Rank
IT & media stock market capitalization	50
Funding for technological development	14
Banking and financial services	20
Country credit rating	34
Venture capital	09
Investment in Telecommunications	19

Technological framework	Rank
Communications technology	13
Mobile Broadband subscribers	31
Wireless broadband	18
Internet users	10
Internet bandwidth speed	46
▷ 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

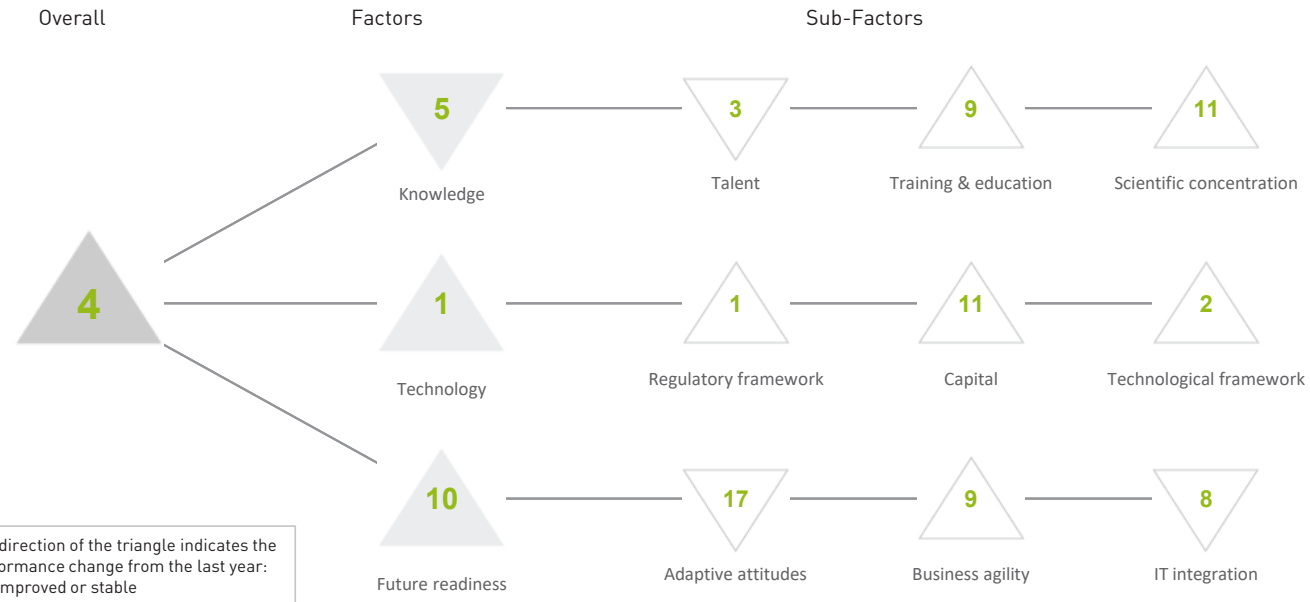
Adaptive attitudes	Rank
E-Participation	50
Internet retailing	48
Tablet possession	31
Smartphone possession	20
Attitudes toward globalization	15

Business agility	Rank
Opportunities and threats	20
World robots distribution	50
Agility of companies	20
Use of big data and analytics	23
Knowledge transfer	23
Entrepreneurial fear of failure	46

IT integration	Rank
E-Government	38
▶ Public-private partnerships	09
▶ Cyber security	02
Software piracy	38
Government cyber security capacity	21
▷ Privacy protection by law content	61

SINGAPORE

OVERALL PERFORMANCE (63 countries)

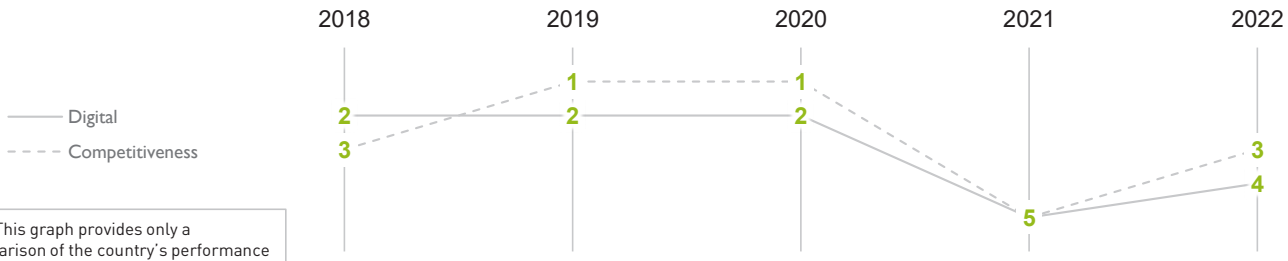


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	02
International experience	05
Foreign highly-skilled personnel	05
Management of cities	04
Digital/Technological skills	09
Net flow of international students	07

Training & education	Rank
Employee training	24
▷ Total public expenditure on education	62
▶ Higher education achievement	02
Pupil-teacher ratio (tertiary education)	25
Graduates in Sciences	04
Women with degrees	-

Scientific concentration	Rank
Total expenditure on R&D (%)	20
Total R&D personnel per capita	14
▷ Female researchers	42
R&D productivity by publication	39
Scientific and technical employment	27
▶ 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
Starting a business	03
▶ Enforcing contracts	01
▷ Immigration laws	43
Development & application of tech.	08
Scientific research legislation	04
Intellectual property rights	07

Capital	Rank
IT & media stock market capitalization	31
Funding for technological development	02
Banking and financial services	05
▶ Country credit rating	01
Venture capital	06
▷ Investment in Telecommunications	55

Technological framework	Rank
Communications technology	09
Mobile Broadband subscribers	19
Wireless broadband	12
Internet users	24
▶ Internet bandwidth speed	01
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

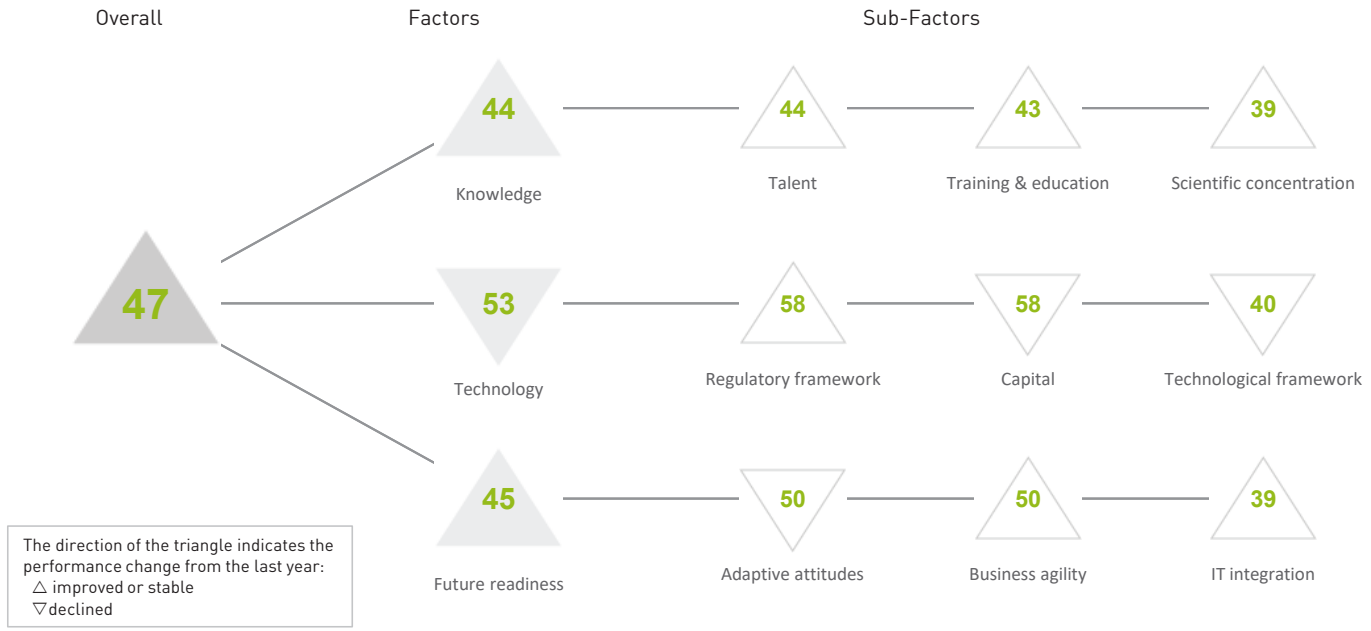
Adaptive attitudes	Rank
E-Participation	06
Internet retailing	26
Tablet possession	20
Smartphone possession	26
Attitudes toward globalization	07

Business agility	Rank
Opportunities and threats	15
World robots distribution	14
Agility of companies	10
Use of big data and analytics	11
Knowledge transfer	06
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	11
Public-private partnerships	02
Cyber security	06
Software piracy	17
Government cyber security capacity	10
▷ Privacy protection by law content	50

SLOVAK REPUBLIC

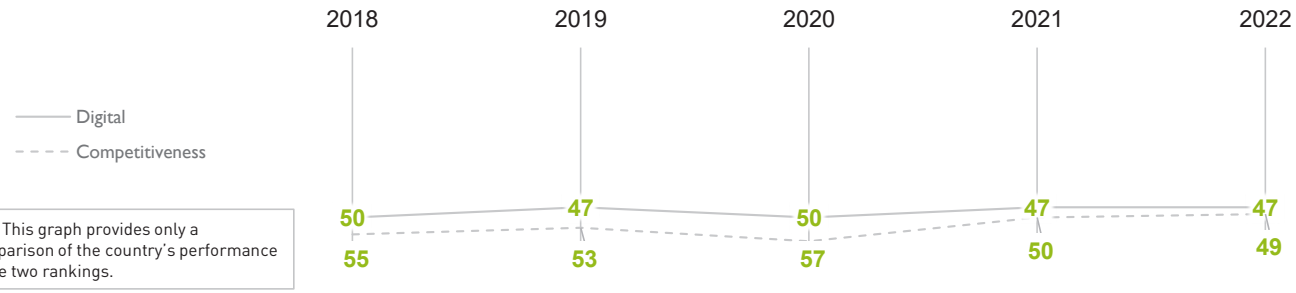
OVERALL PERFORMANCE (63 countries)



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
Educational assessment PISA - Math	30
International experience	40
Foreign highly-skilled personnel	56
Management of cities	46
Digital/Technological skills	35
Net flow of international students	54

Training & education	Rank
Employee training	46
Total public expenditure on education	39
Higher education achievement	39
▶ Pupil-teacher ratio (tertiary education)	24
Graduates in Sciences	41
Women with degrees	40

Scientific concentration	Rank
Total expenditure on R&D (%)	42
Total R&D personnel per capita	33
▶ Female researchers	22
R&D productivity by publication	41
Scientific and technical employment	42
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
Starting a business	48
Enforcing contracts	34
▷ Immigration laws	62
▷ Development & application of tech.	59
Scientific research legislation	57
Intellectual property rights	56

Capital	Rank
▷ IT & media stock market capitalization	58
Funding for technological development	57
Banking and financial services	48
Country credit rating	31
Venture capital	56
▶ Investment in Telecommunications	26

Technological framework	Rank
Communications technology	38
Mobile Broadband subscribers	35
Wireless broadband	38
Internet users	31
Internet bandwidth speed	40
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

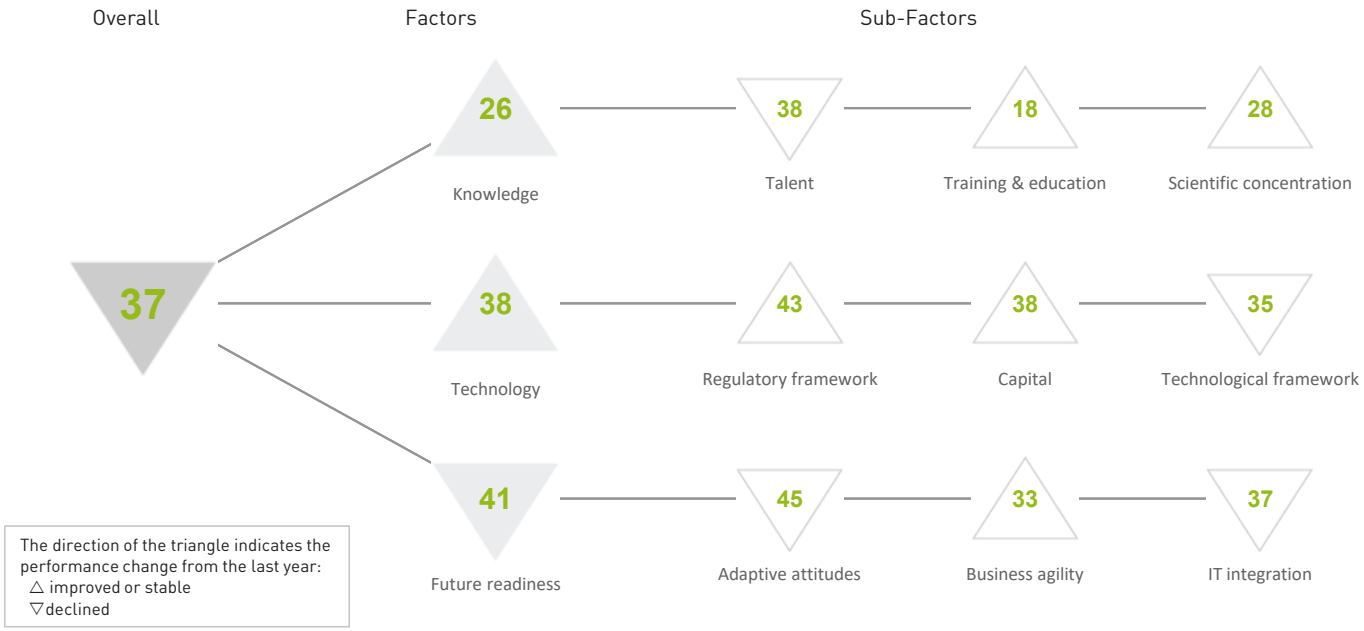
Adaptive attitudes	Rank
E-Participation	52
Internet retailing	32
Tablet possession	33
Smartphone possession	48
▷ Attitudes toward globalization	60

Business agility	Rank
Opportunities and threats	56
World robots distribution	28
Agility of companies	28
Use of big data and analytics	42
▷ Knowledge transfer	60
Entrepreneurial fear of failure	30

IT integration	Rank
E-Government	42
Public-private partnerships	47
Cyber security	43
▶ Software piracy	26
Government cyber security capacity	54
▶ Privacy protection by law content	19

SLOVENIA

OVERALL PERFORMANCE (63 countries)

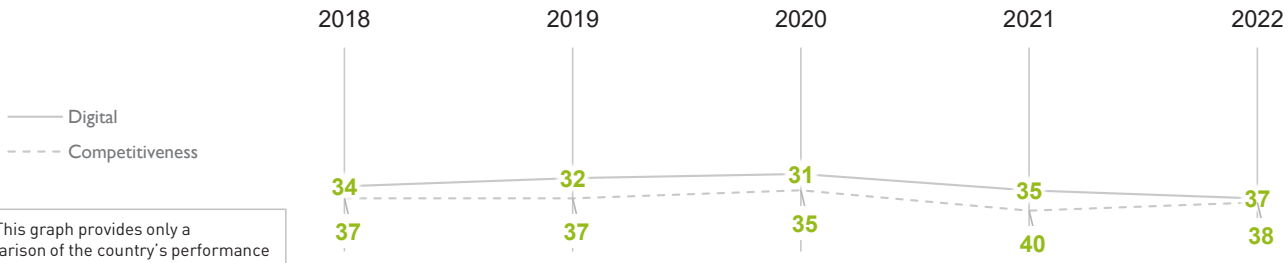


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
▶	Educational assessment PISA - Math	13
	International experience	44
▷	Foreign highly-skilled personnel	55
	Management of cities	30
	Digital/Technological skills	25
▷	Net flow of international students	55

	Training & education	Rank
	Employee training	26
	Total public expenditure on education	18
	Higher education achievement	27
▶	Pupil-teacher ratio (tertiary education)	12
▶	Graduates in Sciences	16
	Women with degrees	27

	Scientific concentration	Rank
	Total expenditure on R&D (%)	18
	Total R&D personnel per capita	17
	Female researchers	38
▷	R&D productivity by publication	57
▶	Scientific and technical employment	10
	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
	Starting a business	24
	Enforcing contracts	53
▷	Immigration laws	54
	Development & application of tech.	43
	Scientific research legislation	37
	Intellectual property rights	32

	Capital	Rank
	IT & media stock market capitalization	46
	Funding for technological development	38
	Banking and financial services	29
	Country credit rating	29
	Venture capital	44
	Investment in Telecommunications	20

	Technological framework	Rank
	Communications technology	39
▶	Mobile Broadband subscribers	06
	Wireless broadband	40
	Internet users	40
	Internet bandwidth speed	26
	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

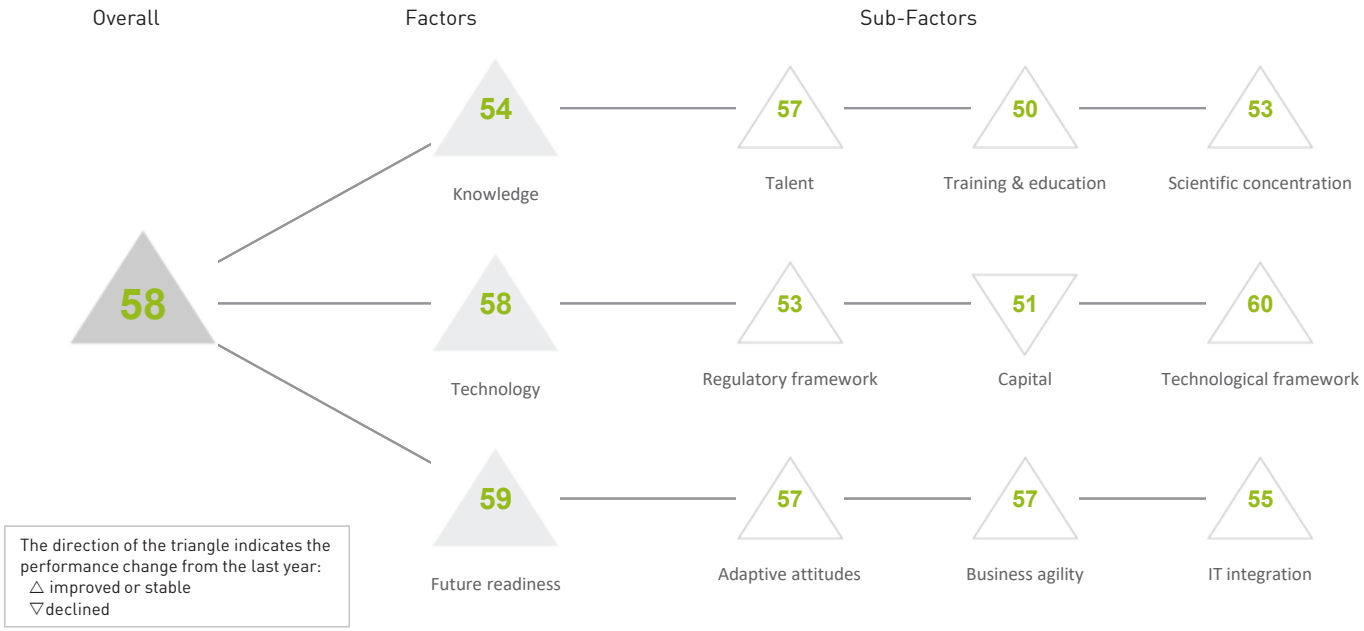
	Adaptive attitudes	Rank
	E-Participation	27
	Internet retailing	37
	Tablet possession	29
	Smartphone possession	53
	Attitudes toward globalization	51

	Business agility	Rank
	Opportunities and threats	26
	World robots distribution	34
	Agility of companies	27
	Use of big data and analytics	35
	Knowledge transfer	42
	Entrepreneurial fear of failure	19

	IT integration	Rank
	E-Government	22
	Public-private partnerships	52
	Cyber security	26
	Software piracy	30
▷	Government cyber security capacity	60
	Privacy protection by law content	17

SOUTH AFRICA

OVERALL PERFORMANCE (63 countries)

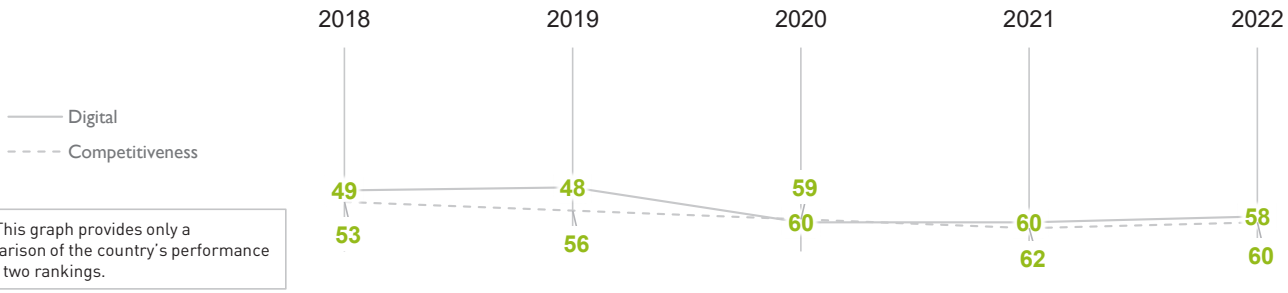


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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

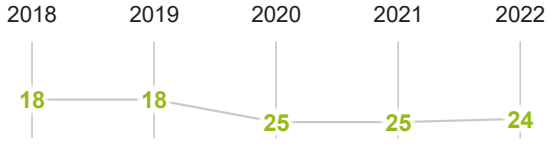


N.B. This graph provides only a comparison of the country's performance in the two rankings.

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
Educational assessment PISA - Math	-
International experience	53
Foreign highly-skilled personnel	44
▷ Management of cities	61
Digital/Technological skills	56
Net flow of international students	34

Training & education	Rank
Employee training	55
▶ Total public expenditure on education	02
▷ Higher education achievement	60
Pupil-teacher ratio (tertiary education)	37
Graduates in Sciences	56
Women with degrees	54

Scientific concentration	Rank
Total expenditure on R&D (%)	44
Total R&D personnel per capita	49
▶ Female researchers	15
▶ R&D productivity by publication	25
Scientific and technical employment	-
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
Starting a business	58
Enforcing contracts	50
Immigration laws	55
Development & application of tech.	54
Scientific research legislation	40
Intellectual property rights	45

Capital	Rank
▶ IT & media stock market capitalization	07
Funding for technological development	58
Banking and financial services	54
Country credit rating	56
Venture capital	60
Investment in Telecommunications	30

Technological framework	Rank
Communications technology	59
▷ Mobile Broadband subscribers	61
Wireless broadband	42
▷ Internet users	61
Internet bandwidth speed	54
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

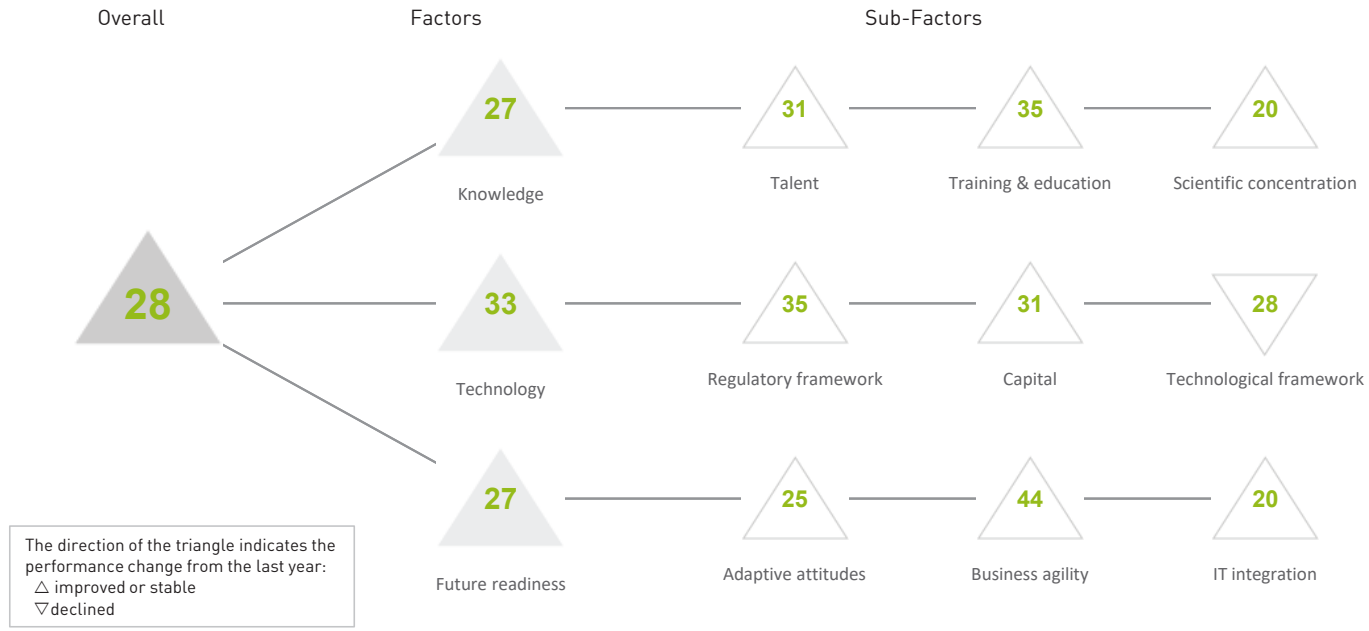
Adaptive attitudes	Rank
E-Participation	44
Internet retailing	56
Tablet possession	56
Smartphone possession	37
Attitudes toward globalization	47

Business agility	Rank
Opportunities and threats	55
World robots distribution	32
▷ Agility of companies	61
Use of big data and analytics	27
Knowledge transfer	48
Entrepreneurial fear of failure	45

IT integration	Rank
E-Government	55
Public-private partnerships	59
Cyber security	56
▶ Software piracy	20
Government cyber security capacity	46
Privacy protection by law content	49

SPAIN

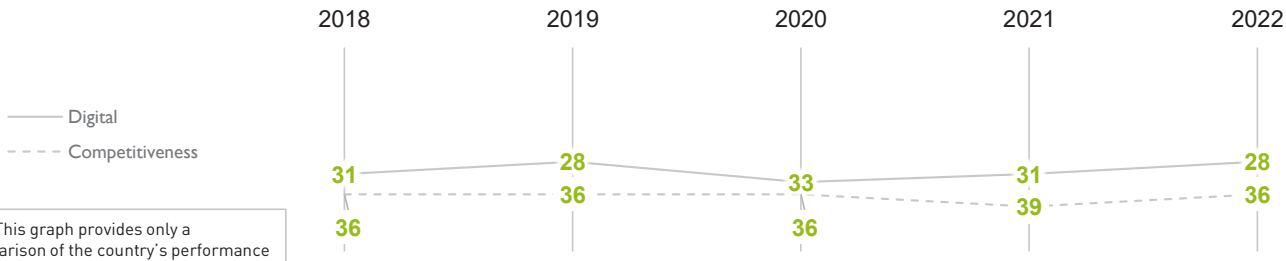
OVERALL PERFORMANCE (63 countries)



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
Educational assessment PISA - Math	32
▷ International experience	46
Foreign highly-skilled personnel	23
Management of cities	25
Digital/Technological skills	30
Net flow of international students	31

Training & education	Rank
▷ Employee training	50
Total public expenditure on education	38
Higher education achievement	24
Pupil-teacher ratio (tertiary education)	19
Graduates in Sciences	39
Women with degrees	28

Scientific concentration	Rank
Total expenditure on R&D (%)	31
Total R&D personnel per capita	28
Female researchers	21
▶ R&D productivity by publication	09
Scientific and technical employment	23
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
Starting a business	40
Enforcing contracts	22
Immigration laws	20
Development & application of tech.	35
▷ Scientific research legislation	54
Intellectual property rights	31

Capital	Rank
IT & media stock market capitalization	21
Funding for technological development	43
Banking and financial services	38
Country credit rating	37
Venture capital	28
Investment in Telecommunications	17

Technological framework	Rank
Communications technology	17
Mobile Broadband subscribers	38
Wireless broadband	33
Internet users	17
Internet bandwidth speed	15
▷ 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

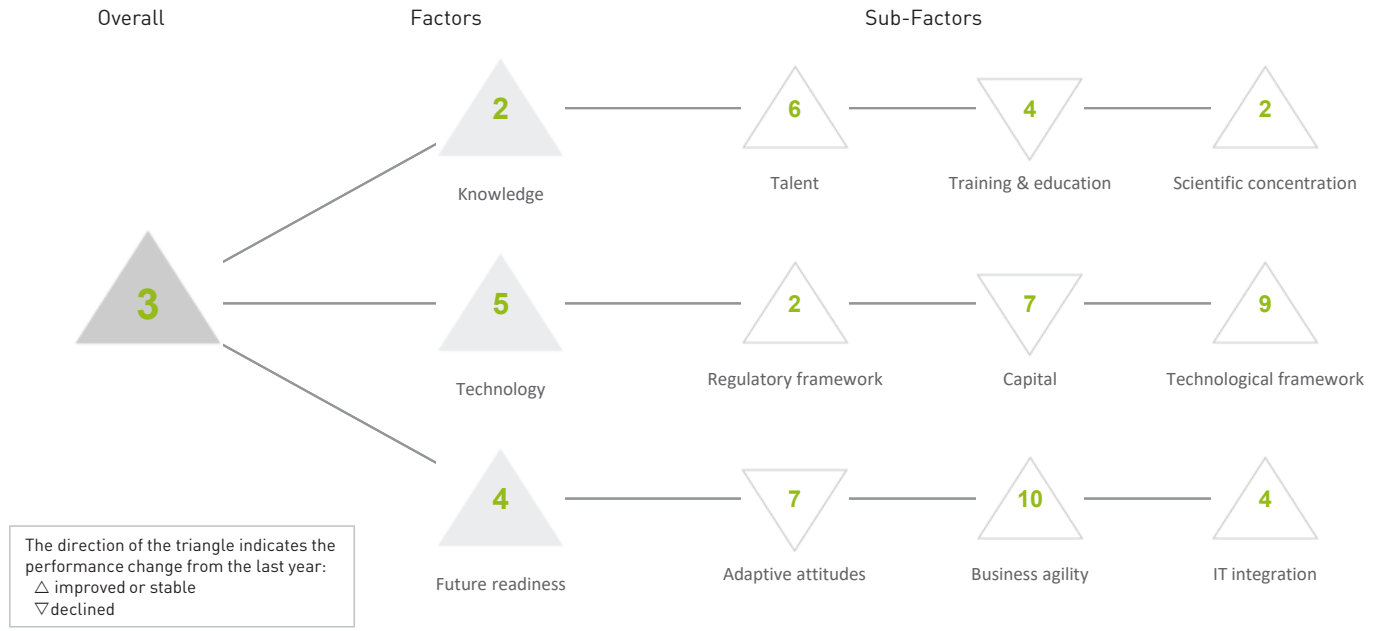
Adaptive attitudes	Rank
E-Participation	33
Internet retailing	28
Tablet possession	27
▶ Smartphone possession	07
Attitudes toward globalization	33

Business agility	Rank
Opportunities and threats	44
▶ World robots distribution	10
Agility of companies	32
▷ Use of big data and analytics	55
Knowledge transfer	46
Entrepreneurial fear of failure	41

IT integration	Rank
E-Government	17
Public-private partnerships	25
Cyber security	39
Software piracy	32
▶ Government cyber security capacity	12
Privacy protection by law content	13

SWEDEN

OVERALL PERFORMANCE (63 countries)

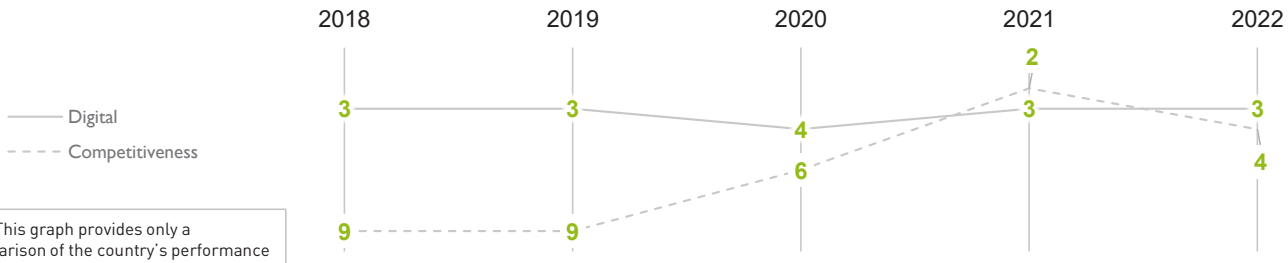


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	16
International experience	03
Foreign highly-skilled personnel	17
Management of cities	11
Digital/Technological skills	04
Net flow of international students	22

Training & education	Rank
Employee training	07
Total public expenditure on education	05
Higher education achievement	22
Pupil-teacher ratio (tertiary education)	20
Graduates in Sciences	19
Women with degrees	13

Scientific concentration	Rank
Total expenditure on R&D (%)	04
Total R&D personnel per capita	08
▷ Female researchers	39
▷ R&D productivity by publication	38
▶ Scientific and technical employment	02
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
Starting a business	23
Enforcing contracts	30
Immigration laws	17
Development & application of tech.	03
▶ Scientific research legislation	02
Intellectual property rights	04

Capital	Rank
IT & media stock market capitalization	25
Funding for technological development	05
Banking and financial services	03
▶ Country credit rating	01
▶ Venture capital	01
▷ Investment in Telecommunications	49

Technological framework	Rank
Communications technology	04
Mobile Broadband subscribers	13
Wireless broadband	24
Internet users	09
Internet bandwidth speed	10
▷ 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

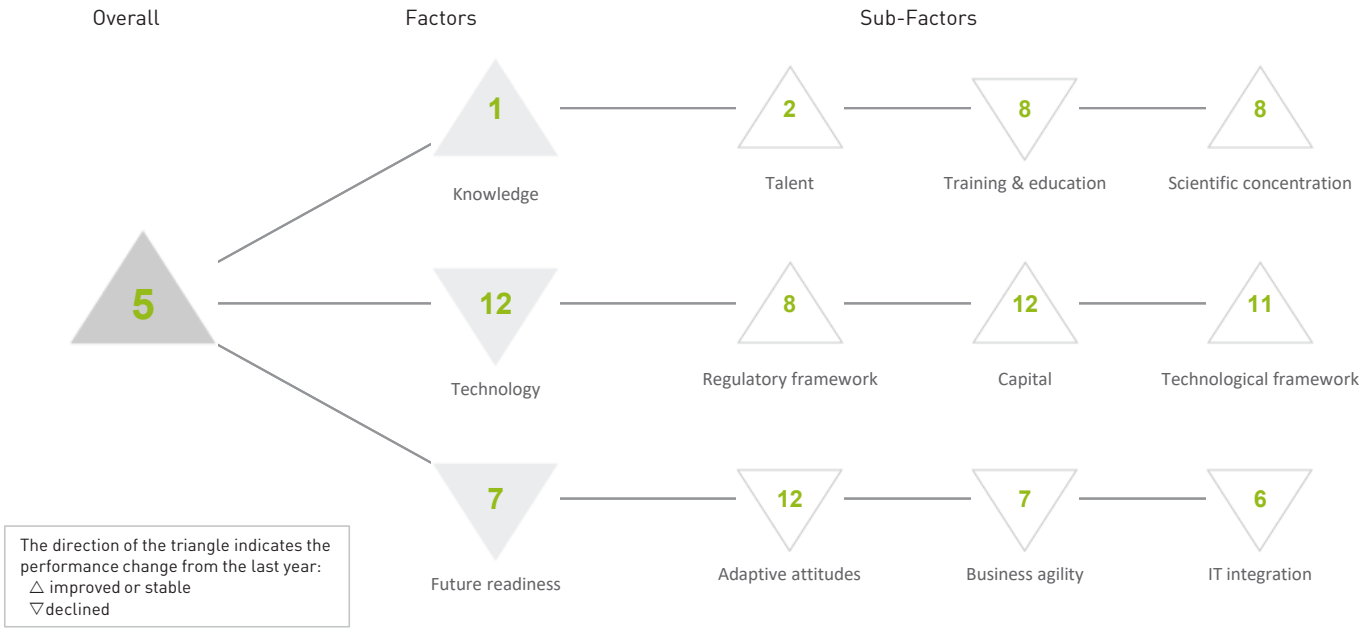
Adaptive attitudes	Rank
E-Participation	34
Internet retailing	11
Tablet possession	04
Smartphone possession	29
▶ Attitudes toward globalization	01

Business agility	Rank
Opportunities and threats	07
World robots distribution	21
Agility of companies	07
Use of big data and analytics	14
Knowledge transfer	03
▷ Entrepreneurial fear of failure	22

IT integration	Rank
E-Government	06
Public-private partnerships	11
Cyber security	13
Software piracy	06
Government cyber security capacity	17
Privacy protection by law content	06

SWITZERLAND

OVERALL PERFORMANCE (63 countries)

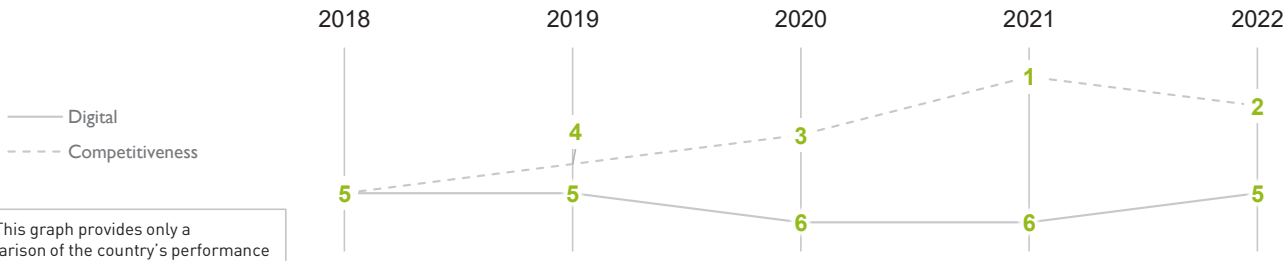


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



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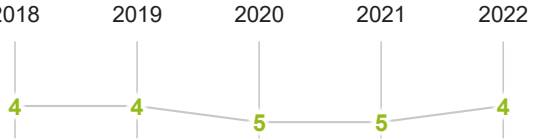
PEER GROUPS RANKINGS

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
Educational assessment PISA - Math	10
▶ International experience	01
▶ Foreign highly-skilled personnel	01
Management of cities	05
Digital/Technological skills	18
Net flow of international students	09

Training & education	Rank
Employee training	02
Total public expenditure on education	19
Higher education achievement	17
Pupil-teacher ratio (tertiary education)	06
Graduates in Sciences	26
Women with degrees	30

Scientific concentration	Rank
Total expenditure on R&D (%)	09
Total R&D personnel per capita	04
Female researchers	31
▷ R&D productivity by publication	35
Scientific and technical employment	05
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
Starting a business	36
▷ Enforcing contracts	40
Immigration laws	21
Development & application of tech.	04
▶ Scientific research legislation	01
Intellectual property rights	02

Capital	Rank
▷ IT & media stock market capitalization	49
Funding for technological development	09
Banking and financial services	06
▶ Country credit rating	01
Venture capital	11
Investment in Telecommunications	23

Technological framework	Rank
Communications technology	07
Mobile Broadband subscribers	11
▷ Wireless broadband	42
Internet users	11
Internet bandwidth speed	02
▷ 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

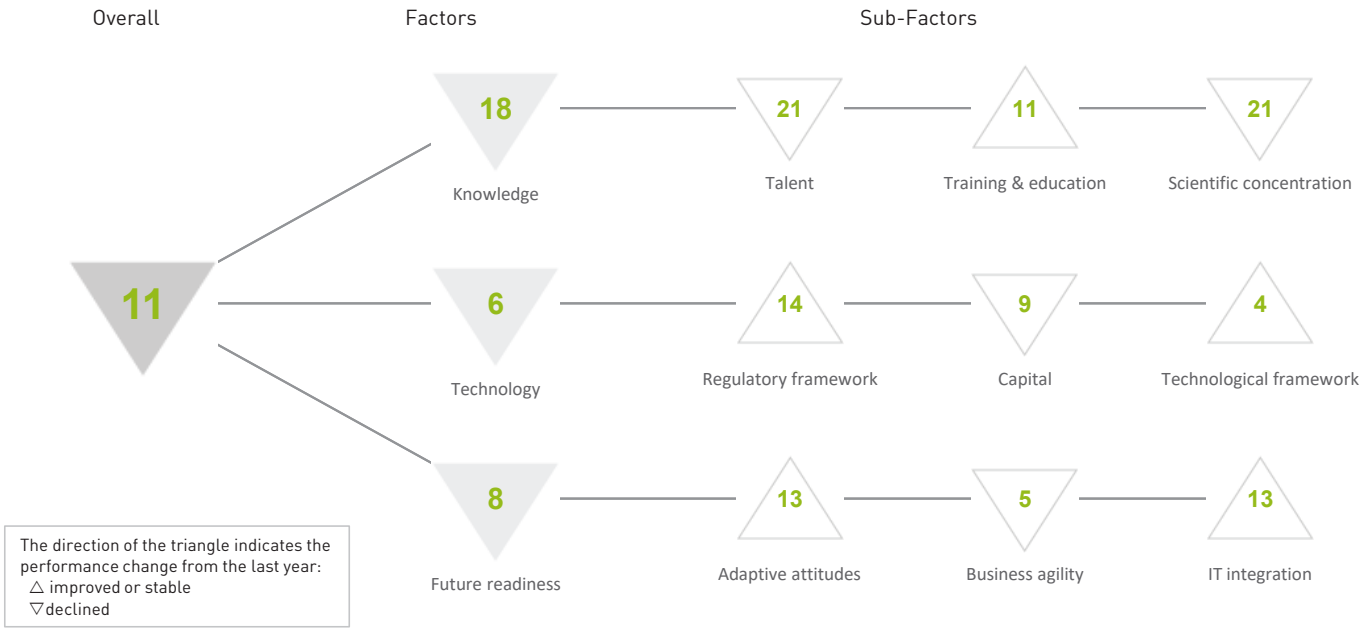
Adaptive attitudes	Rank
E-Participation	18
Internet retailing	10
Tablet possession	09
Smartphone possession	26
Attitudes toward globalization	23

Business agility	Rank
Opportunities and threats	08
World robots distribution	24
Agility of companies	09
Use of big data and analytics	25
▶ Knowledge transfer	01
Entrepreneurial fear of failure	05

IT integration	Rank
E-Government	16
Public-private partnerships	07
Cyber security	15
Software piracy	10
Government cyber security capacity	27
Privacy protection by law content	03

TAIWAN, CHINA

OVERALL PERFORMANCE (63 countries)

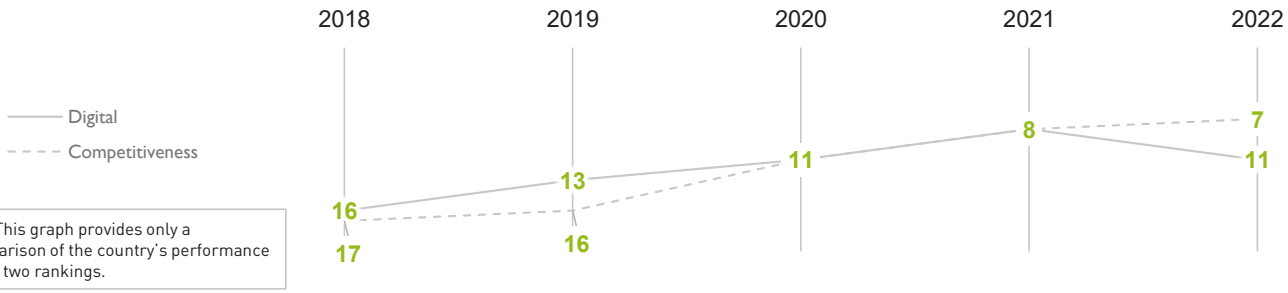


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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

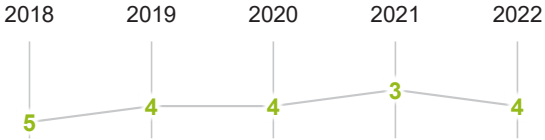
COMPETITIVENESS & DIGITAL RANKINGS



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	04
International experience	27
Foreign highly-skilled personnel	43
Management of cities	18
Digital/Technological skills	33
Net flow of international students	11

Training & education	Rank
Employee training	06
▷ Total public expenditure on education	52
Higher education achievement	03
▷ Pupil-teacher ratio (tertiary education)	50
Graduates in Sciences	05
Women with degrees	18

Scientific concentration	Rank
Total expenditure on R&D (%)	03
▶ Total R&D personnel per capita	01
▷ Female researchers	52
R&D productivity by publication	33
▷ Scientific and technical employment	45
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
Starting a business	10
Enforcing contracts	11
Immigration laws	34
Development & application of tech.	17
Scientific research legislation	10
Intellectual property rights	19

Capital	Rank
▶ IT & media stock market capitalization	01
Funding for technological development	16
Banking and financial services	10
Country credit rating	16
Venture capital	13
▷ Investment in Telecommunications	57

Technological framework	Rank
Communications technology	22
▶ Mobile Broadband subscribers	01
Wireless broadband	13
Internet users	21
Internet bandwidth speed	20
▶ 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

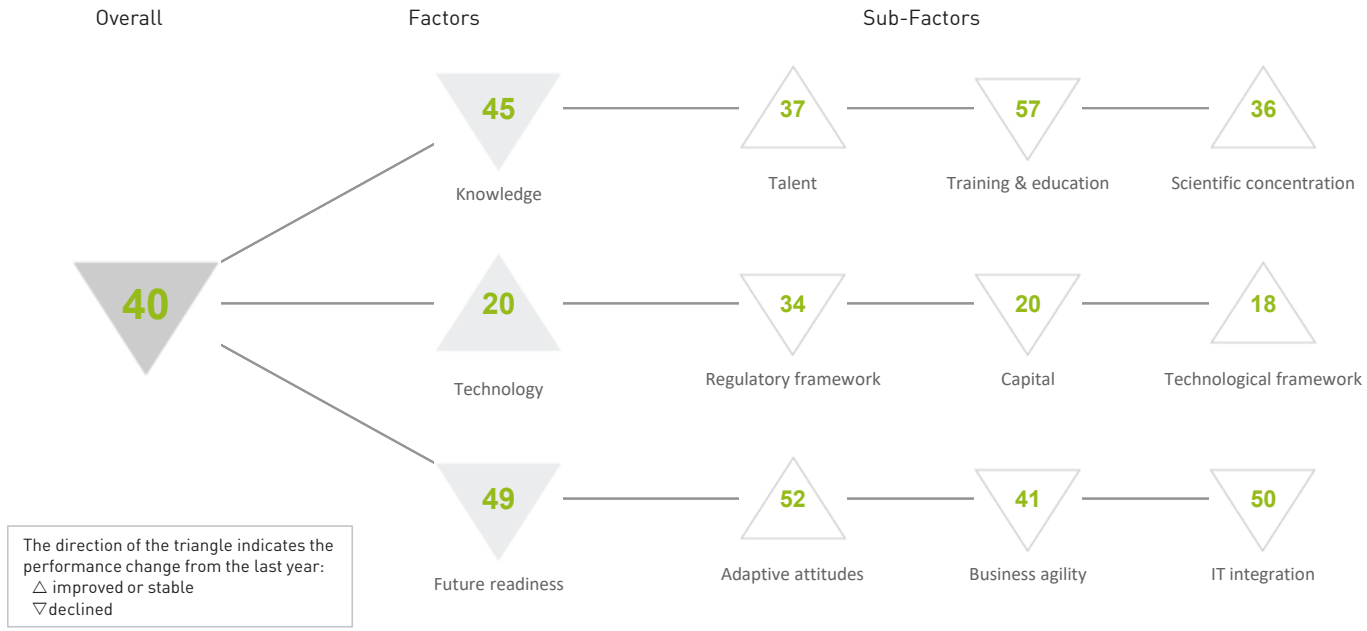
Adaptive attitudes	Rank
E-Participation	-
Internet retailing	22
Tablet possession	25
Smartphone possession	05
Attitudes toward globalization	05

Business agility	Rank
Opportunities and threats	05
World robots distribution	07
Agility of companies	03
▶ Use of big data and analytics	02
Knowledge transfer	10
Entrepreneurial fear of failure	18

IT integration	Rank
E-Government	-
Public-private partnerships	13
Cyber security	09
Software piracy	25
Government cyber security capacity	09
Privacy protection by law content	40

THAILAND

OVERALL PERFORMANCE (63 countries)

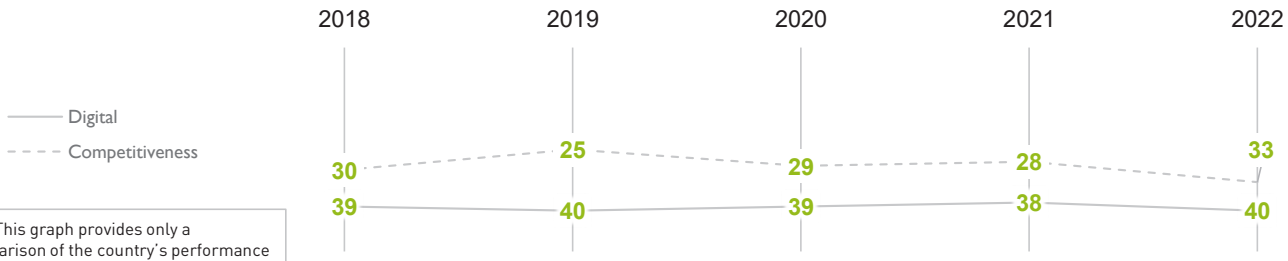


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	46
International experience	19
Foreign highly-skilled personnel	25
Management of cities	29
Digital/Technological skills	45
Net flow of international students	40

Training & education	Rank
Employee training	20
Total public expenditure on education	50
Higher education achievement	45
▷ Pupil-teacher ratio (tertiary education)	55
Graduates in Sciences	37
Women with degrees	48

Scientific concentration	Rank
Total expenditure on R&D (%)	33
Total R&D personnel per capita	39
▶ Female researchers	06
R&D productivity by publication	30
▷ Scientific and technical employment	55
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
Starting a business	26
Enforcing contracts	28
Immigration laws	32
Development & application of tech.	39
Scientific research legislation	39
Intellectual property rights	43

Capital	Rank
IT & media stock market capitalization	17
Funding for technological development	40
Banking and financial services	23
Country credit rating	41
Venture capital	32
▶ Investment in Telecommunications	07

Technological framework	Rank
Communications technology	15
Mobile Broadband subscribers	25
Wireless broadband	27
Internet users	44
▶ Internet bandwidth speed	14
▶ 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

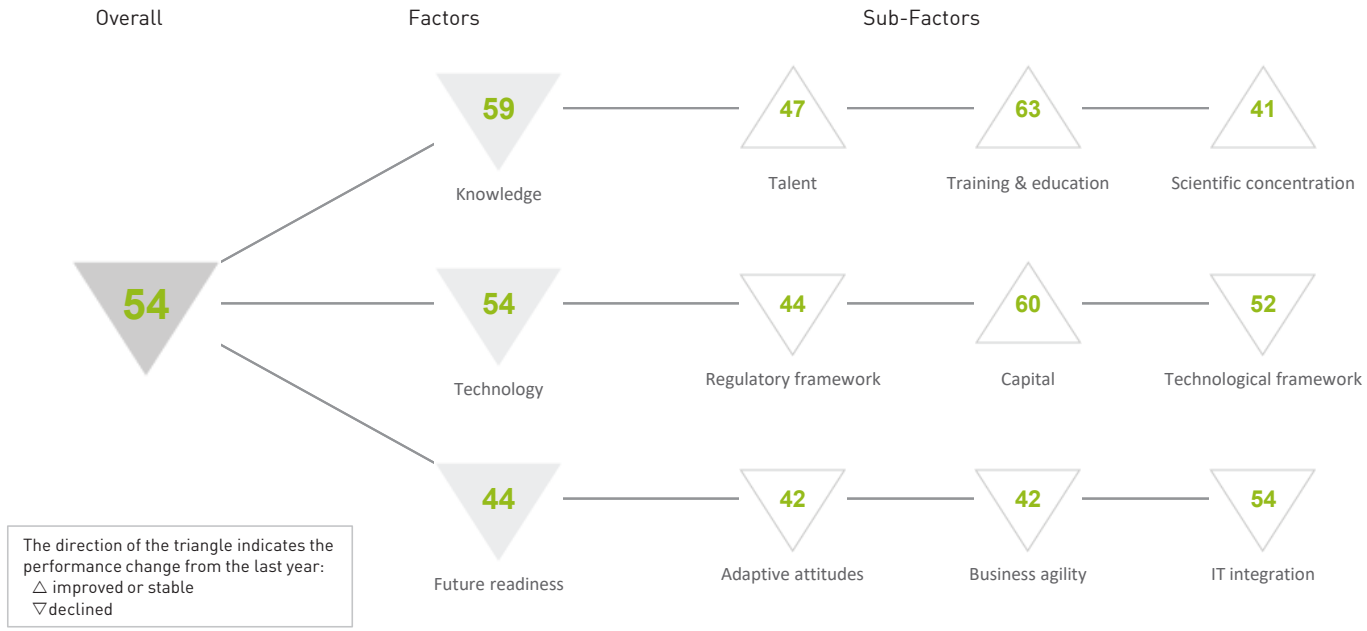
Adaptive attitudes	Rank
E-Participation	40
Internet retailing	50
▷ Tablet possession	57
Smartphone possession	39
Attitudes toward globalization	14

Business agility	Rank
Opportunities and threats	27
▶ World robots distribution	11
Agility of companies	37
Use of big data and analytics	28
Knowledge transfer	33
Entrepreneurial fear of failure	50

IT integration	Rank
E-Government	49
Public-private partnerships	26
Cyber security	38
▷ Software piracy	56
▷ Government cyber security capacity	57
Privacy protection by law content	43

TURKEY

OVERALL PERFORMANCE (63 countries)

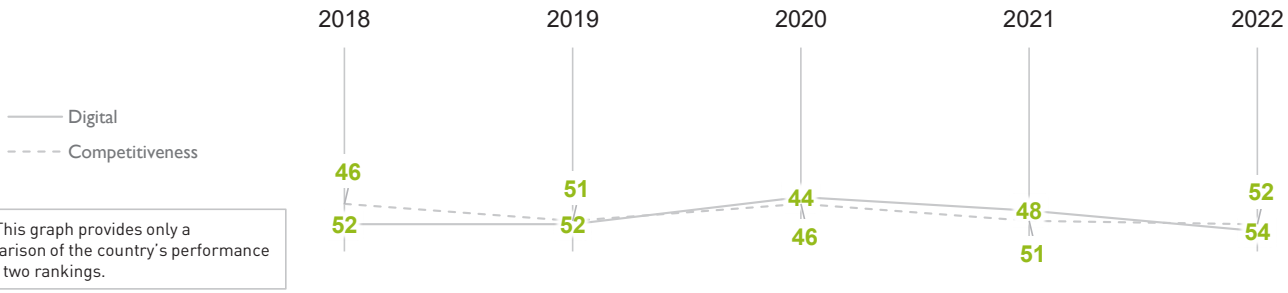


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	38
International experience	43
Foreign highly-skilled personnel	52
Management of cities	50
Digital/Technological skills	50
Net flow of international students	26

Training & education	Rank
▷ Employee training	63
Total public expenditure on education	24
Higher education achievement	43
▷ Pupil-teacher ratio (tertiary education)	59
Graduates in Sciences	55
Women with degrees	51

Scientific concentration	Rank
Total expenditure on R&D (%)	39
Total R&D personnel per capita	41
Female researchers	30
▶ R&D productivity by publication	11
Scientific and technical employment	41
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
Starting a business	35
▶ Enforcing contracts	20
Immigration laws	50
Development & application of tech.	51
Scientific research legislation	45
Intellectual property rights	59

Capital	Rank
IT & media stock market capitalization	37
Funding for technological development	55
Banking and financial services	51
▷ Country credit rating	60
Venture capital	55
Investment in Telecommunications	48

Technological framework	Rank
Communications technology	54
▶ Mobile Broadband subscribers	17
Wireless broadband	54
Internet users	46
▷ Internet bandwidth speed	60
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

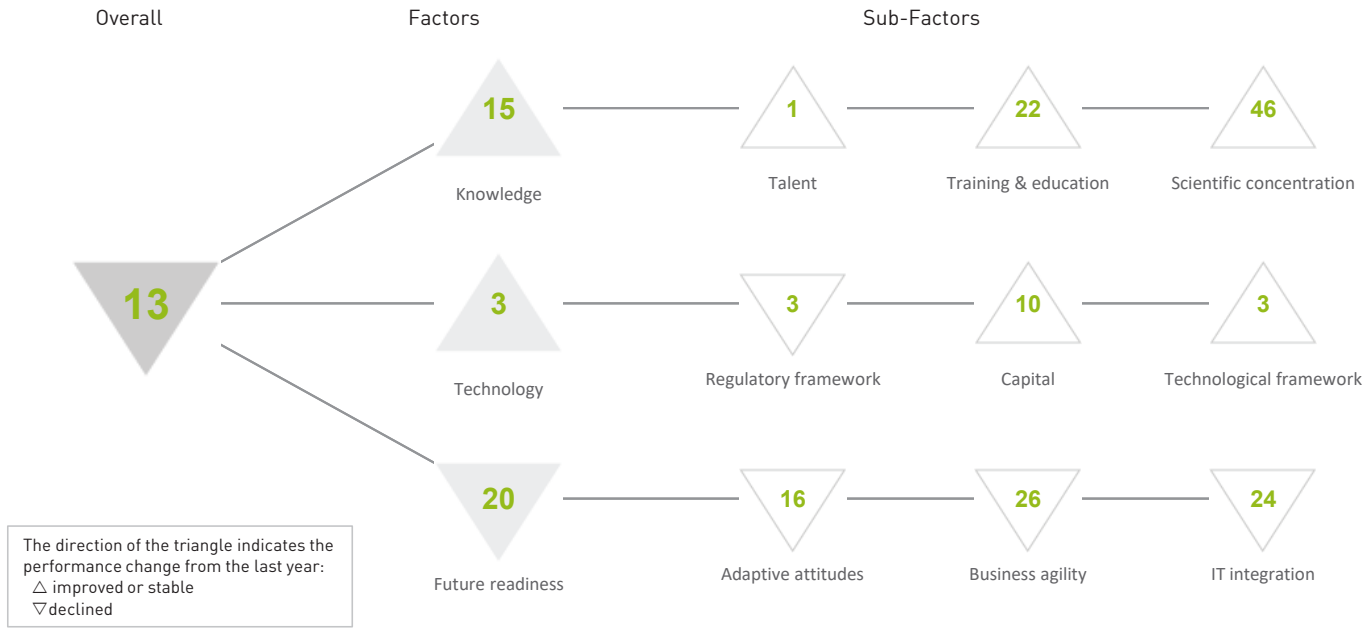
Adaptive attitudes	Rank
▶ E-Participation	22
Internet retailing	42
Tablet possession	44
Smartphone possession	26
▷ Attitudes toward globalization	59

Business agility	Rank
Opportunities and threats	47
World robots distribution	18
Agility of companies	46
Use of big data and analytics	40
Knowledge transfer	51
▶ Entrepreneurial fear of failure	16

IT integration	Rank
E-Government	46
Public-private partnerships	48
Cyber security	49
Software piracy	49
Government cyber security capacity	41
Privacy protection by law content	54

UAE

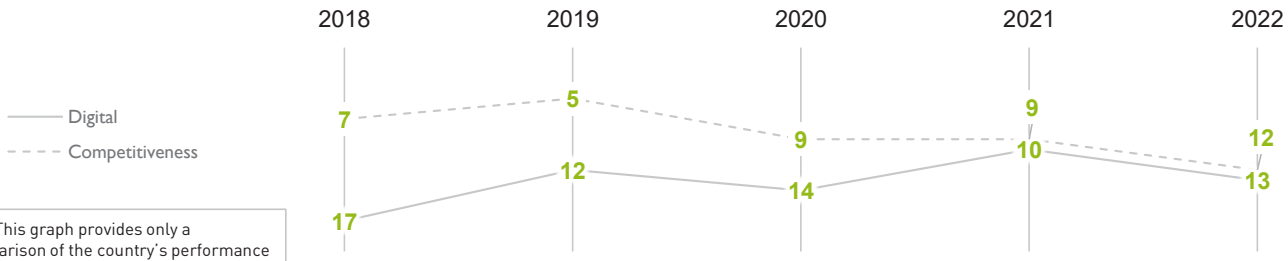
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (40 countries)

POPULATIONS < 20 MILLION (36 countries)

UAE

▶ 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
Educational assessment PISA - Math	43
International experience	04
Foreign highly-skilled personnel	03
▶ Management of cities	01
Digital/Technological skills	16
▶ Net flow of international students	01

Training & education	Rank
Employee training	28
▷ Total public expenditure on education	49
Higher education achievement	12
Pupil-teacher ratio (tertiary education)	42
Graduates in Sciences	08
Women with degrees	14

Scientific concentration	Rank
Total expenditure on R&D (%)	29
Total R&D personnel per capita	32
Female researchers	37
▷ R&D productivity by publication	50
Scientific and technical employment	24
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
Starting a business	08
Enforcing contracts	09
▶ Immigration laws	01
Development & application of tech.	05
Scientific research legislation	15
Intellectual property rights	39

Capital	Rank
IT & media stock market capitalization	14
Funding for technological development	11
Banking and financial services	26
Country credit rating	19
Venture capital	17
Investment in Telecommunications	25

Technological framework	Rank
Communications technology	28
Mobile Broadband subscribers	03
▶ Wireless broadband	01
▶ Internet users	01
Internet bandwidth speed	29
▷ 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

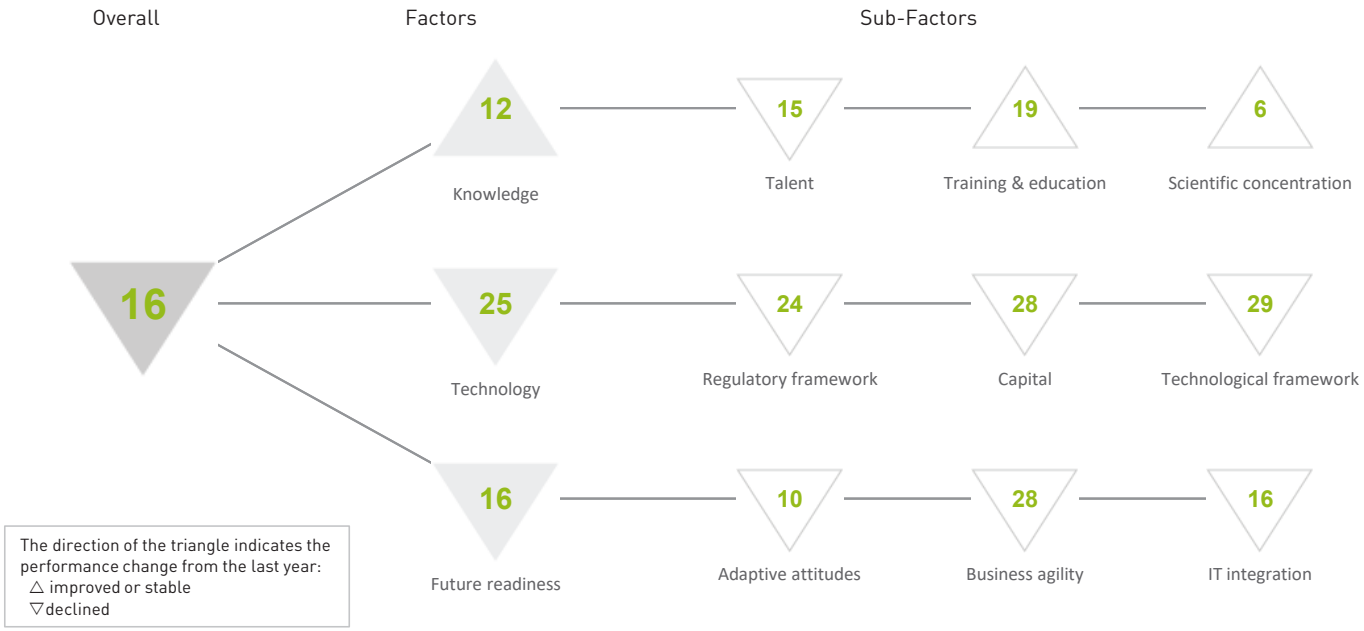
Adaptive attitudes	Rank
E-Participation	16
Internet retailing	31
Tablet possession	11
Smartphone possession	10
Attitudes toward globalization	09

Business agility	Rank
Opportunities and threats	23
▷ World robots distribution	51
Agility of companies	08
Use of big data and analytics	20
Knowledge transfer	21
Entrepreneurial fear of failure	38

IT integration	Rank
E-Government	21
Public-private partnerships	10
Cyber security	05
Software piracy	20
Government cyber security capacity	07
▷ Privacy protection by law content	62

UNITED KINGDOM

OVERALL PERFORMANCE (63 countries)

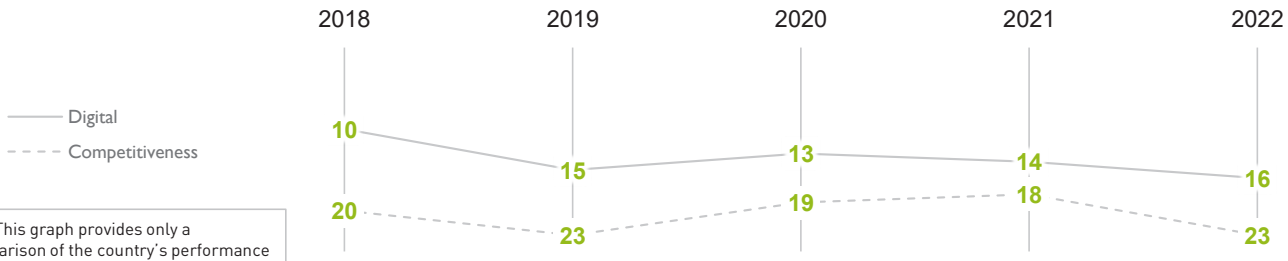


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	17
International experience	33
Foreign highly-skilled personnel	18
Management of cities	28
Digital/Technological skills	24
▶ Net flow of international students	04

Training & education	Rank
Employee training	37
Total public expenditure on education	22
Higher education achievement	14
Pupil-teacher ratio (tertiary education)	34
Graduates in Sciences	22
Women with degrees	15

Scientific concentration	Rank
Total expenditure on R&D (%)	23
Total R&D personnel per capita	19
Female researchers	24
▶ R&D productivity by publication	06
Scientific and technical employment	07
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
Starting a business	09
Enforcing contracts	26
Immigration laws	40
Development & application of tech.	27
Scientific research legislation	21
Intellectual property rights	27

Capital	Rank
IT & media stock market capitalization	32
Funding for technological development	21
Banking and financial services	28
Country credit rating	20
Venture capital	20
▷ Investment in Telecommunications	50

Technological framework	Rank
Communications technology	40
Mobile Broadband subscribers	16
Wireless broadband	26
Internet users	36
Internet bandwidth speed	37
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

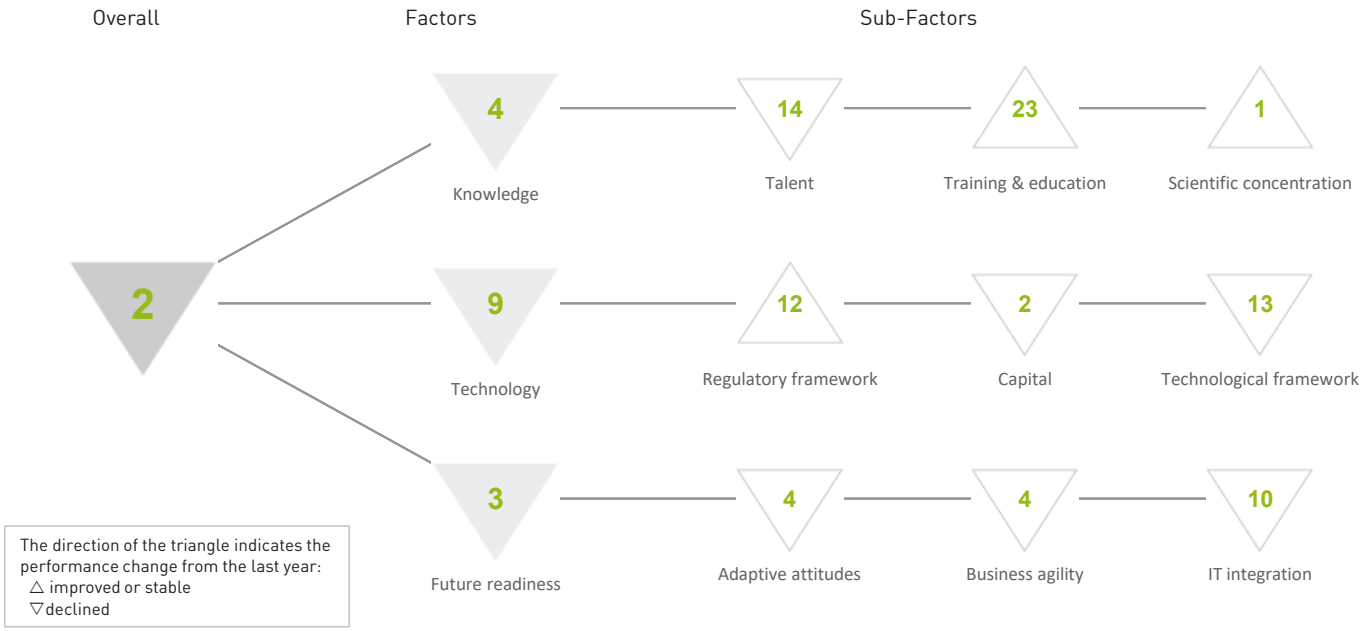
Adaptive attitudes	Rank
▶ E-Participation	06
▶ Internet retailing	03
Tablet possession	17
▷ Smartphone possession	45
▷ Attitudes toward globalization	45

Business agility	Rank
Opportunities and threats	32
World robots distribution	15
Agility of companies	25
Use of big data and analytics	19
Knowledge transfer	19
▷ Entrepreneurial fear of failure	43

IT integration	Rank
E-Government	07
Public-private partnerships	21
Cyber security	22
Software piracy	10
Government cyber security capacity	22
▷ Privacy protection by law content	46

USA

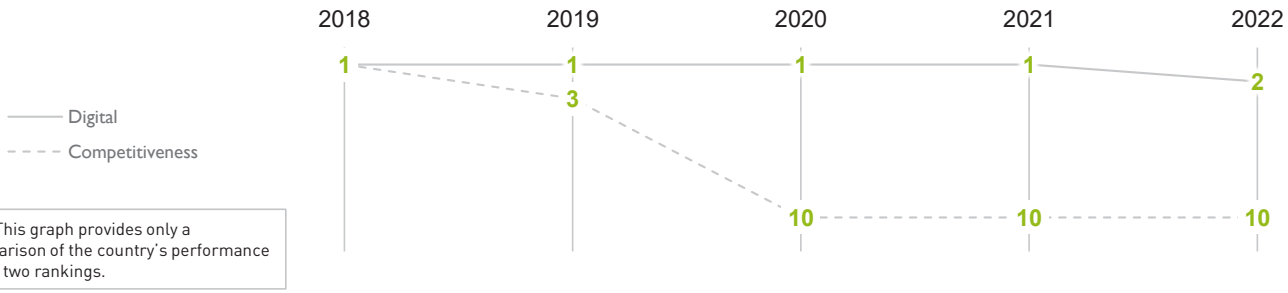
OVERALL PERFORMANCE (63 countries)



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)

USA

▶ 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
Educational assessment PISA - Math	35
International experience	26
Foreign highly-skilled personnel	06
Management of cities	20
Digital/Technological skills	10
Net flow of international students	14

Training & education	Rank
Employee training	33
Total public expenditure on education	11
Higher education achievement	19
Pupil-teacher ratio (tertiary education)	18
▷ Graduates in Sciences	50
Women with degrees	10

Scientific concentration	Rank
Total expenditure on R&D (%)	06
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	03
Scientific and technical employment	18
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
Starting a business	29
Enforcing contracts	16
▷ Immigration laws	41
Development & application of tech.	09
Scientific research legislation	07
Intellectual property rights	13

Capital	Rank
IT & media stock market capitalization	06
Funding for technological development	04
Banking and financial services	09
Country credit rating	11
Venture capital	03
Investment in Telecommunications	14

Technological framework	Rank
Communications technology	21
Mobile Broadband subscribers	28
Wireless broadband	08
Internet users	35
Internet bandwidth speed	09
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

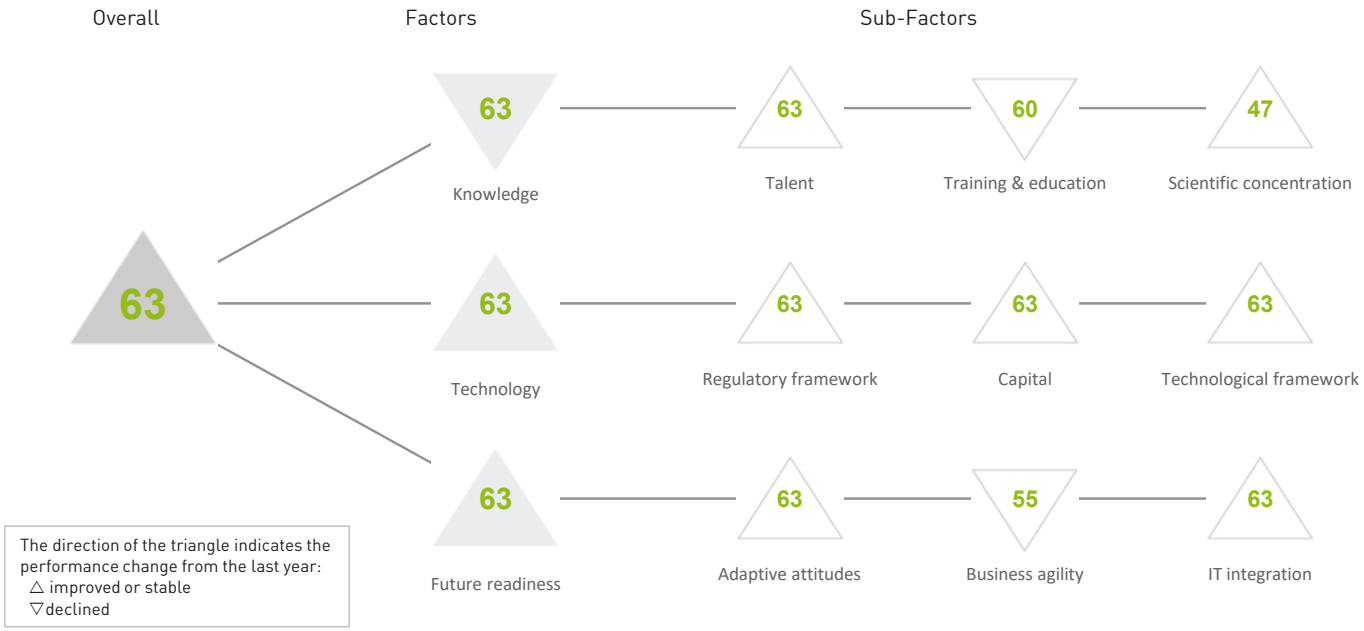
Adaptive attitudes	Rank
▶ E-Participation	01
▶ Internet retailing	02
▶ Tablet possession	02
▷ Smartphone possession	41
▷ Attitudes toward globalization	40

Business agility	Rank
Opportunities and threats	19
World robots distribution	04
Agility of companies	21
▶ Use of big data and analytics	01
Knowledge transfer	07
Entrepreneurial fear of failure	17

IT integration	Rank
E-Government	09
Public-private partnerships	18
Cyber security	27
▶ Software piracy	01
Government cyber security capacity	15
▷ Privacy protection by law content	37

VENEZUELA

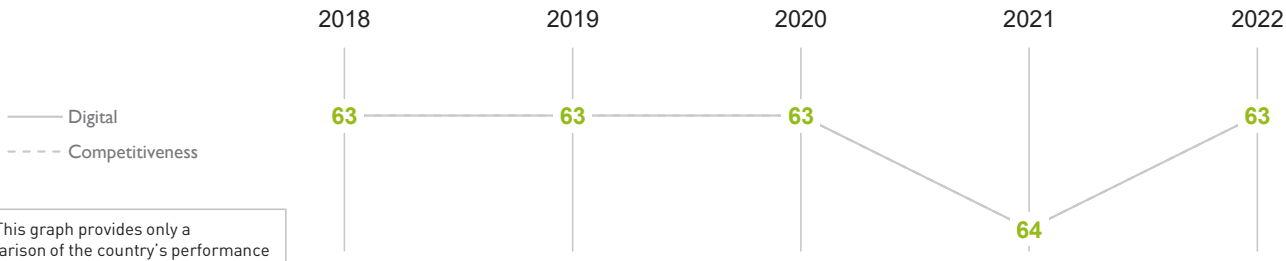
OVERALL PERFORMANCE (63 countries)



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



N.B. This graph provides only a comparison of the country's performance in the two 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
Educational assessment PISA - Math	-
International experience	60
Foreign highly-skilled personnel	63
Management of cities	63
Digital/Technological skills	63
Net flow of international students	-

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

Scientific concentration	Rank
Total expenditure on R&D (%)	61
Total R&D personnel per capita	-
▶ Female researchers	01
R&D productivity by publication	31
Scientific and technical employment	-
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
▷ Starting a business	63
Enforcing contracts	60
Immigration laws	47
Development & application of tech.	63
Scientific research legislation	63
Intellectual property rights	63

Capital	Rank
IT & media stock market capitalization	59
Funding for technological development	63
Banking and financial services	63
▷ Country credit rating	63
Venture capital	63
▷ Investment in Telecommunications	63

Technological framework	Rank
▷ Communications technology	63
Mobile Broadband subscribers	59
▷ Wireless broadband	63
Internet users	60
Internet bandwidth speed	62
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
E-Participation	61
Internet retailing	57
Tablet possession	51
Smartphone possession	60
Attitudes toward globalization	49

Business agility	Rank
Opportunities and threats	49
World robots distribution	55
Agility of companies	53
Use of big data and analytics	58
Knowledge transfer	62
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	61
Public-private partnerships	62
Cyber security	63
Software piracy	62
Government cyber security capacity	42
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	**Sofware 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 terciary 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

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, equipement etc.). The result gives therefore the number of scientific articles published every year for a one percent (of GDP) expenditure in R&D activities. This measure can be consider as a proxy to assess the efficiency (or productivity) in producing high-level scientific research at country level.

1.3.5 Scientific and technical employment

Eurostat
OECD (2022), "Labour Force Statistics: Employment by activities and status", OECD Employment and Labour Market Statistics ILOSTAT
National sources

Scientific and technical employment as a % of total employment. Defined as formal employment within the 'scientific and technical' sector. For more information, refer to NACE2 category M (or equivalent). Philippines: 2020 data are preliminary figures for October 2020.

1.3.6 High-tech patent grants

WIPO Statistics Database
http://www.wipo.int/ipstats/en/statistics/patents/
TIPO for Taiwan, China

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).

1.3.7 Robots in Education and R&D

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.

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

World Robotics 2020
International Federation of Robotics (IFR)

Industrial robot as defined by ISO 8373:2012: an automatically controlled, reprogrammable, multipur

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.

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.internetworldstats.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
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Degrees, ... 1.2.5-1.2.6
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S

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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
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Total public expenditure on education 1.2.2
Total R&D personnel per capita 1.3.2
Training 1.2.1

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Wireless broadband 2.3.3
Women with degrees 1.2.6

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