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IMD WORLD COMPETITIVENESS CENTER

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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IMD WORLD COMPETITIVENESS CENTER

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

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

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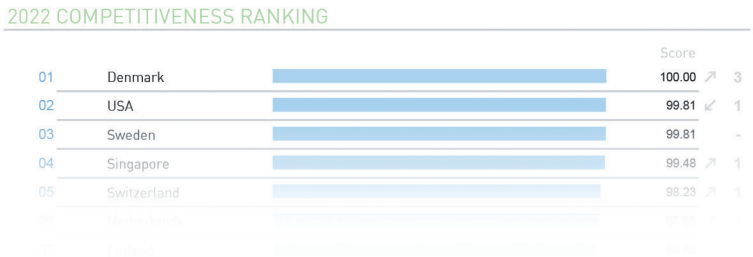
User's Guide to the IMD World Digital Competitiveness Ranking

Overall and Breakdown Digital Rankings

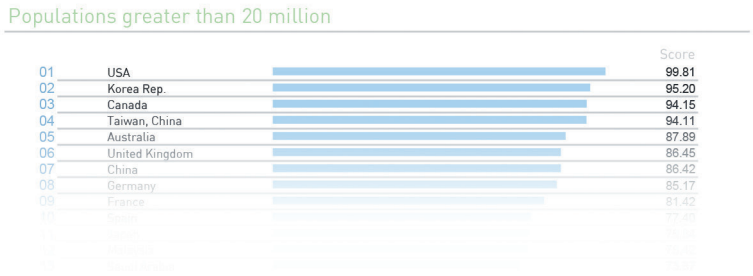
The IMD World Digital Competitiveness Ranking

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.



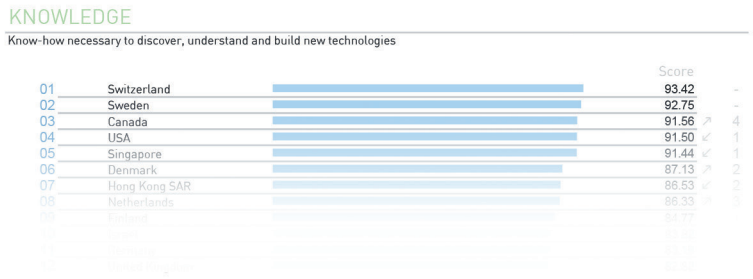
Selected breakdowns of the IMD World Digital Competitiveness Ranking

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

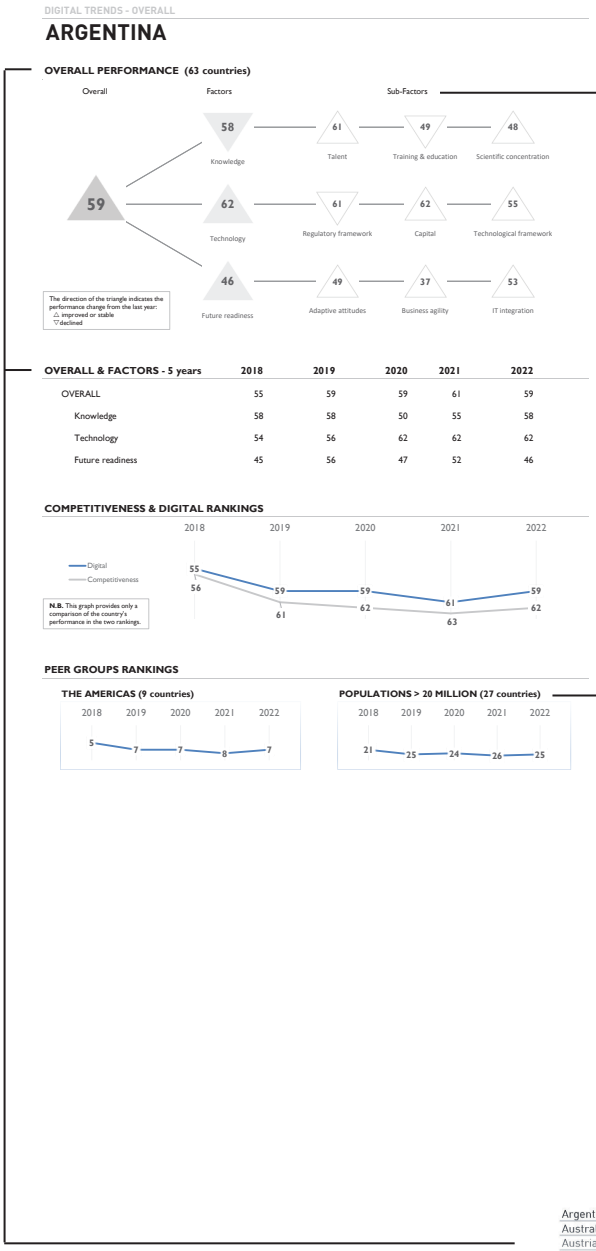
Digital Competitiveness Country Profiles

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

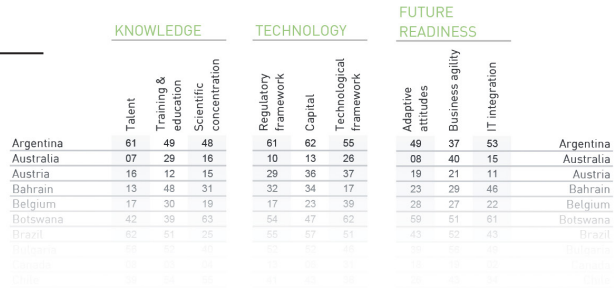
The evolution of the overall and factors digital rankings in the past 5 years.

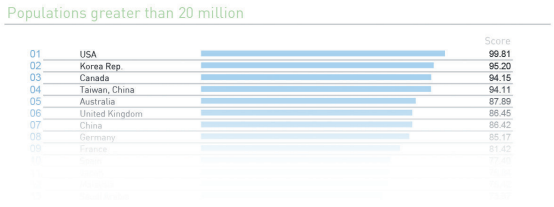
3. Competitiveness and Digital Rankings

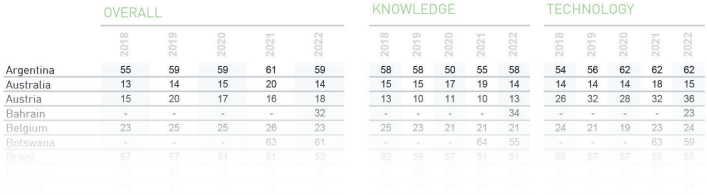
Comparison of the country' performances in the World Competitiveness Ranking and World Digital Competitiveness Ranking in the last 5 years.

4. Peer Group Rankings

Based on geographical region and population size.

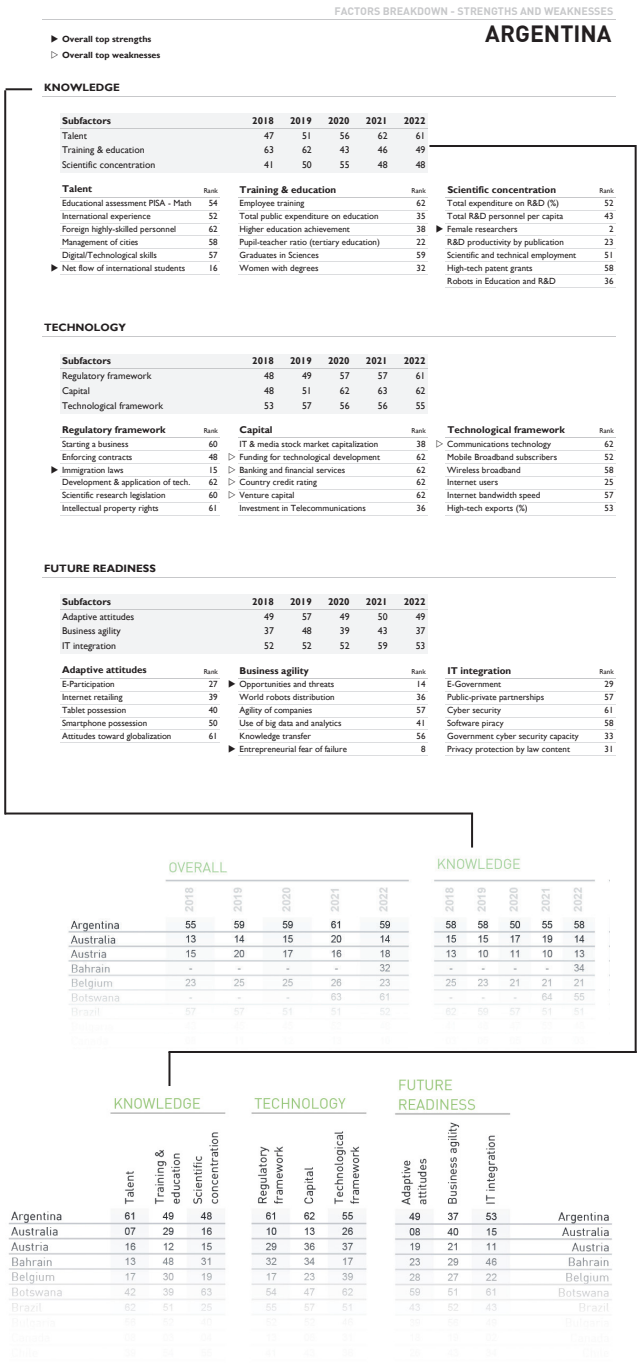






Page 2: Factors breakdown & Strengths and Weaknesses

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	82	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)

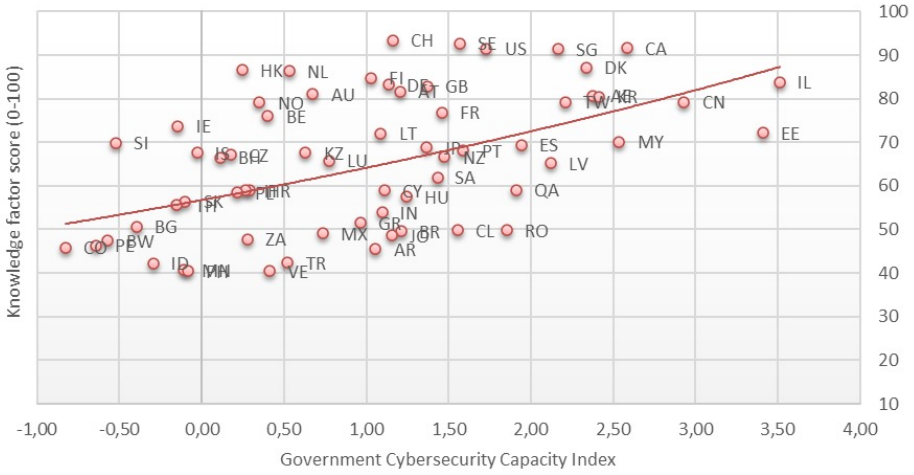
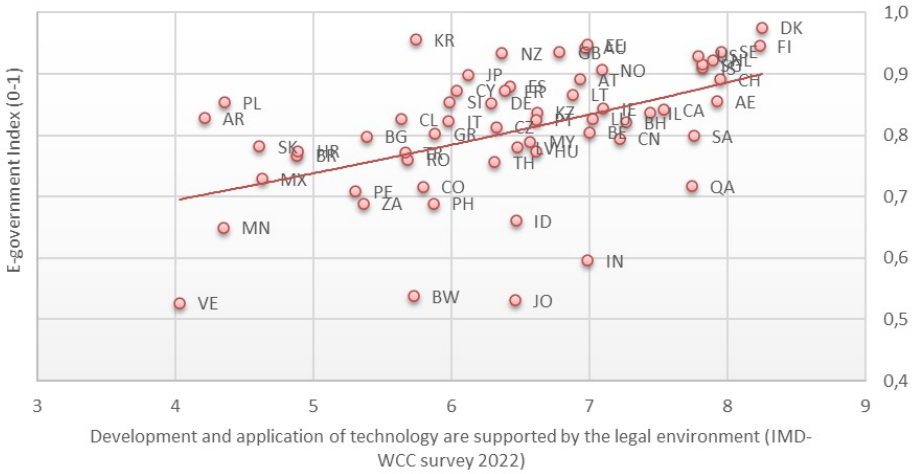


Figure 2: Correlation between "Development and application of technology are supported by the legal environment" and E-Government index. (IMD, 2022)



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

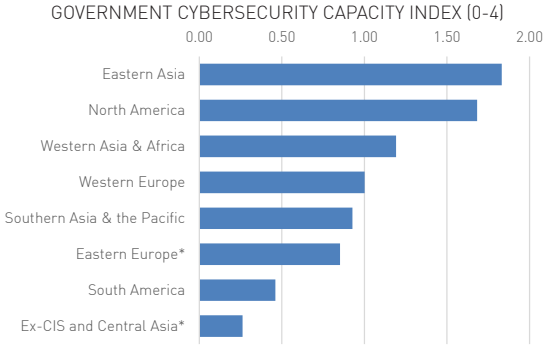


Figure 4: E-government index by region

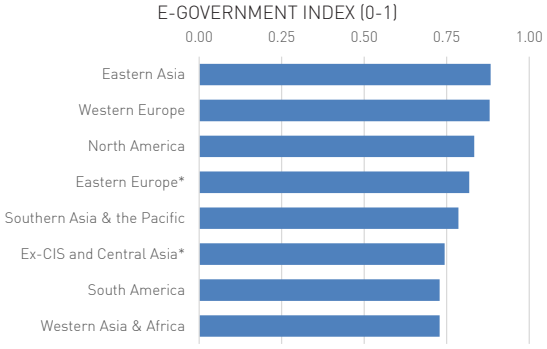
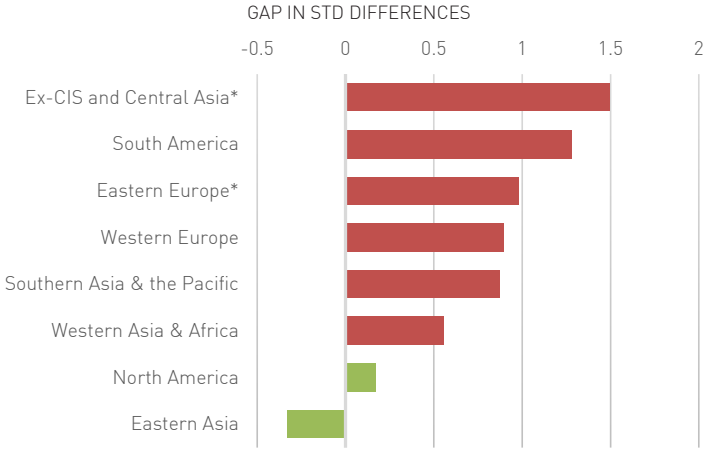


Figure 5: Gap between scores in the E-government index and the Cybersecurity capacity index. IMD (2022)



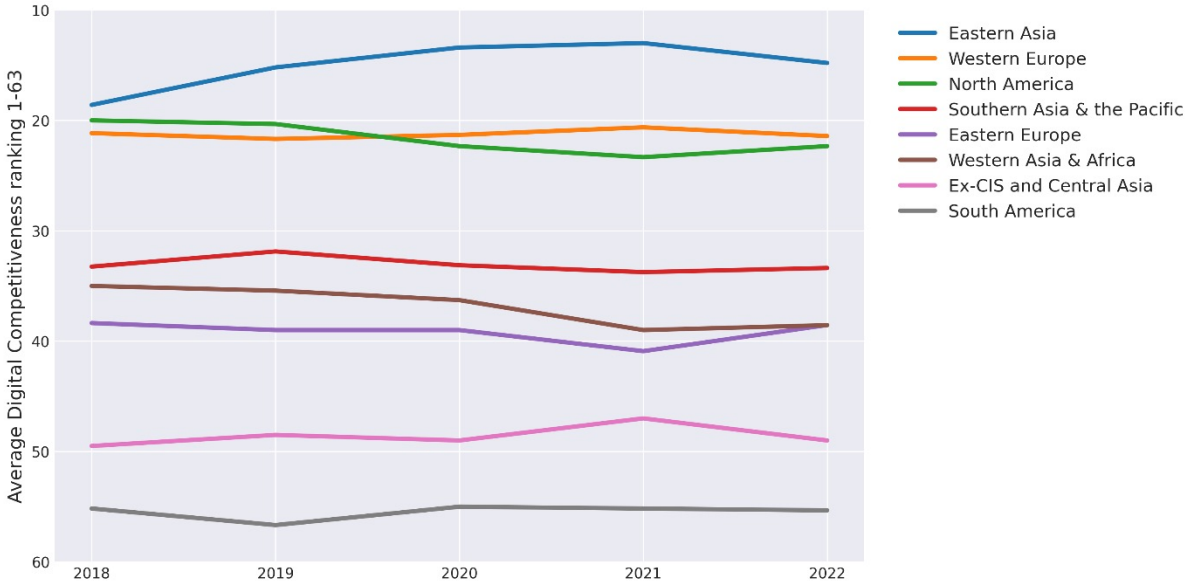
NOTE: *Eastern Europe does not include values for Ukraine; Ex-CIS and Central Asia does not include values for Russia.

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.

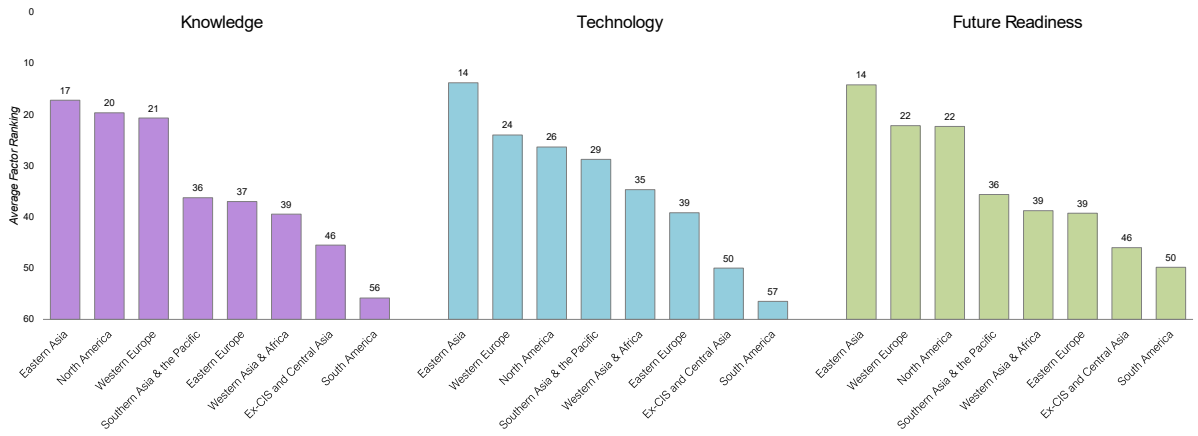
3. Digital competitiveness trends at a regional level

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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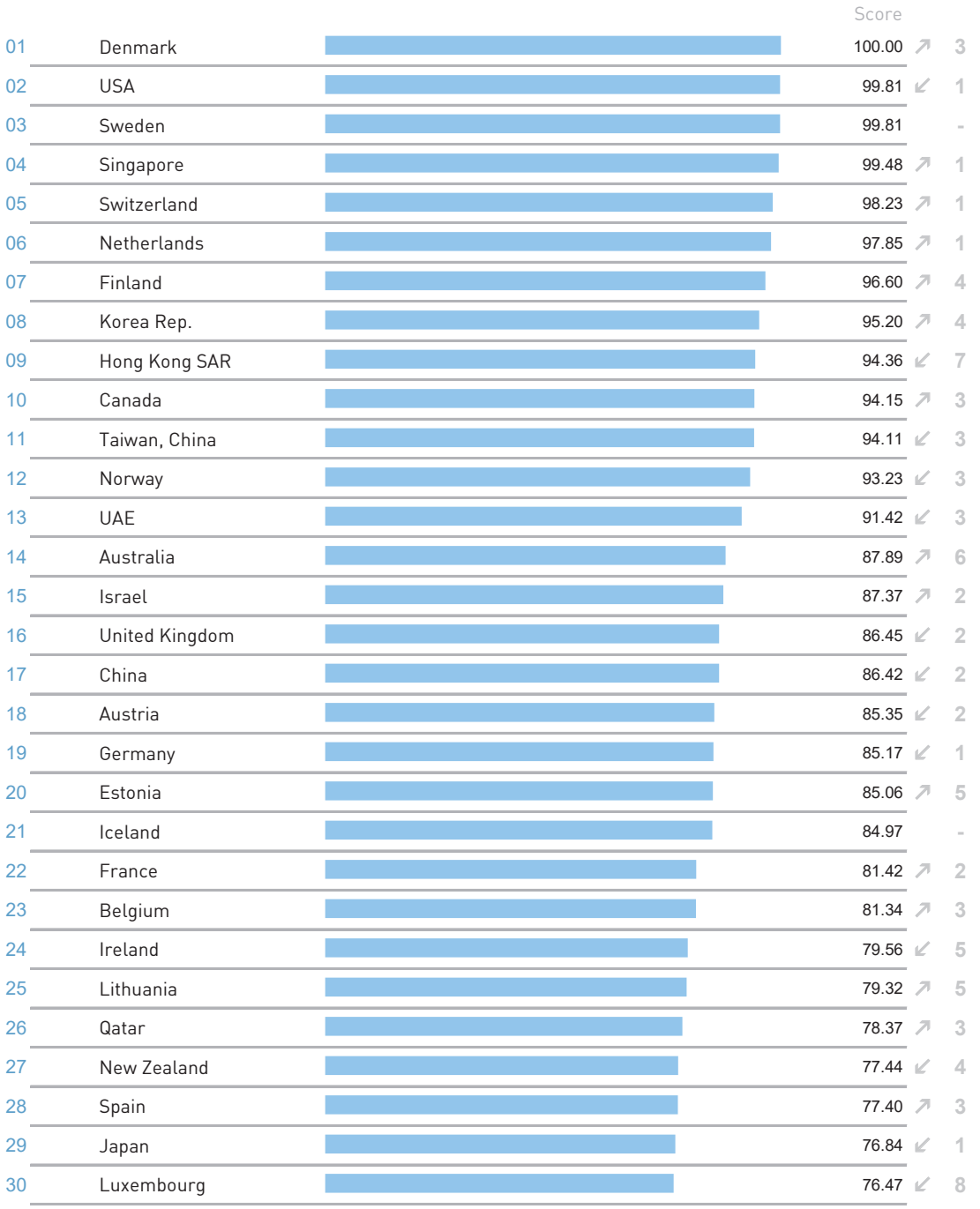
The 2022 IMD World Digital Competitiveness Ranking

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

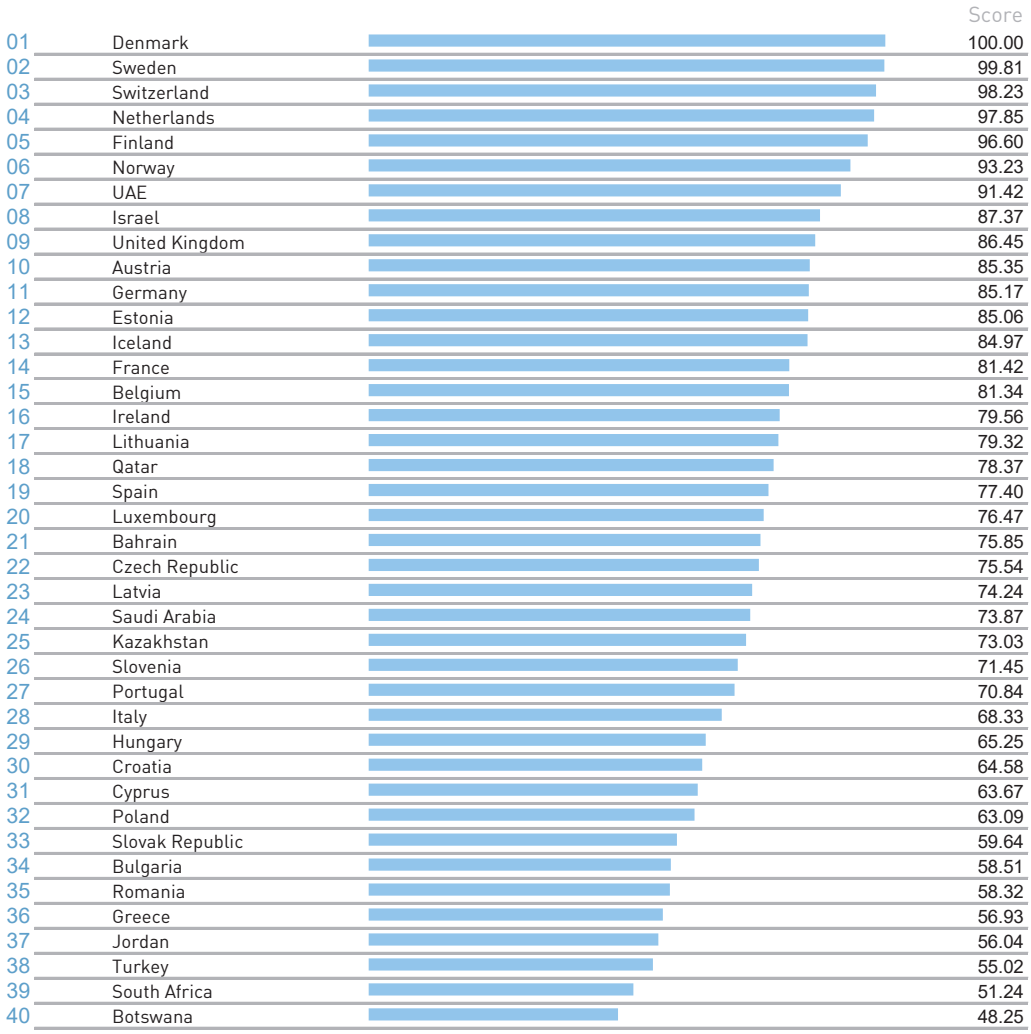
		Score
01	Denmark	100.00
02	USA	99.81
03	Sweden	99.81
04	Singapore	99.48
05	Switzerland	98.23
06	Netherlands	97.85
07	Finland	96.60
08	Korea Rep.	95.20
09	Hong Kong SAR	94.36
10	Canada	94.15
11	Taiwan, China	94.11
12	Norway	93.23
13	UAE	91.42
14	Australia	87.89
15	Israel	87.37
16	United Kingdom	86.45
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

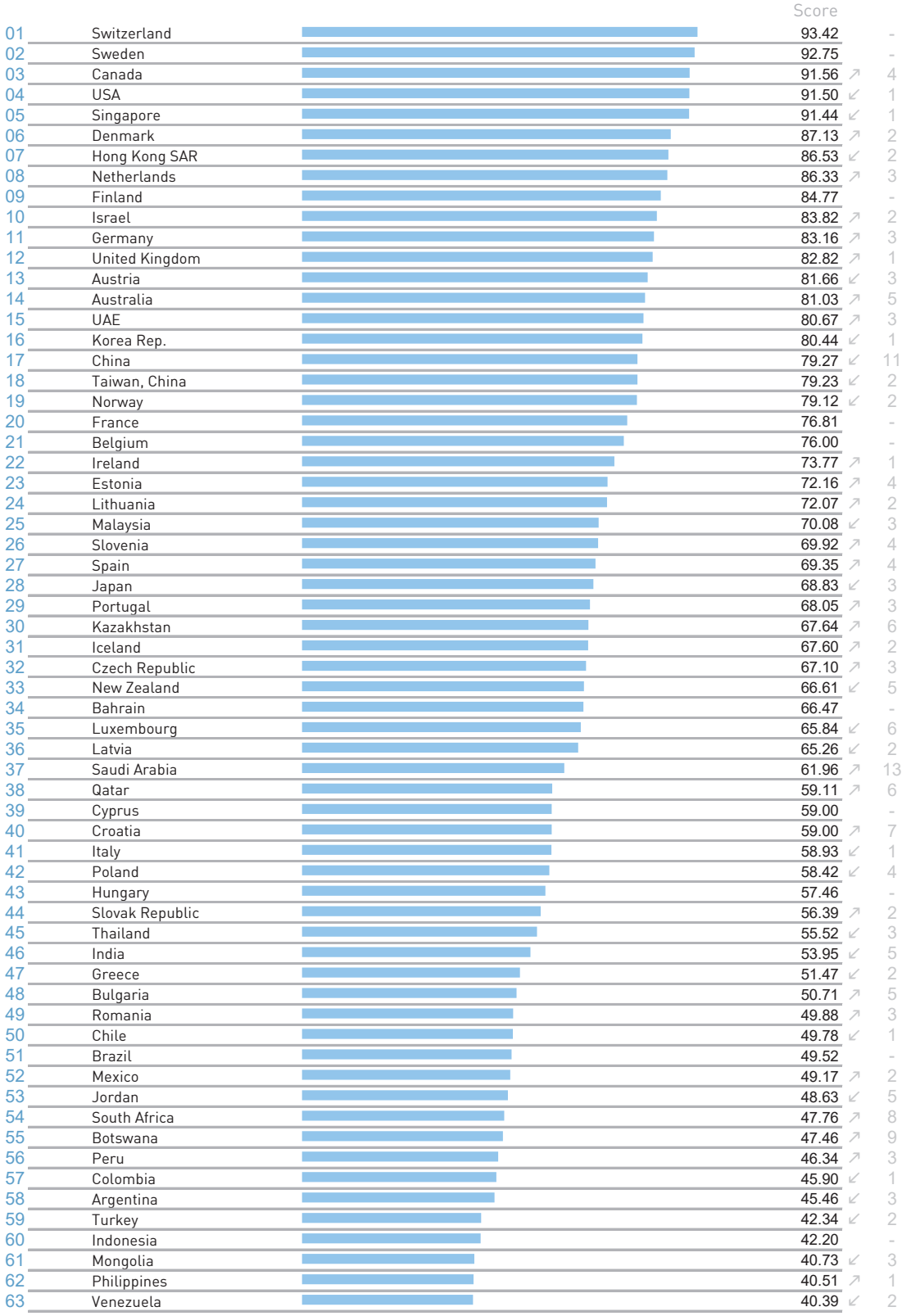
The Americas

		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

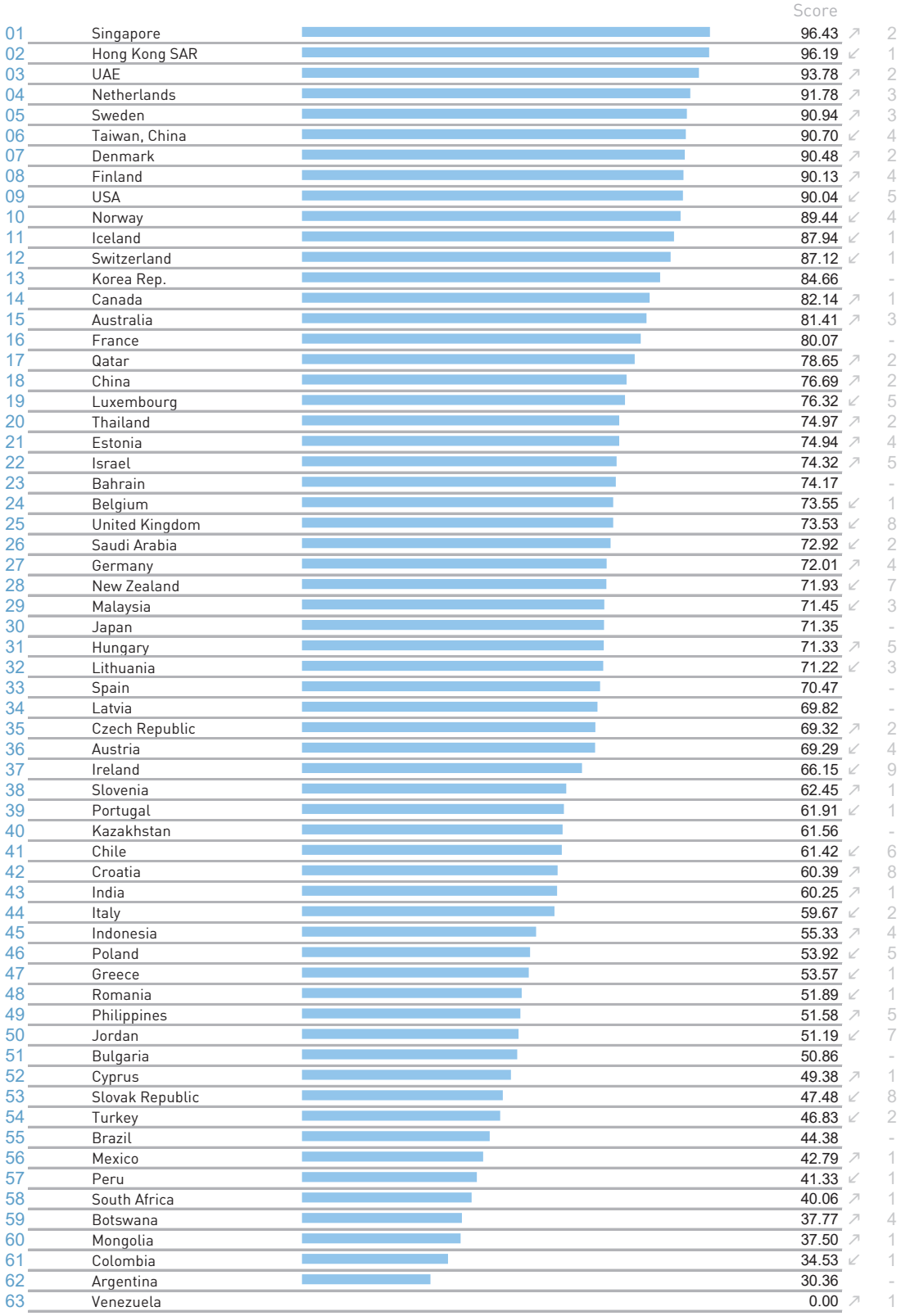


		Score		
01	Switzerland	93.42		-
02	Sweden	92.75		-
03	Canada	91.56	↗	4
04	USA	91.50	↙	1
05	Singapore	91.44	↙	1
06	Denmark	87.13	↗	2
07	Hong Kong SAR	86.53	↙	2
08	Netherlands	86.33	↗	3
09	Finland	84.77		-
10	Israel	83.82	↗	2
11	Germany	83.16	↗	3
12	United Kingdom	82.82	↗	1
13	Austria	81.66	↙	3
14	Australia	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

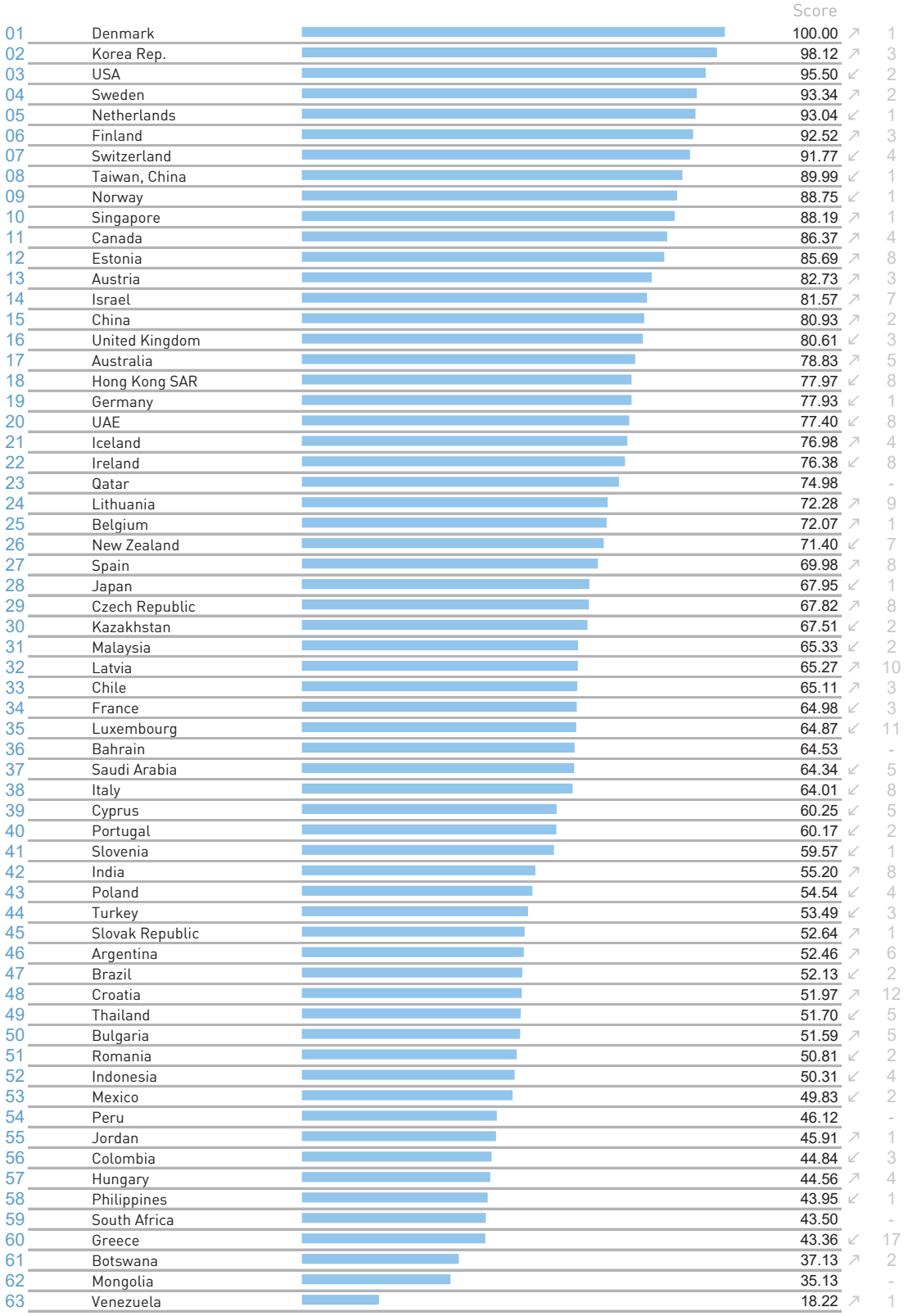
Overall context that enables the development of digital technologies



		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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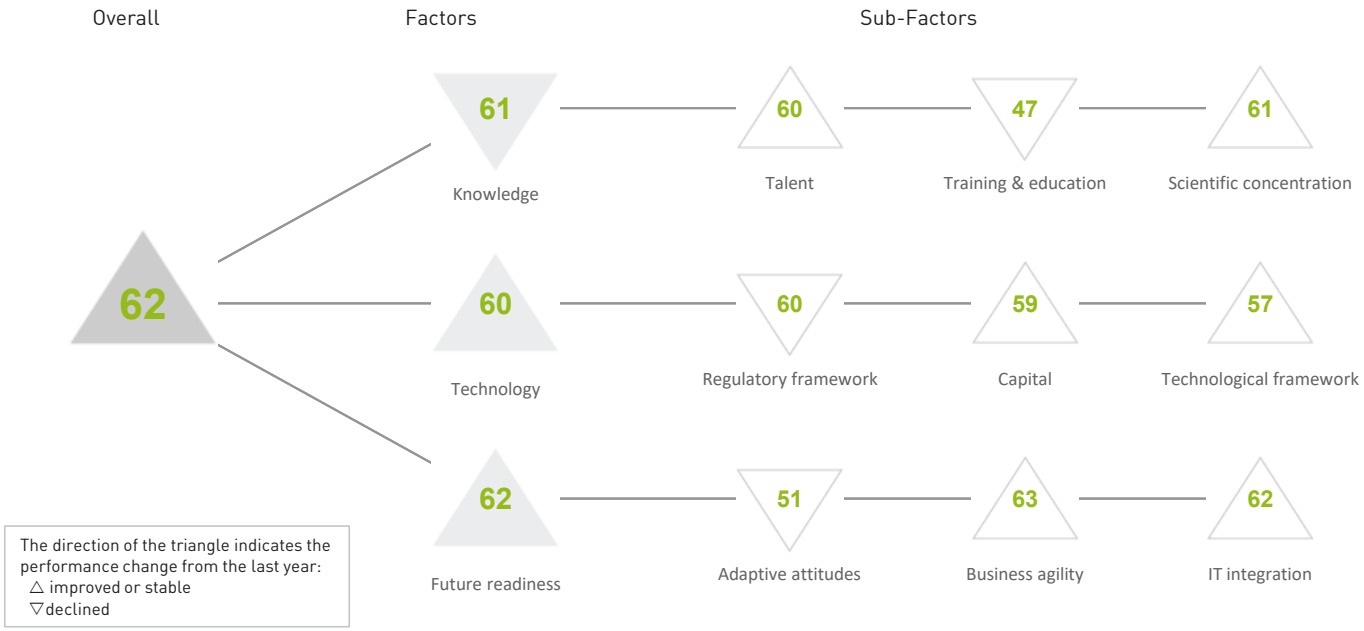
MONGOLIA

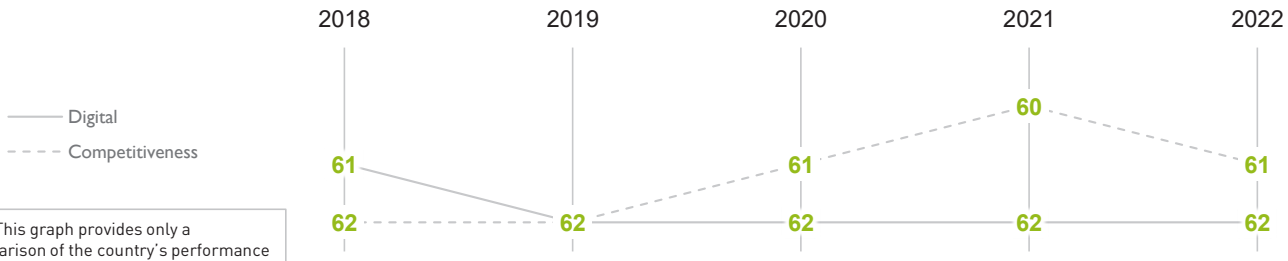
OVERALL PERFORMANCE (63 countries)



OVERALL & FACTORS - 5 years

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

COMPETITIVENESS & DIGITAL RANKINGS



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