IMD World Digital Competitiveness Ranking 2024

The digital divide: risks and opportunities

IMD / World Competitiveness Center

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IMD WORLD DIGITAL COMPETITIVENESS RANKING 2024

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Preface

This is the eighth year that the WCC has produced its IMD World Digital Competitiveness Ranking, tracking the ever-changing conditions of digital governance, economy, and society.

The total number of economies assessed this year is 67, with Ghana, Nigeria, and Puerto Rico making their debuts.

This report **The Digital Divide: Risks and Opportunities**, focuses on the global impact of three overlapping phenomena: the uneven development of digital infrastructure, geopolitical tensions, and the impact of emerging technologies.

We explore how, as technological advancements continue to evolve quickly, the ability of governments and companies to invest in data infrastructure and systems will be an ever-greater determinant of a country's digital competitiveness.

I strongly believe that instead of overly worrying about the dark side of AI and Web3's technologies, our main focus should be on understanding and learning about them, starting with planting them in our education systems.

Digital transformation, then, goes hand in hand with financial development and inclusion. National policies in conjunction with global regulation can feed the fair use of individual information. The European Union, the UAE, and Singapore are at an advantage in this sense compared to the US and China, where the "rule of digital law" is still not fully upheld.

And yet, Europe's fragmented capital markets and financing systems are major obstacles to its digital competitiveness. As the European Commission gears up for a new five-year term and shapes its forthcoming policies, now is an apt moment for reflection. And with Donald Trump having secured a second presidential term, we should be anticipating the effects of near-definite protectionism not only in the US but also in Europe, China, and the Global South.

As our report discusses, countries resort to economic protectionism partly to safeguard strategic industries and the technology sector is key among them. An increase in trade friction between the US and China will lead to trade volatility and policy uncertainty. The knock-on effect? Strategic hesitation among third-party countries in terms of which areas of digital technology to invest in.

We are, as ever, indebted to our partner institutes and the IMD alumni community for offering national-level data and executive opinion survey answers without which our ranking wouldn't be possible.

Finally, I leave you with a quote emphasizing the importance of seeing "digital" in the context of global infrastructure. It was spoken by Alaa Moussawi, Chief Data Scientist of New York City Council, at the AI & Web3 Festival in Dubai this September: "Data is not a commodity; data is oxygen, and oxygen is the same everywhere."

Professor Arturo Bris
Director
IMD World Competitiveness Center

Table of Contents

Digital Competitiveness Country Profiles

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 65 Partner Institutes in 58 countries 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**
- **Hinrich-IMD Sustainable Trade Index**
- **Smart City Index**

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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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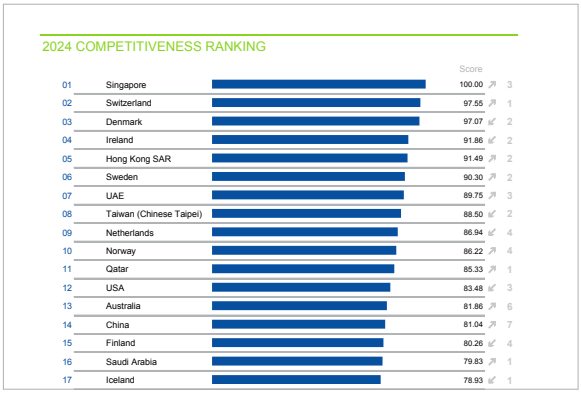
User guide

User Guide for the IMD World Digital Competitiveness Ranking

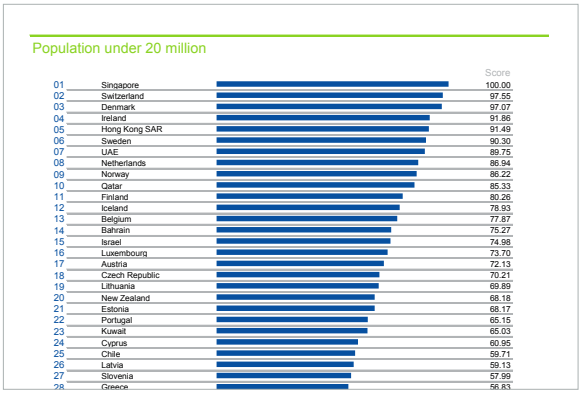
Overall and Breakdown: Digital Rankings

The IMD World Digital Competitiveness Ranking



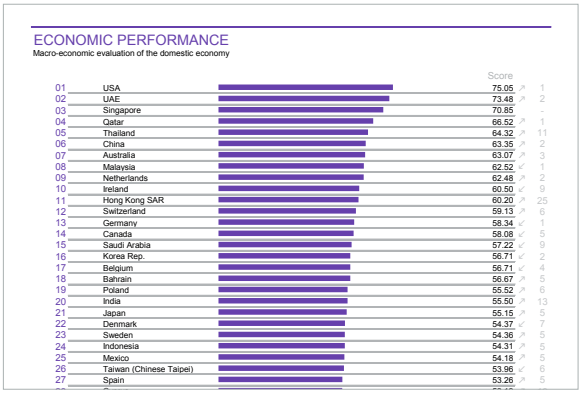
The IMD World Digital Competitiveness Ranking presents the 2024 overall rankings for the 67 economies covered by the WCY. The rankings are calculated on the basis of the 59 ranked criteria: 38 hard and 21 survey data. The countries are ranked from the most to the least digital competitive. The final 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



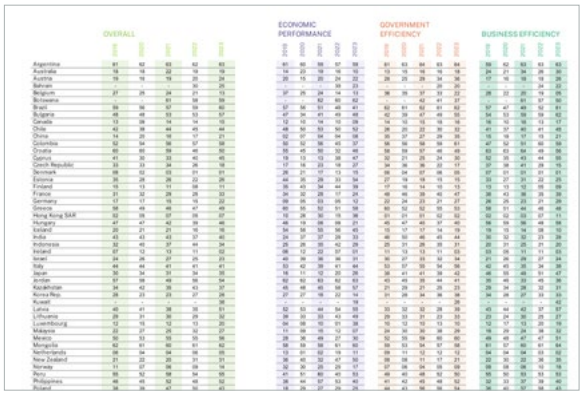
In addition to global digital rankings, other rankings are provided to show comparisons based on different perspectives. These digital rankings include countries split by population size (populations above and below 20 million), by GDP per capita to reflect different peer groups (above and below $20,000)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

Digital Competitiveness Factor Rankings



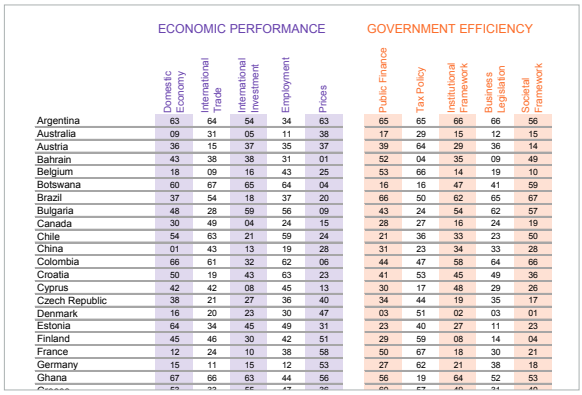
The global rankings for each of the Digital Competitiveness Factors are then shown as individual ranking tables. Again, the economies are ranked from the most to the least digital competitive and the previous year's rankings (2023) are shown in brackets. Similar to the Overall Digital Ranking, the values 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.

Digital Sub-factor Rankings



	ECONOMIC PERFORMANCE					GOVERNMENT EFFICIENCY				
	Domestic Economy	International Trade	International Investment	Employment	Prices	Public Finance	Tax Policy	Institutional Framework	Business Legislation	Societal Framework
Argentina	63	64	54	34	63	65	65	66	66	56
Australia	09	31	05	11	38	17	29	15	12	15
Austria	36	15	37	35	37	39	64	29	36	14
Bahrain	43	38	38	31	01	52	04	35	09	49
Belgium	18	09	16	43	25	53	66	14	19	10
Botswana	60	67	65	64	04	16	16	47	41	59
Brazil	37	54	18	37	20	66	50	62	65	67
Bulgaria	48	28	59	56	09	43	24	54	62	57
Canada	30	49	04	24	15	28	27	16	24	19
Chile	54	63	21	59	24	21	36	33	23	50
China	01	43	13	19	28	31	23	34	33	28
Colombia	66	61	32	62	06	44	47	58	64	66
Croatia	50	19	43	63	23	41	53	45	49	36
Cyprus	42	42	08	45	13	30	17	48	29	26
Czech Republic	38	21	27	36	40	34	44	19	35	17
Denmark	16	20	23	30	47	03	51	02	03	01
Estonia	64	34	45	49	31	23	40	27	11	23
Finland	45	46	30	42	51	29	59	08	14	04
France	12	24	10	38	58	50	67	18	30	21
Germany	15	11	15	12	53	27	62	21	38	18
Ghana	67	66	63	44	56	56	19	64	52	53

A summary of the rankings for all nine sub-factors is presented for the 67 economies for 2024. 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.

User Guide

Digital Competitiveness Country Profiles

Each two page profile analyses the performance of one of the 67 economies that are included in the IMD World Digital Competitiveness Ranking. The economies are presented in alphabetical order. The term economy signifies an economic entity and does not imply any political independence.
It is possible, in one glimpse, to evaluate the digital evolution of each economy over time and its relative strengths and weaknesses. However, each economy's particular situation is influenced by its development level, political restraints and social value system.

Page 1: Digital Competitiveness – Overall and factors trends

This page shows the overall, factors and sub-factors ranking performances of the country in 2024, 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 2024. 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.

5-years Evolution

	OVERALL					KNOWLEDGE					TECHNOLOGY					FUTURE READINESS				
	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
Argentina	59	61	59	61	62	50	55	58	62	61	62	62	62	63	65	47	52	46	49	47
Australia	15	20	14	16	15	17	19	14	15	13	14	18	15	18	11	17	22	17	20	20
Austria	17	16	18	22	25	11	10	13	16	21	28	32	36	35	32	16	16	13	19	31
Bahrain	-	-	32	38	30	-	-	34	36	35	-	-	23	30	33	-	-	36	46	24
Belgium	25	26	23	15	21	21	21	21	12	18	19	23	24	19	25	25	26	25	16	26
Botswana	-	63	61	60	60	-	64	55	52	49	-	63	59	52	57	-	63	61	63	62
Brazil	51	51	52	57	57	57	51	51	57	56	57	55	55	60	60	43	45	47	52	53
Bulgaria	45	52	48	55	56	47	53	48	53	59	45	51	51	56	49	44	55	50	58	61
Canada	12	13	10	11	13	05	07	03	04	06	13	15	14	13	13	15	15	11	11	19

SWITZERLAND

DIGITAL TRENDS - OVERALL

1

OVERALL PERFORMANCE (67 economies)

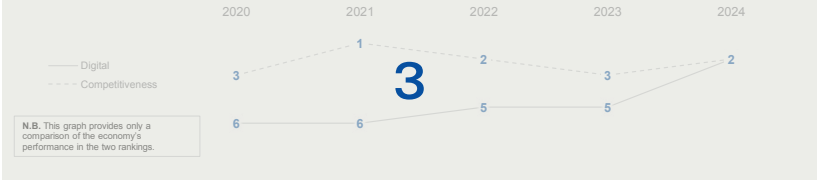
2

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	06	06	05	05	02
Knowledge	03	01	01	01	01
Technology	11	11	12	10	04
Future readiness	05	03	07	06	05

3

COMPETITIVENESS & DIGITAL RANKINGS



4

PEER GROUPS RANKINGS

Selected breakdowns

Population over 20 million

		Score
01	USA	91.31
02	Korea Rep.	88.62
03	Taiwan (Chinese Taipei)	86.33
04	Canada	83.16
05	China	82.59
06	Australia	81.24
07	United Kingdom	78.21
08	France	76.58
09	Germany	75.32
10	Saudi Arabia	71.60
11	Spain	70.86

Sub-factors Ranking

	KNOWLEDGE			TECHNOLOGY			FUTURE READINESS		
	Talent	Training & education	Scientific concentration	Regulatory framework	Capital	Technological framework	Adaptive attitudes	Business agility	IT integration
Argentina	62	60	52	48	66	57	53	32	53
Australia	09	27	15	05	19	12	16	38	15
Austria	23	18	17	32	41	23	38	28	20
Bahrain	11	59	31	31	29	38	07	26	41
Belgium	15	23	19	30	18	33	39	15	29
Botswana	31	37	66	56	26	64	63	51	62
Brazil	66	51	29	53	59	54	47	63	50
Bulgaria	61	54	47	61	37	49	61	57	60

User Guide

Digital Competitiveness Country Profiles

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 59 criteria rankings for 2024.

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 ▶) and the five criteria in which its performance is the worst (weaknesses ▷) 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 59 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.

5-years Evolution

	OVERALL					KNOWLEDGE				
	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
Argentina	59	61	59	61	62	50	55	58	62	61
Australia	15	20	14	16	15	17	19	14	15	13
Austria	17	16	18	22	25	11	10	13	16	21
Bahrain	-	-	32	38	30	-	-	34	36	35
Belgium	25	26	23	15	21	21	21	21	12	18
Botswana	-	63	61	60	60	-	64	55	52	49
Brazil	51	51	52	57	57	57	51	51	57	56
Bulgaria	45	52	48	55	56	47	53	48	53	59
Canada	12	13	10	11	13	05	07	03	04	06

SWITZERLAND

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	02	03	02	02	03
Training & education	14	07	08	07	08
Scientific concentration	09	08	08	10	02

1

Talent	Rank
Educational assessment PISA - Math	08
▶ International experience	01
▶ Foreign highly skilled personnel	01
Management of cities	07
Digital/Technological skills	10
Net flow of international students	08

Training & education	Rank
Employee training	02
Total public expenditure on education	13
Higher education achievement	21
Pupil-teacher ratio (primary education)	06
Graduates in Sciences	26
Women with degrees	32
Computer science education index	14

Scientific concentration	Rank
Total expenditure on R&D (%)	08
Total R&D personnel per capita	09
Female researchers	29
▷ R&D productivity by publication	35
Scientific and technical employment	03
High-tech patent grants	22
Robots in Education and R&D	16
AI articles	03

2

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	10	09	08	04	02
Capital	14	12	12	11	11
Technological framework	14	11	11	12	07

Regulatory framework	Rank
Starting a business	36
▷ Enforcing contracts	40
Immigration laws	12
Development & application of tech.	06
Scientific research legislation	02
▶ Intellectual property rights	01
AI policies passed into law	17

Capital	Rank
▷ IT & media stock market capitalization	49
Funding for technological development	06
Banking and financial services	03
Country credit rating	01
Venture capital	15
Investment in Telecommunications	30

Technological framework	Rank
▶ Communications technology	01
Mobile broadband subscribers	12
▷ Wireless broadband	52
Internet users	13
Internet bandwidth speed	10
High-tech exports (%)	09
Secure internet servers	05

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	09	10	12	16	15
Business agility	06	04	07	07	07
IT integration	07	04	06	06	07

Adaptive attitudes	Rank
E-Participation	27
Internet retailing	09
Tablet possession	08
Smartphone possession	17
Attitudes toward globalization	20
Flexibility and adaptability	26

Business agility	Rank
Opportunities and threats	08
World robots distribution	24
Agility of companies	08
Use of big data and analytics	25
▶ Knowledge transfer	01
Entrepreneurial fear of failure	10

IT integration	Rank
E-Government	25
Public-private partnerships	05
Cyber security	11
Software piracy	10
▷ Government cyber security capacity	34
Privacy protection by law exists	27

Sub-factors Ranking

	KNOWLEDGE			TECHNOLOGY			FUTURE READINESS			
	Talent	Training & education	Scientific concentration	Regulatory framework	Capital	Technological framework	Adaptive attitudes	Business agility	IT integration	
Argentina	62	60	52	48	66	57	53	32	53	Argentina
Australia	09	27	15	05	19	12	16	38	15	Australia
Austria	23	18	17	32	41	23	38	28	20	Austria
Bahrain	11	59	31	31	29	38	07	26	41	Bahrain
Belgium	15	23	19	30	18	33	39	15	29	Belgium
Botswana	31	37	66	56	26	64	63	51	62	Botswana
Brazil	66	51	29	53	59	54	47	63	50	Brazil
Bulgaria	61	54	47	61	37	49	61	57	60	Bulgaria

Analysis

The digital divide: risks and opportunities

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The digital divide – the growing gap between the haves and have-nots of internet access and beyond – is nothing new but it is becoming more complex in the context of ever more tech advancements and relentless geopolitical tensions. As a result, digital competitiveness is beset with an increasing number of challenges.

As the 21st century has progressed, digital competitiveness has become fundamental for economic growth. The fast pace at which industries, companies, and governments shift to digital tools underscores the need for a reliable digital infrastructure to facilitate an effective digital transformation. In addition, key trends such as the rise of data-driven economies, automation, and the role of technology in shaping industries from healthcare to manufacturing highlight the need to ensure long-term digital competitiveness.

There are, however, several interconnected and mounting challenges that can constrain the advancement of digital competitiveness. The latter includes sustained investment in R&D and innovation, and continued access to relevant talent, among others. In this essay, we focus on four such challenges: digital disparities, the pace of technological changes led by emerging technologies, geopolitical tensions, and the fragmentation of digital governance.

The digital divide remains a significant challenge, both between and within countries. Wealthier economies or regions with better infrastructure can sustain their levels of digital competitiveness, while others lag. In some economies, in addition, the rural population does not have the same access, for example, to high-speed internet that its urban counterpart has, which increases disparities in terms of their participation in the digital economy.

The role of emerging technologies is also crucial for long-term digital competitiveness, particularly in relation to widening digital disparities. In this context, artificial intelligence (AI) is a fundamental aspect of the "new arms race" for countries in search of "tech supremacy."[1] Economies able to invest in AI research, development, and relevant talent are positioning themselves for leadership in automation, healthcare, and other key sectors. In addition, as quantum computing moves from theory to application, countries and firms that invest early will have a competitive edge in, for example, drug research and complex problem-solving.

Furthermore, the ongoing geopolitical tensions have led to increased competition for digital dominance among some countries. The result has been an added layer of complexity to digital competitiveness, that is, the fragmentation of global digital governance. In turn, such fragmentation can hinder collaboration on issues like cybersecurity, and data privacy which are essential for a balanced and secure digital ecosystem. In addition, fragmentation, by hampering collaboration, can increase the level of digital disparities among countries.

In what follows, we explore the nature of these challenges. The focus is on the links between such challenges and how they threaten digital competitiveness. The second section discusses the digital infrastructure disparities. The next section focuses on the impact of new technologies. The fourth considers how geopolitics compromise digital competitiveness. The fifth looks at digital governance fragmentation. The sixth section concludes.

1 Nguyen, X. T. (2023). Tech Supremacy: The New Arms Race Between China and the United States. J. Corp. L., 49, 103.

Digital infrastructure disparities, 2024

Digital infrastructure	Digital connectivity					
	High level			Low level		
Mobile broadband subscribers	**Qatar**	**Australia**	**Japan**	**Botswana**	**Kazakhstan**	**Nigeria**
5G market, % of mobile market	66.11	45.81	44.24	3.15	2.44	1.04
Internet users	**UAE**	**Iceland**	**Norway**	**Venezuela**	**Nigeria**	**Philippines**
Number of internet users per 1000 people	1000	996.87	990	642	553.64	526.76
Broadband subscribers	**Japan**	**Denmark**	**Austria**	**Philippines**	**Ghana**	**Nigeria**
Number of subscriptions per 1000 inhabitants	1000	657.14	635.49	72.24	55.15	3.62
Internet bandwidth speed	**Iceland**	**Singapore**	**France**	**Venezuela**	**Indonesia**	**Botswana**
Average speed (megabytes per second, mbps)	269.20	226.23	225.97	30.73	23.90	10.61

Table 1
Source: IMD World Competitiveness Online

Digital infrastructure disparities

One of the most significant challenges to digital competitiveness is how much disparity exists in the development of digital infrastructure across countries. Many economies, particularly in developing regions, lack access to high-speed broadband, reliable electricity, and modern telecommunications networks, which limit their participation in the global digital economy. According to the International Telecommunication Union (ITU), while broadband access has expanded globally, significant gaps remain, especially in rural and underserved areas.[2]

Such disparities play a critical role in digital competitiveness and ultimately in economic development. For instance, high-income economies, particularly those in North America, Europe, and parts of East Asia, have developed extensive broadband networks, high-speed internet, modern data centers, and reliable electricity grids. These resources enable greater productivity, drive innovation in sectors like finance and education, and facilitate global commerce. Globally, between 2018 and 2022, there was an increase of 1.5 billion internet users, with growth especially accelerating in middle-income economies. This was so, partly, because of the impact of the COVID-19 pandemic and shifts, for example, in the greater use of business and education apps. However, low-income countries lag behind, with just one in four people online by 2022.[3]

In this context, countries like Korea and Norway have high rates of internet penetration along with advanced 5G infrastructure that enables their digital services and smart city projects, allowing them to stay at the forefront of digital competitiveness. In contrast, many developing economies, in Africa, Latin America, and parts of South Asia, have an inadequate or inconsistent digital infrastructure. In this sense, limited broadband access, slow internet speeds, and unreliable electricity service are significant constraints for participating in the digital economy. For example, in Africa, only 33% of the population used the internet in 2021, compared to 87% in Europe.[4] Additionally, rural areas in some regions are often the most affected, with poor connectivity limiting access to online education, healthcare services, and economic opportunities. **Table 1** presents the disparities between countries that rank high and low in several aspects of digital infrastructure. It shows, for example, the disparity in 5G share of the mobile market between Japan (44.24%) and Nigeria (1.04%), in broadband subscribers (per 1,000 inhabitants) with Denmark reaching 657 subscribers compared to Ghana's 55.15, and in the average speed of internet between Iceland (269.2 Mbps) and Indonesia (23.9 Mbps).

In terms of disparities across smart city projects, some of the findings of the IMD Smart City Index 2024 (SCI) are noteworthy. To contextualize those results, we follow the example of the economies we referred to above as being able to exploit digital technologies to advance their smart cities programs, that is, cities in Korea and Norway and we compare them to cities from Latin American economies. Participants in the SCI's survey evaluate the existing infrastructure (**Table 2**, panel A) and technological services (Table 2, panel B) provided by their city of residence. As Table 2 (panel A) shows, there is a gap in the opportunities for children to access quality education between Oslo where 80%

2 ITU. (2021). Measuring digital development: Facts and figures. International Telecommunication Union
3 World Bank (2024). Digital Progress and Trends Report 2023. International Bank for Reconstruction and Development / The World Bank.
4 ITU. Measuring digital development...

Smart cities: Disparities in work and school opportunities, 2024

Opportunities: Work and school	City, Country (% of respondents)			
	Oslo, Norway	Seoul, Korea	Guatemala City, Guatemala	Rio de Janeiro, Brazil
Panel A. Structures				
Employment finding services are readily available	75.70%	61.60%	49.10%	45.20%
Most children have access to a good school	80.00%	54.00%	15.80%	22.40%
Lifelong learning opportunities are provided by local institutions	69.30%	62.50%	33.80%	35.90%
Panel B. Technologies				
Online access to job listings has made it easier to find work	71.30%	67.20%	58.50%	56.20%
IT skills are taught well in schools	55.40%	63.00%	32.10%	25.00%
The current internet speed and reliability meet connectivity needs	70.70%	79.80%	55.00%	55.20%

Table 2
Source: IMD Smart City Index (2024)

of respondents indicate that children do have such opportunities, and Guatemala City (15.8%) and Rio de Janeiro (22.4%). Panel A also makes evident that access to lifelong learning follows the same trend with 62.5% of Seoul's residents stipulating that local institutions provide such service compared to 35.9% of those in Rio de Janeiro. Panel B shows comparable results in terms of the use of technologies to address the shortcomings of the infrastructure. While 63% of Seoul's respondents specify that IT skills are adequately taught in schools, only 32.1% of Guatemala City's participants do. In terms of the speed and reliability of connectivity, 70.7% of Oslo's residents point out that such a service meets their needs, compared to 55.2% of those from Rio de Janeiro.

The consequences of such a digital gap are significant. Countries lacking robust digital infrastructure struggle to foster innovation, connect businesses to global markets, and provide essential services to their citizens. In a rapidly digitalizing economy, countries with poor digital infrastructure are at higher risk of falling behind, which could lead to slower economic growth and greater inequalities. According to some accounts, halving the digital divide will need an investment of more than $2tn, which highlights the economic costs of reducing digital disparities.[5] Achieving such an objective will thus require a substantial investment in the digital infrastructure, particularly in underserved regions. In short, infrastructure disparities create an uneven playing field, constraining developing countries from taking advantage of digital technologies and thus from fostering innovation and economic growth.

Furthermore, digital disparities go beyond the cross-country level as they exacerbate socioeconomic inequalities within economies. Often, marginalized communities and members of low-income populations lack the resources to engage fully with digital technologies. Such limitation hinders their access to technology and education, for example, and thus widens the already existing socioeconomic inequalities within countries. The latter remains a pervasive challenge to digital competitiveness. Several factors drive such disparities. Location is crucial as urban areas have greater access than their rural counterparts. In addition, there are generational differences in internet usage with 71% of youth (15-24 years of age of the world population) using it compared to 57% of all other age groups. Furthermore, the gap is driven by gender differences with 57% of women compared to 62% of men using the internet.[6] Other drivers of in-country disparities are affordability and digital literacy with 15% of households in 22 developing economies indicating that affordability is an issue and 69% citing literacy as such.[7] Reducing the digital divide is thus crucial for achieving equitable digital transformation. The latter requires achieving universal connectivity, developing open and sustainable digital information systems, and creating frameworks for trust and information security.[8] Without such changes, digital transformation risks increasing existing socioeconomic inequalities, thus reducing inclusive growth, and negatively affecting long-term digital competitiveness.

5 Vaishali Rastogi, V., Bock, W., Wilms, M., Tasiaux J., and Lim, K.M. (2020). A $2 Trillion Plan to Bring Two Billion More People into the Digital Age. Boston Consulting Group.
6 ITU. Measuring digital development...
7 World Bank (2021). World Development Report 2021: Data for Better Lives. International Bank for Reconstruction and Development / The World Bank.
8 In the case of health system see Saisó, S. G., Marti, M. C., Medina, F. M., Pascha, V. M., Nelson, J., Tejerina, L., ... & D'Agostino, M. (2022). Digital transformation for more equitable and sustainable public health in the age of digital interdependence. American Journal of Public Health, 112(S6), S621-S624.

Fast technological changes: emerging technologies

Digital competitiveness is not static. Countries and businesses must constantly adapt to new technologies to remain competitive. In this context, emerging technologies are transforming the global digital landscape in terms of the pace of changes and capabilities requirements. Such technologies thus play a fundamental role in shaping digital competitiveness. While emerging technologies such as artificial intelligence (AI), blockchain, and quantum computing are driving innovation reshaping industries, economies, and societies, they can also widen the digital gap. Countries that effectively exploit the power of these technologies are likely to enhance their digital competitive advantage, leading to sustained economic growth, improved productivity, and greater global influence. The impact of such technologies on digital competitiveness is thus fundamental, as they influence innovation capacity, business agility, and even governance structures.

AI is one of the most transformative technologies currently influencing digital competitiveness, particularly in its ability to automate processes, analyze large datasets, and facilitate decision-making. AI-driven innovation accelerates productivity and efficiency across multiple sectors, from mobility (e.g., logistics and transportation) to healthcare, manufacturing, and finance. In terms of mobility, AI technologies can support governments in improving road safety, optimizing public transport, managing traffic, and reducing carbon emissions. In healthcare, AI can help governments take advantage of related technologies to detect medical conditions early, including through remote diagnostics. It also aids in delivering preventive care, improving clinical decision-making, and discovering new treatments. There are also potential benefits from AI for the public sector. AI can make government services smarter by increasing agility, efficiency, and user-friendliness. For instance, AI can help provide citizens with personalized services and streamline administrative processes by automating both physical and digital tasks. Additionally, AI can enhance decision-making by offering better predictions based on large datasets. Public agencies can also use AI to boost law enforcement capabilities and improve the implementation of policies.[9]

In this context, AI can potentially generate between $3.5tn and $5.8tn in annual value for the global economy.[10] According to some estimates, by 2030 AI could contribute up to $13tn to the global economy bringing a boost of up to 26% to the world's GDP, with countries that are able to heavily invest in AI research, development of relevant talent, and infrastructure likely to see the greatest benefits.[11] Investment in and research on AI have seen rapid growth in recent years. **Figure 1** displays venture capital investments in AI start-ups in selected OECD countries between 2016 and 2020. It shows the gap in investment between two groups of countries: Japan, France, and Korea in the high-investment group, and Colombia, Costa Rica, Czech Republic, Mexico, Norway, and Sweden. In Japan and France, from 2016 to 2019, there was a strong boom in investments which took a downturn in 2020, most likely because of external factors such as the economic impact of the COVID-19 pandemic. Korea and Sweden show a steady increase in investment throughout the period. The other countries in the selected sample have relatively low investments, most remaining below $100m throughout the five years, with minor fluctuations.

With respect to research, from 1999 to 2019, the total number of scientific papers related to AI increased fourfold, with the USA, China, and the EU leading the way. Notably, the number of AI-related papers co-authored by researchers from the USA and China more than doubled between 2014 and 2020.[12] Countries with advanced AI capabilities, such as the USA and China, are already taking advantage of such technology to maintain and expand their competitive edge, while others attempt to keep up.

Blockchain technologies play a crucial role in enhancing trust and transparency within digital systems, which is vital for the growth of digital economies.[13] As a decentralized and secure ledger, within the private sector, blockchain can revolutionize industries that rely heavily on secure transactions and data integrity, such as finance, supply chain management, and digital identity verification.[14] For instance, in supply chain management, blockchain allows for the efficient and cost-effective tracking of goods, enhancing thus the traceability of products. In doing so, it improves collaboration among partners and ultimately increases transparency and trust among all stakeholders.[15] In terms of the finance sector, beyond fostering trust and transparency, reducing costs, and improving efficiency, blockchain technologies can increase financial inclusion in countries with high rates

9 OECD (2020). "Artificial intelligence, blockchain and quantum computing", in OECD Digital Economy Outlook 2020, OECD Publishing, Paris.
10 Chui, M., Manyika, J., Miremadi, M., Henke, N., Chung, R., Nel, P., & Malhotra, S. (2018). Notes from the AI frontier: Insights from hundreds of use cases. McKinsey Global Institute, 2, 267.
11 Cited in Banerjee, A., Kabadi, S., & Karimov, D. (2023). The Transformative Power of AI: Projected Impacts on the Global Economy by 2030. Review of Artificial Intelligence in Education, 4(00), e020-e020.
12 OECD. "Artificial intelligence, blockchain…"
13 Tan, E., Mahula, S., & Crompvoets, J. (2022). Blockchain governance in the public sector: A conceptual framework for public management. Government Information Quarterly, 39(1), 101625.
14 See Beck, R., Avital, M., Rossi, M., & Thatcher, J. B. (2017). Blockchain technology in business and information systems research. Business & information systems engineering, 59, 381-384.
15 Vishal Gaur, V. & Gaiha, A. (2020). Building a Transparent Supply Chain. Harvard Business Review. Available from https://hbr.org/2020/05/building-a-transparent-supply-chain

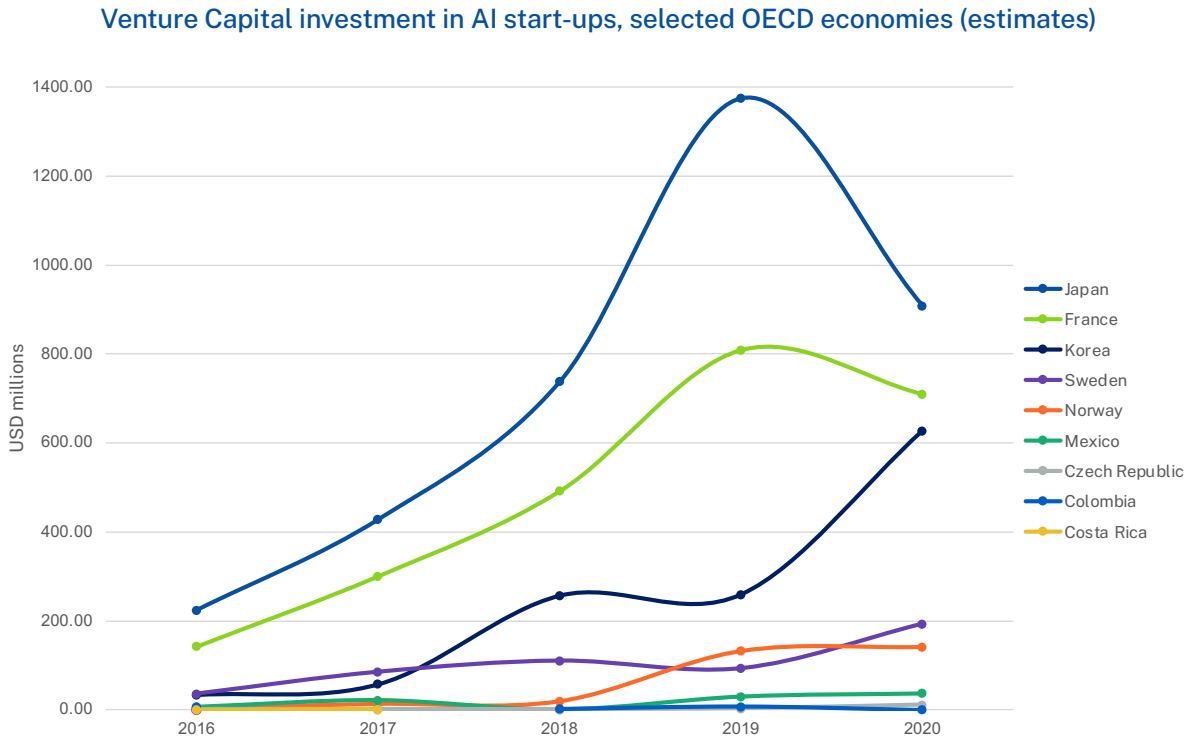

Figure 1
Source: OECD based on Preqin data (2021)

of financial exclusion. For instance, blockchain-based digital currencies enable marginalized citizens to conduct monetary transactions without the need to access the traditional banking infrastructure. In short, blockchain technologies can potentially address many of the obstacles to financial inclusion. It could, for instance, facilitate overcoming some of the fundamental challenges to such an inclusion: limited geographical access, excessive costs, unsuitable banking products, and a lack of financial literacy.[16]

Figure 2[17] shows the potential of blockchain technologies in reducing financial exclusion. It presents the Global Crypto Adoption Index for 2024 and lists the top 20 countries ranked based on their level of cryptocurrency adoption. The figure uses a scale, with darker shades representing higher levels of adoption, while lighter shades indicate lower levels. It is important to note that emerging markets such as Nigeria, Vietnam, Philippines, Brazil, Türkiye, and Venezuela are among the leading countries in crypto adoption (see list of the top 20). These countries often adopt cryptocurrencies as a means of accessing financial services, preserving wealth amid inflation, or enabling cross-border transactions with lower fees. Regionally, the figure highlights parts of Africa, Latin America, and South Asia as regions with particularly strong crypto adoption. This is likely the result of economic factors, where cryptocurrencies provide solutions for remittances, and banking services for excluded populations.

In the public sector, blockchain technologies can transform public services including auditing, taxation, and voting.[18] For individuals who reside in countries where institutions are not reliable or trustworthy, blockchain technology offers an alternative method to conduct transactions.[19] To this end, blockchain as a "Trust Protocol"[20] provides a decentralized, transparent, and fixed system for recording and verifying transactions which, in turn, eliminates the need for intermediaries, in this case unreliable institutions, that can be inefficient and subject to corruption or manipulation. Blockchain technologies

16 Schuetz, S., & Venkatesh, V. (2020). Blockchain, adoption, and financial inclusion in India: Research opportunities. International journal of information management, 52, 101936.
17 Adapted from Chainalysis 2024, available from https://www.chainalysis.com/blog/2024-global-crypto-adoption-index/#top-countries
18 Tan. "Blockchain governance in the public sector…"
19 Catalini, C., & Gans, J. S. (2020). Some simple economics of the blockchain. Communications of the ACM, 63(7), 80-90.
20 Bris, A. & Huizinga, R. (2018). Blockchange!: How to survive the crypto economy. TROI Studio, the Netherlands.

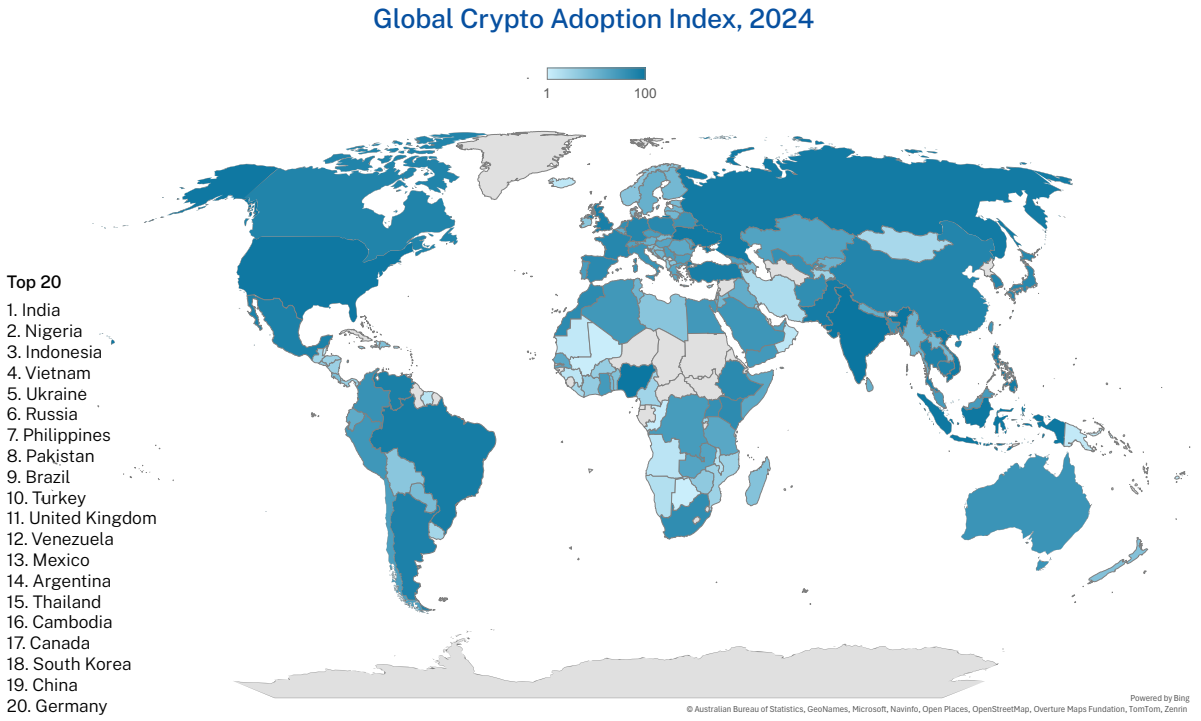

Figure 2
Source: Chainalysis (2024)

can, furthermore, lead to the democratization of data by making transactions visible, and it can also reduce human error because of the automatic nature of those transactions.[21] In short, such technologies can improve governance (e.g., transparency and public participation), bring economic benefits (e.g., reduce costs), and enhance information quality and privacy protection.[22] The use of blockchain technologies in the public sector, however, faces several challenges not the least in regard to its governance but also in terms of making design choices regarding the infrastructure and application architecture, interoperability, decision-making processes, incentive structures, consensus mechanisms, organizational structure, and accountability.[23] In any case, the adequate adoption of blockchain technologies can contribute to a more resilient and competitive digital economy through the establishment of a secure infrastructure for digital transactions. In doing so, it provides a path toward long-term digital competitiveness.

Quantum computers can solve complex problems at rates that far surpass even the most advanced standard computers, opening new avenues for scientific research and technological breakthroughs. It thus can, though still in its initial stages of development, potentially revolutionize fields such as cryptography, material science, and drug development. Moreover, it could speed up innovation across other sectors such as agriculture, energy, healthcare, the manufacturing of cars and airplanes, and national security. Countries able to invest in quantum research, such as the US (i.e., quantum computers), China (i.e., quantum communication and cryptography), and members of the EU (i.e., quantum mechanics), are positioning themselves at the forefront of this technological revolution.[24] Such an ability to exploit quantum computing to reach significantly higher innovation levels enhances digital competitiveness. And yet, because of the high level of investment required to take advantage of such technologies, the advancement in quantum computing is likely to widen global digital disparities.

21 See Ølnes, S., Ubacht, J., & Janssen, M. (2017). Blockchain in government: Benefits and implications of distributed ledger technology for information sharing. Government information quarterly, 34(3), 355-364
22 Ølnes, S., & Jansen, A. (2018, May). Blockchain technology as infrastructure in public sector: an analytical framework. In Proceedings of the 19th annual international conference on digital government research: governance in the data age (pp. 1-10).
23 Tan. "Blockchain governance in the public sector..."
24 OECD. "Artificial intelligence, blockchain..."

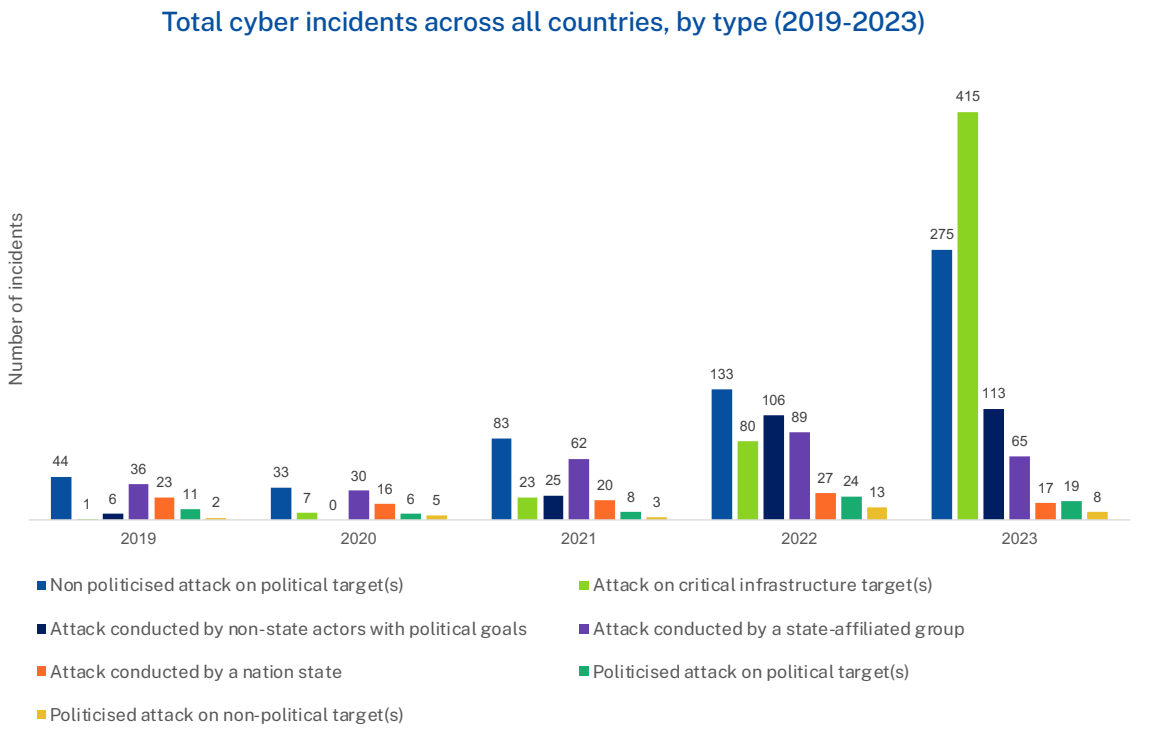

Figure 3
Source: European Repository of Cyber Incidents (2024)

Geopolitical tensions

Geopolitical tensions have increasingly become a defining factor in shaping the digital competitiveness of countries. As digital technologies become central to national economies, security, and governance, the interactions between geopolitics and digital transformation are reshaping global power dynamics. These tensions manifest through competition over leadership in emerging technologies, technology-related trade disputes, and the weaponization of digital tools. In this context, geopolitical rivalries, particularly between major powers such as the USA and China's technological competition, are somewhat fragmenting the digital landscape, influencing not only how other countries develop and use digital technologies but also their ability to compete globally.[25]

One of the most visible impacts of geopolitical tensions on digital competitiveness is thus the rise of technology trade wars. Countries are resorting to economic protectionism to safeguard strategic industries, particularly in the technology sector.[26] In this context, the 2024 US election results can exacerbate the geopolitical situation. If the second Trump administration implements his much-discussed tariff proposal, a 60% tax on all imported Chinese goods,[27] China could introduce retaliatory measures on US imports. Ultimately, increasing trade frictions between the two countries can lead, for instance, to trade volatility and thus policy uncertainty and strategic hesitation among third countries in terms of which areas of digital technology to invest.

Thus far, the trade war between the US and China, largely focused on critical technologies such as semiconductors, 5G networks, and AI, has significantly impacted global supply chains and innovation ecosystems. The USA has imposed export restrictions on Chinese tech companies, such as Huawei, citing national security concerns, while China has responded by accelerating its drive toward self-sufficiency in key digital technologies.[28] It is therefore likely that any new tariffs will encompass national security-related elements. That is, tensions over technology and security concerns could also intensify leading the US to further curtail China's access to advanced technology. However, it is not entirely clear whether under the new Trump administration the US will abandon the relevant Biden's policies.[29]

25 Nguyen. "Tech Supremacy: The New Arms Race…."
26 See Bradford, A. (2023). Digital empires: The global battle to regulate technology. Oxford University Press.
27 See Wiseman, P. (2024, September 27). Trump favors huge new tariffs. What are they, and how do they work? Associate Press News. https://apnews.com/article/tariffs-trump-taxes-imports-inflation-consumers-prices-c2eef295a078a76ce2bb7fedb0c5e58c
28 Wong, P. N. (2021). Techno-Geopolitics: US-China tech war and the practice of digital statecraft. Taylor & Francis.
29 See Mistreanu, S. (2024, November 7). China is bracing for fresh tensions with Trump over trade, tech and Taiwan. ABC News. https://abcnews.go.com/Business/wireStory/china-bracing-fresh-tensions-trump-trade-tech-taiwan-115586883

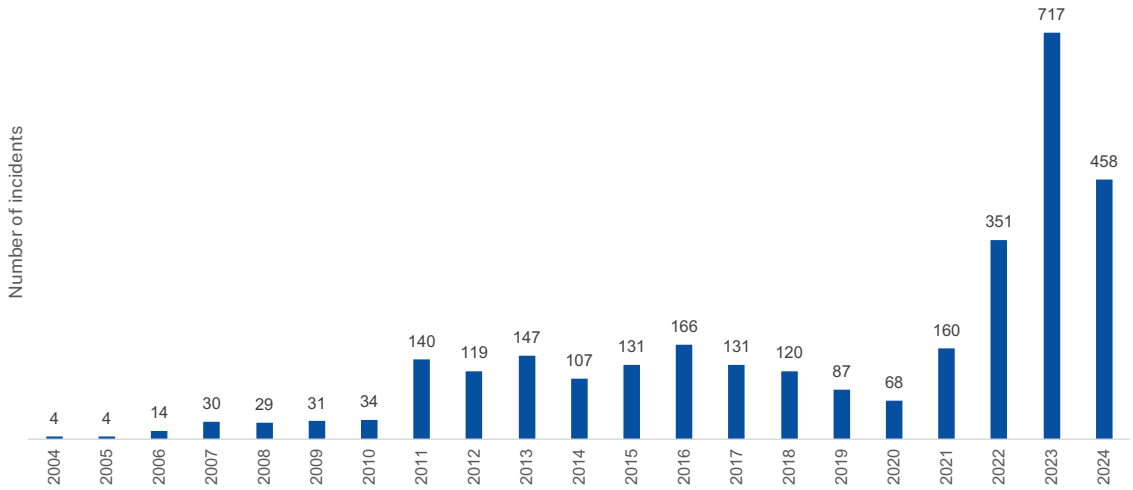

Figure 4
Source: European Repository of Cyber Incidents (2024)

Importantly, such tensions have led to a greater focus on digital sovereignty or the capacity of a country to rely on "itself to sustain its digital ecosystem."[30] Countries, for example, are increasing investment in their domestic technological capabilities to reduce dependence on overseas technologies. It is important to note, however, that digital sovereignty does not imply "digital autarky or absolute autonomy," but rather a strategic approach that promotes balanced global interdependence. The objective is to ensure that any attempt by a state to harm others would also carry the risk of harming themselves.[31]

Notwithstanding such an approach, the "weaponization" of digital technologies has occurred. Such a process refers to the deliberate manipulation or misuse of digital platforms and tools for harmful purposes. The absence of clear boundaries in cyberspace fuels geopolitical tensions, as data and technology are increasingly used by states as "weapons" and cyberattacks targeting essential infrastructure become widespread.[32] Such weaponization includes using digital technologies like social media, artificial intelligence (AI), malware, and surveillance systems to achieve goals including destabilizing societies, spreading disinformation, conducting cyberattacks, or infringing on the privacy of citizens of particular countries. Weaponization can target individuals, institutions, or governments, and is often associated with malicious actors including states, organized crime, and extremist groups. **Figure 3** reveals a significant increase in cyber incidents since 2019. It shows that a considerable rise in cyberattacks, particularly targeting critical infrastructure, occurred in 2023.[33] This may be the result of a shift in the attackers' focus toward disrupting essential services, potentially driven by geopolitical conflicts. Such targeting is possibly due to the increasing reliance on digital systems in essential services including energy, healthcare, and transportation. The figure also suggests that politically motivated attacks, especially those linked to state actors and affiliated groups, have undergone a surge, reflecting the increasingly strategic nature of cyber operations in the geopolitical context.

Figure 4 presents the total number of cyberattacks since 2004. It shows that up to 2010, the number of cyber incidents remained relatively low, with minor fluctuations. Occurrences increased gradually from 4 in 2004 to 34 in 2010. A significant rise took place from 2011 to 2016. The number of incidents increased from 140 in 2011 to a peak of 166 in 2016. Such a rise suggests growing cyber threats and/or better reporting and detection mechanisms during this period. Between 2017 to 2020, the number of incidents shows a decline fluctuating between 68 and 131 incidents. However, the number of cyber incidents significantly increased after 2020. In 2021, there is a rapid growth (160 incidents) and a significant rise in 2022 (351 incidents), followed by a further steep increase in 2023 with 717 incidents. As of the time of writing, in 2024 the incidents dropped to 458. Nevertheless, occurrences remain substantially higher than in previous years.

30 Martin, C. (2022). Geopolitics and digital sovereignty. In H. Werthner, E. Prem, E. A. Lee, and C. Ghezzi (Eds.) Perspectives on Digital Humanism, 227-231. Springer
31 Metakides, G. (2022). A crucial decade for European digital sovereignty. Perspectives on Digital Humanism, 219-225. Springer.
32 Lawton, T. C., Tonn Goulart Moura, S., Tobin, D., & Silva-Rêgo, B. (2023). Geopolitics of the digital economy: implications for states and firms. AIB Insights
33 See European Repository of Cyber Incidents (2024). Critical Infrastructure Tracker. Available from https://cit.eurepoc.eu/

In this context, cyber warfare, that is, the practice of governments or groups to use hacking, malware, and ransomware to damage critical infrastructure or steal sensitive information, as seen in cyberattacks like the Stuxnet worm and the NotPetya attack,[34] becomes a critical contributor to geopolitical tensions. States, in addition, use global digital platforms for coercive purposes, including surveillance and the disruption of their rivals' internal politics.[35] Moreover, dark web technologies are employed for illicit activities, such as cybercrime, and state-sponsored espionage.[36] Furthermore, social media platforms have been weaponized to polarize public opinion, spread misinformation, and destabilize political systems.[37] Automated bots and AI algorithms, more specifically, can amplify divisive content or manipulate trends. Ultimately, such utilization of digital technologies "erodes the quality of democracy by undermining trust in leaders, media, and institutions."[38] While using digital technologies to pursue strategic objectives, states may face a cybersecurity dilemma.[39] That is, as countries develop their cyberattack capabilities, there may be a scalation while other states follow suit leading to actual conflict[40] and increasing tensions and distrust among countries.

The fragmentation of digital governance

With the borderless nature of cyberspace and geopolitical tension in the background, countries attempt to maintain their digital sovereignty to better protect their interests. Digital sovereignty in the current geopolitical landscape is a fluid concept, as it requires a careful balance of strategic interdependence with major global powers including the US, China, and other influential actors. To reach such strategic balance, countries resort to three policy instruments: investment, regulation, and the "completion of the internal digital market."[41] This situation, in turn, leads to the fragmentation of global digital governance which brings an additional layer of complexity to the digital landscape.

For instance, while the internet was originally conceived as a global and open network, diverging national approaches to internet regulation and governance are creating distinct digital ecosystems. China's "Great Firewall" exemplifies an approach that prioritizes state control over information flows and digital platforms, contrasting with the more open internet models in the West.[42] Russia has also moved toward increased digital sovereignty with its push for a state-controlled and self-contained internet.[43] Such differing approaches to internet governance, exacerbated by geopolitical rivalries, create barriers to cross-border data flows and digital trade, making it more challenging for countries to collaborate on digital initiatives and weakening the digital competitiveness of other economies.

The fragmentation of digital governance, however, can be the result of a more normative approach. As countries attempt to strengthen their digital sovereignty, they can develop digital regulation to protect the ideals they uphold. For instance, members of the EU strive to safeguard and promote cultural and humanistic values (e.g., regulation designed to protect individuals' fundamental rights and freedoms) in the context of a rapidly changing digital landscape.[44] The region's digital competitiveness, specifically, is shaped by strong regulatory frameworks, with a focus on privacy, ethics in AI, and creating a "Digital Single Market" to "...ensure that Europe's economy, industry and society take full advantage of the new digital era."[45] Its Data Protection Regulation (GDPR) is a clear example of how regulations can impose compliance burdens on businesses, particularly for those operating in multiple regions.[46] In other words, while such regulations aim to protect

34 See Rid, T. (2020). Active measures: The secret history of disinformation and political warfare. Farrar, Straus, and Giroux. On cyberattacks directed at governments see, Medhurst, R. (2024). Five notorious cyberattacks that targeted governments. In the Conversation. Available from https://theconversation.com/five-notorious-cyberattacks-that-targeted-governments-230690
35 Farrell, H., & Newman, A. L. (2019). Weaponized interdependence: How global economic networks shape state coercion. International security, 44(1), 42-79
36 Hsinchun, C., Ramesh, S., & Stefan, V. (2012). Dark Web Exploring and Data Mining the Dark Side of the Web.
37 Oates, S. (2020). The easy weaponization of social media: why profit has trumped security for US companies. Digital War, 1, 117-122.
38 Bradshaw, S., & Howard, P. N. (2018). The global organization of social media disinformation campaigns. Journal of International Affairs, 71(1.5), 23-32.
39 Buchanan, B. (2016). The cybersecurity dilemma: Hacking, trust, and fear between nations. Oxford University Press.
40 Beckerman, C. E. (2022). Is there a cyber security dilemma?. Journal of Cybersecurity, 8(1).
41 Metakides. "A crucial decade for European digital sovereignty..."
42 Creemers, R. (2024). The Chinese Conception of Cybersecurity: A Conceptual, Institutional, and Regulatory Genealogy. Journal of Contemporary China, 33(146), 173-188
43 Vendil Pallin, C. (2017). Internet control through ownership: the case of Russia. Post-Soviet Affairs, 33(1), 16-33.
44 Metakides. "A crucial decade for European digital sovereignty..."
45 European Council (2020). Digital single market for Europe. Available from https://www.consilium.europa.eu/en/policies/digital-single-market/
46 See European Commission. (2018). General Data Protection Regulation (GDPR). Available from https://gdpr-info.eu/

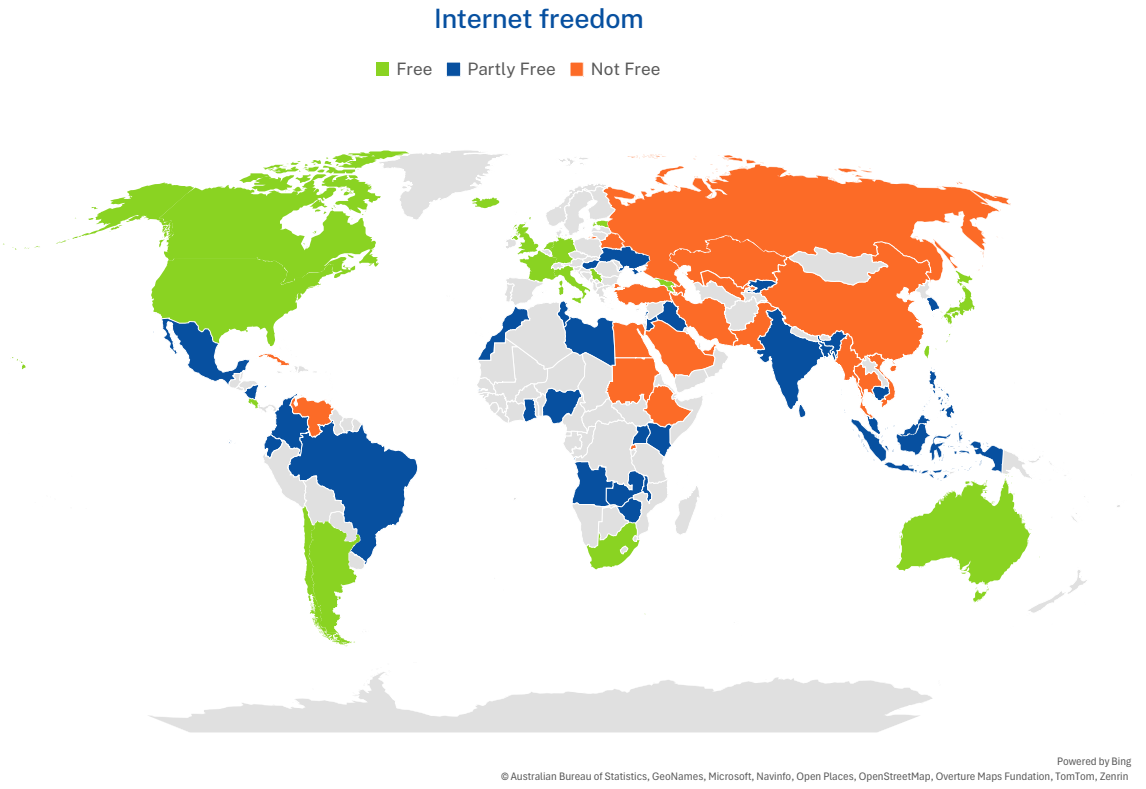

Figure 5
Source: Freedom House (2024)

consumers and ensure data security, they can also create an environment of uncertainty and complexity that constrains digital innovation and investment, and largely digital competitiveness.

Figure 5 illustrates the fragmentation of internet governance around the world. It shows the state of internet freedom in 72 countries, categorized by Freedom House into three groups.[47] The "free category" refers to countries where internet freedom is robust, and there are minimal restrictions on access, freedom of expression, and privacy. Australia, Canada, Chile, Germany, and Japan fall into this category. The second category, "partly free" includes countries with moderate restrictions, where internet access and online freedoms are somewhat constrained by government policies. Many African and Latin American as well as South and Southeast Asian countries are included in this group. The final category, "not free" refers to countries where the government imposes heavy censorship, limits online freedoms, and is likely to engage in widespread surveillance of internet use. Countries from Asia, the Middle East, Eastern Europe, and Central Asia are in this category.

Such fragmentation of internet governance can hinder innovation, increase costs for businesses, limit consumer access to goods, and prevent global collaboration. As countries adopt more divergent regulatory frameworks, such impacts will likely intensify, making it harder for businesses to compete on a global scale and for consumers to benefit from the full potential of digital transformation. Simultaneously, countries will remain steadfast in their belief that fragmentation is an effective way to protect their digital sovereignty, further driving digital disparities. In short, the fragmentation of digital governance can significantly affect the digital competitiveness of countries by introducing inefficiencies, regulatory uncertainty, and barriers to innovation. As countries increasingly rely on digital technologies to drive economic growth, effective digital governance is essential for maintaining competitive advantages.

47 See Freedom House (2024). Internet Freedom: Countries. Available from https://freedomhouse.org/countries/freedom-net/scores

2025: refocusing the lens of digital competitiveness

Digital competitiveness faces several mounting challenges. Digital disparities have negative consequences both across and within countries. Economies with more developed infrastructure can continue to advance their digital competitiveness, while others fall behind. Disparities also affect countries internally. For instance, differences in access to high-speed internet between rural and urban areas are a main concern. The other threats we discussed above, that is, the impact of emerging technologies and geopolitical tensions with the concomitant fragmentation of global digital governance, can exacerbate the already widening digital gap.

Indeed, one of the foremost challenges is the rapid pace of technological change. Organizations and countries must continuously adapt to emerging technologies, which requires substantial investment in both infrastructure and human capital. Countries that effectively integrate AI, blockchain, and quantum computing into their economic strategies are likely to experience enhanced productivity, economic growth, and long-term digital competitiveness. However, not all economies can invest in such technologies. The latter, although it drives innovation, enhances trust, and transforms industries, can thus widen the digital gap exponentially. As technological advancements continue to evolve, the ability to take advantage of such innovations will be a key determinant of a country's long-term digital competitiveness.

Geopolitical tensions as displayed by the ongoing trade disputes and restrictions on technology exports, can hamper digital competitiveness. The friction between the USA and China over technology (such as 5G, semiconductors, and AI) has thus broader implications for digital competitiveness beyond the borders of the countries involved. In addition, the shifting geopolitical landscapes have led to differing approaches to digital governance. The resulting regulatory and policy frameworks pose challenges to digital competitiveness. Inconsistent regulations across different regions can create barriers to the adoption and implementation of digital technologies and thus hinder the necessary innovation to sustain digital competitiveness, particularly in economies with limited clout in the geopolitical context.

Appendices

Appendix 1: Composition of sub-regions and regions

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

Analysis of results

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1. Introduction

Several important factors impact the overall digital competitiveness of economies, and certain indicators used in this ranking stand out as determining countries' outcomes in this rapidly evolving space. Effective urban management plays a critical role, and robust digital infrastructure and good governance are essential in supporting business development and long-term value creation.

There is an increasing prominence of high-tech patent grants – particularly from China – and a correlation between them and countries' leadership in digital innovation. Challenges persist such as how to enforce intellectual property rights which remain uneven across economies like China and the United States. Not managing to do so poses risks to the competitiveness of countries' digital ecosystems and hinges partly on the quality of innovation achieved.

An economy's Country Credit Rating Index tells us that economies characterized by strong governance, transparency, and stable political environments tend to attract more digital investments, ultimately enhancing their overall competitiveness. Notably, economies such as Switzerland – known for their robust governance, innovation capacity, and effective knowledge transfer mechanisms – consistently rank highly in digital competitiveness. The essay also explores the role of e-government services in fostering digital inclusion, recognizing their potential to bridge digital divides. However, it also addresses the associated risks, including disparities in access and the ever-present threat of cybersecurity vulnerabilities.

In what follows we will explore the above in detail before deep diving into the performance of the top-ranking economies, offering a closer look at their digital competitiveness and providing insights into how they balance the multifaceted aspects of digitalization and transformation.

Recognizing that the digital landscape is shaped by ever-changing conditions such as emerging technologies and evolving applications of digital infrastructure, we update the WDCR yearly with the introduction of new indicators designed to capture these dynamic shifts. We will also detail 2024's updates below, before reflecting on key findings and their broader implications for enhancing digital competitiveness in the broader sense, across economies.

2. The 2024 IMD World Digital Competitiveness Ranking: Selected indicators

Digital competitiveness implies the central role of new technologies in transforming government and business processes as well as how society interacts with these. It thus reflects the adoption of new technologies in providing solutions that lead to long-term value creation. Such solutions may be, for example, the development of an innovative process that enables businesses to improve their services to customers. Value creation, in the latter example, may emerge from an organization's better understanding of its customers' needs and/or of its products' value in the eyes of customers. In any case, value creation brings long-term benefits to all stakeholders.

The WDCR measures the capacity and readiness of 67 economies to adopt and explore digital technologies for economic and social transformation. Its framework encompasses organizational, institutional, and structural elements. These elements include, for instance, the assimilation and application of knowledge, the role of research in digital transformation, the effectiveness of relevant regulation, the adoption of new technologies, and the openness and flexibility to manage the resulting changes. The WDCR captures all these aspects through 52 criteria grouped into three factors: Knowledge, Technology, and Future Readiness.

Smart cities and the management of cities, 2024

IMD Smart City Index	City	Economy	Management of cities survey
1st	Zurich	Switzerland	7th
2nd	Oslo	Norway	13th
3rd	Canberra	Australia	16th
4th	Geneva	Switzerland	7th
5th	Singapore	Singapore	1st
48th	Doha	Qatar	2nd
10th	Abu Dhabi	UAE	3rd
6th	Copenhagen	Denmark	4th
17th	Seoul	Korea	5th

Table 1
Source: IMD World Competitiveness Center (2024)

Whereas the Knowledge factor focuses on capturing the development and quality of human capital, education, and research outcomes by measuring indicators in areas such as talent, workforce training, and scientific research; the Technology factor aims to assess if a country's regulatory environment, financial investment framework, and physical tech infrastructure are supportive in enhancing digital advancement. Future Readiness, on the other hand, evaluates how prepared an economy is to adopt digital changes, emphasizing societal adaptability, business agility in adopting new technologies, and IT integration across sectors.

Together, these three factors drive an economy's ability to innovate and generate long-term value creation through well-managed digital inclusion and transformation. Below, we discuss the impact that some of the components of these factors have on digital competitiveness.

2.1. The good management of cities supports business development

This survey indicator (indicator number 1.1.4.) asks the respondents of the IMD Executive Opinion Survey to evaluate how the management of cities supports business development. Each economy receives a score in the range of 0-10, with 10 being the best.

All cities are unique, and their challenges depend upon region as well as size. However, well-managed cities typically have robust transportation networks and reliable utilities and provide a high quality of life for their residents. Effective governance and efficient bureaucracy are pivotal for city management. This ensures that policies are implemented quickly and efficiently and that resources and services are allocated wisely, equitably, and promptly. Good governance is driven by transparency, accountability, and responsiveness to citizens' needs.

The IMD Smart City Index (SCI) states that "the future of cities will be increasingly digital. The rapid spread of artificial intelligence across municipal services (traffic, surveillance, energy consumption, for instance) has raised both new hopes and new concerns. Trust and governance will be key ingredients in making cities both future-ready and human-centric. In other words, to make tomorrow's cities green, digital, and humancentric we will need to give more attention to talent strategies, education, and openness (for instance, for trade, investment, and exchanges of experiences)."

Table 1 shows that the top five cities in the SCI (left column) are mid-sized and based in prosperous countries with a relatively high emphasis on social equity. When compared to the top five economies in the "management of cities" survey question (right column), we notice that only one city, Singapore, also appears in the former. The remaining four cities (Doha, Abu Dhabi, Copenhagen, and Seoul) mostly align with the observations made above; namely about size, prosperity, and equitable prosperity. Slight exceptions can be made for Seoul, being a larger city, and for Doha, which is marked down in the SCI for pollution, city governance, and social disparity.

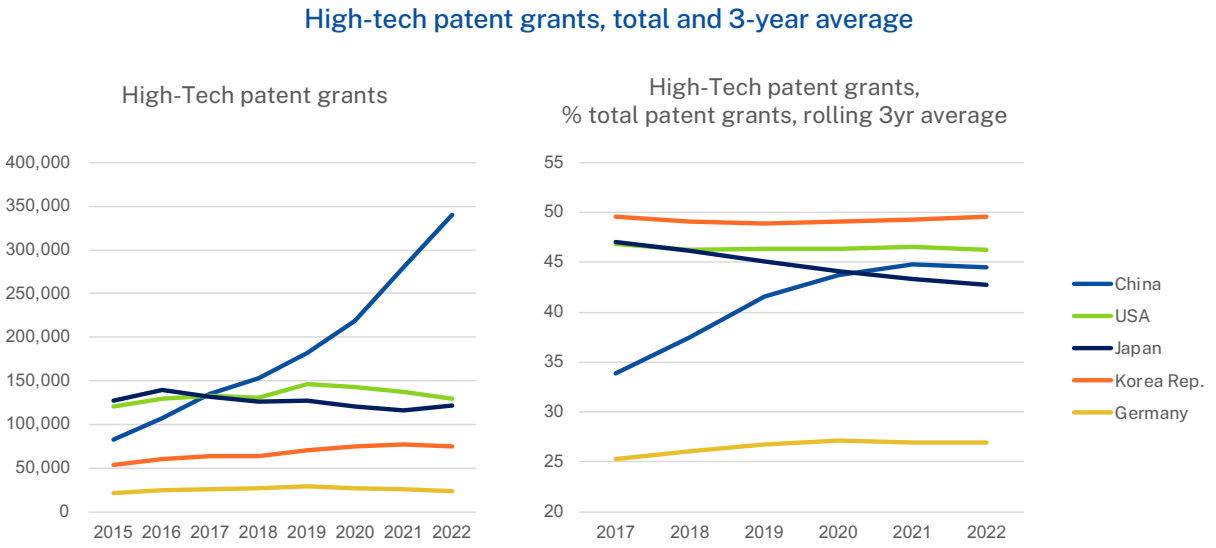


Figure 1
Source: IMD World Competitiveness Center (2024)

Interestingly, comparing the scores achieved by economies in the survey question "management of cities" with the performance of their top cities in the SCI, we notice some discrepancies: whereas the ranking of urban areas by executives from Switzerland, Singapore, UAE, and Denmark align with SCI results, Norwegian and Australian executives' sentiments paint a bleaker picture, and Qatari and South Korean executives are more optimistic about their country's urban quality.

2.2. High-tech patent grants as a reflection of innovation

The high-tech patent grants criterion (indicator number 1.3.6.) uses World Intellectual Property Organization (WIPO) data to measure the number of patents granted by applicant's origin as a percentage of all patents, using a three-year average (i.e., 2020-2022) to reduce volatility.

Patent grants, particularly related to high-tech, reflect an economy's innovation capacity; often resulting in significant scientific breakthroughs. Innovation is a major driver of a prosperous economy, creating value through the development of new products and services, encouraging greater levels of productivity, generating employment opportunities in new and diversified industries, and ultimately fostering greater digital competitiveness. On the contrary, economies that lack innovative drive stagnate, or worse, fall behind. Companies and industries rise and fall through a cycle of creative disruption. Without innovation, these companies and industries decline, unemployment rises, and overall prosperity falls.

Among the larger economies in our sample, we observe that China's high-tech patents are growing both in absolute terms and as a percentage of total patents while the US, Japan, Korea, and Germany are all relatively stable in this regard, as illustrated in **Figure 1**. Though China's surge in high-tech patents is commendable and suggests the country's strong focus on innovation and technological development, it must be highlighted that the metric does not account for any potential variation in the quality of the registered patents. This may therefore limit the metric's robustness and its pertinence in evaluating such patents' innovation capacity.

Importantly, patent grants are just one element among an array of interconnected criteria within our ranking. These include government spending on education, the quality of the education system, knowledge transfer between universities and private enterprises, funding for start-ups, streamlined bureaucracy to start a business, and protection of intellectual property rights. The quality and effectiveness of patent grants are therefore closely tied to economies' performances in other indicators, and the inclusion of a high-tech patent grant indicator in the WDCR comes as a complementary element strengthening the Scientific Concentration subfactor.

Figure 2
Source: IMD World Competitiveness Center (2024)

2.3. Intellectual property rights: enforcement is vital

Patents, trademarks, and associated protections are designed to protect the intellectual property rights of the holders against infringement, piracy, and counterfeiting. Within the WDCR, we measure whether Intellectual property rights are adequate (indicator number 2.1.6.). This survey question covers both the ideal and the practical application of the legislation. Are there laws in place and are they enforceable through an impartial and strong judicial system?

This enforceability of the laws is vital, as intellectual property rights are meaningless without enforcement. The enforcement rests upon a juridical system that follows the Rule of Law, which the World Justice Project defines as "a durable system of laws…that delivers … accountability, just law, open government, and accessible and impartial justice."[1]

Several major economies, including the US (28th) and China (33rd), rank lower than one may expect from leading global economies in terms of intellectual property rights protection. In the case of China, this may be attributed to challenges related to the enforcement of intellectual property laws and adherence to international standards. For the US, the comparatively lower ranking could possibly be explained by factors such as the high cost of enforcing contracts and a legal environment characterized by frequent litigation. In this context, **Figure 2** offers an insight into the strong correlation (0.86) between Intellectual property rights and the World Justice Projects' Rule of Law index. Whereas both economies demonstrate average performances in the former, the US fares much better (19th) in the latter than China (54th), hinting at a stricter enforcement of property laws as discussed.

1 See World Justice Project (n.d.). What is the Rule of Law?.
Available from https://worldjusticeproject.org/about-us/overview/what-rule-law

Country credit rating index

G7 Economy	Country Credit Rating Index
Germany	1st
Canada	10th
USA	12th
France	18th
United Kingdom	22nd
Japan	30th
Italy	50th

Figure 3
Source: IMD World Competitiveness Center (2024)

Forms and types of knowledge transfer

Figure 4
Source: IMD World Competitiveness Center (2024)

2.4. Country credit rating indices and growth

The IMD country credit rating index (indicator number 2.2.4.) combines the values of three credit rating agencies (S&P, Fitch, and Moody's) into one. Each agency gives a rating such as AAA through to E, while our index converts that into a range of 0-60 for ease of calculation and comparison. A country's credit rating reflects perceived risk; a high rating shows the country as more attractive for foreign direct investment (FDI) and other forms of capital inflows.

Credit ratings also reflect the effectiveness of a country's governance. High ratings go together with transparent and accountable government and a stable political climate, which are critical for maintaining investor confidence and ensuring sustainable economic growth. It is therefore no surprise that the country crediting rating index is highly correlated with prosperity measurements of an economy, such as GDP per capita and the Human Development Index (HDI).

However, there are some notable exceptions. As apparent in **Figure 3**, of the G7 economies, only Germany gets a perfect score in the Country Credit Rating Index. Interestingly, the only G7 economy with government debt below 100% of GDP is Germany (65% of GDP). These economies also display other weaknesses: Japan has an aging population (30% over 65); both the US and Italy are classed as flawed democracies on the EIU's Democracy Index; while France has a reputation for industrial disputes exacerbated by lack of consensus between workers, business, and government.

2.5. Knowledge transfer: from academia to the private sector to the economy

This is a survey-based indicator that assesses if knowledge transfer is highly developed between companies and universities (indicator number 3.2.5.). The knowledge transfer between the academic sector and private enterprise is a driver for innovation within the economy. Without knowledge transfer, academic research has no real-world application and therefore creates no value. Knowledge transfer can take many different forms and structures, with much overlap between them, as illustrated by **Figure 4**. However, there is a common element among all forms of knowledge transfer; they seldom grow organically and must instead be actively nurtured.

For example, facilitating entrepreneurship of academics through incubators goes hand-in-hand with providing them with training on starting a business, giving access to university resources, seed funding, facilitating patent applications, and forming informal and formal alliances with private enterprises.

In this criterion, we observe that Switzerland is ranked first, and the US is 10th. Switzerland's strengths are the strong links between the highly regarded technical universities (i.e., EPFL, EPFZ) and industry, agencies such as Innosuisse that promote knowledge transfer, and the ease of starting a business. However, Switzerland like many European economies, lacks access to venture capital and other forms of seed funding. Conversely, the US has the world-leading venture capital market, but the relationship between universities and industry tends to be overly transactional.

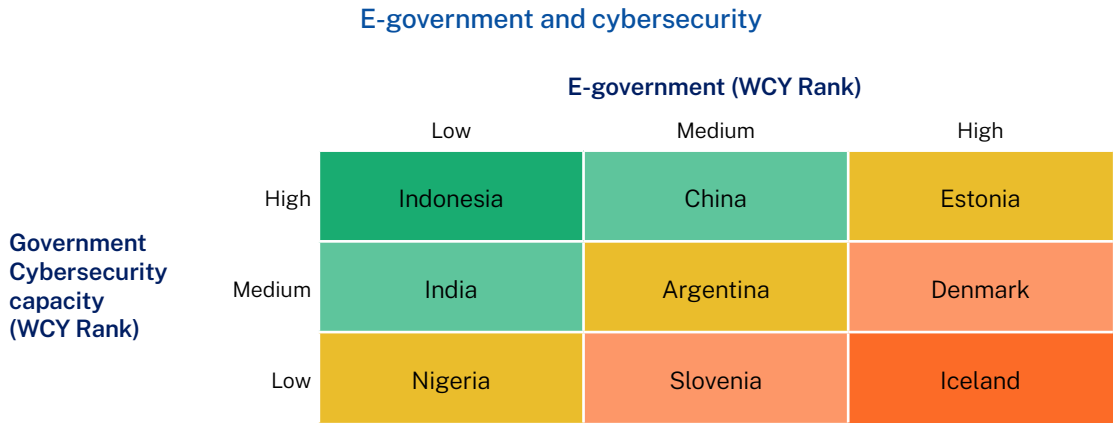


Figure 5
Source: IMD World Competitiveness Center (2024)

2.6. E-Governance: myriad benefits

The UN E-Government Development Index (indicator number 3.3.1.) measures the provision of online government services to promote citizen access and inclusion. It is a composite measure of three important dimensions of e-government. That is, the provision of online services, telecommunications, and human capacity (education levels).

The index encompasses the agility of government in developing and providing services in a new and more efficient manner. By providing these services online, it is expected that they become accessible to more people and thus increase equity and equality in the provision of government services. However, e-government services may fail to bridge the digital divide, leading to already marginalized citizens (e.g., the poor, immigrants, and the elderly) becoming more so. Additionally, as e-government services begin to incorporate AI technologies in their processes, the presence and prevalence of unknown biases may increase. Thus, checks must be implemented to minimize the risk and impact of inadvertent broader exclusion.

The e-government index is particularly interesting because of the wide range of other factors that it relates to. We also expect that providing services online may help reduce low-level corruption where bureaucrats are no longer able to accept bribes or favors in return for facilitation or simply doing their job. The provision of e-government services must also be accompanied by increased cyber-security as the consequences of a cyberattack grow exponentially on both day-to-day operations and during election cycles.

Figure 5 shows the exposure of certain governments to the risk of cyberattacks and other cyber-related threats. For a selection of nine countries, it shows their relative rank between the e-government and government cybersecurity capacity criteria from our digital competitiveness ranking, categorizing economies across low, medium, and high WDCR ranks. Indonesia in the top left quadrant is the government least exposed to a cyber-related risk, as the country boasts very high levels of cyber security capacity for a relatively low number of e-government services. On the other hand, Iceland in the bottom right quadrant, is extremely exposed to cyber risk as the very high number of e-government services it provides are perhaps vulnerable as a result of low levels of government cyber security capacity. This demonstrates that despite the efficiency gains of providing e-services, through reduced transaction costs to citizens for example, governments need to strike a fine balance between digitalization and cyber capacity. For instance, Nigeria, which currently has low levels of both e-government services and security capacity, is better off focusing on strengthening the latter before expanding on the former, to ensure moving towards a more sustainable position in the digital quadrant.

3. Top performers in 2024

Singapore advances to the top of the 2024 edition of IMD's World Digital Competitiveness Ranking (WDCR), gaining two positions overall. It is followed by Switzerland, which represents an improvement of three positions, and Denmark, which gains one position to complete this year's podium. Whilst the US declines by three positions to rank fourth, Sweden bounces back to fifth position, up from seventh the previous year. Maintaining its sixth position overall, Korea demonstrates a robust performance in 2024, whilst Hong Kong SAR achieves its best ranking in the last three years to position itself in seventh, up by three positions. The biggest decline in this year's top 10 is experienced by the Netherlands, which drops to eighth position down from second in 2023, whilst Taiwan, Chinese Taipei holds its ninth position. Norway completes the top 10 following a four-position improvement.

Singapore

Singapore secures the top spot in the 2024 WDCR ranking, progressing two positions overall. This achievement is driven by a one-rank improvement in the Knowledge factor to reach second, maintaining a robust first position in the Technology factor, as well as achieving a noteworthy leap of nine positions to claim first place in the Future Readiness factor. At the subfactor level, Singapore demonstrates some clear strengths across the board, ranking first out of 67 economies analyzed in Talent, Regulatory Framework, Adaptive Attitudes, Business Agility, and IT Integration. Although it improves in Scientific Concentration (ninth) and Capital (fourth), Singapore declines in the Technological Framework (fourth) and Training & Education (14th) subfactors. Singapore's strong performance in 2024 is underpinned by strengths that are evenly distributed across all factors, ranking among the top 10 for eight of the nine subfactors.

At the indicator level, Singapore has made some notable progress, particularly in the perception of executives with regard to the international experience of its talent pool (second), the quality and availability of employee training (fourth), the availability of venture capital (first), attitudes towards globalization (third), as well as the agility of companies (fourth). Singapore's strengths include its management of cities, its number of high-tech patent grants, banking, and financial services, as well as public-private partnerships – all ranking in top position this year. It also performs strongly in higher education achievement and PISA - math educational assessment (ranking second in both). Among the few declines in Singapore's performance, we find scientific and technical employment levels (down eight positions to 30th), the number of high-tech exports as a percentage of GDP (13th) as well as wireless broadband speed (17th). Singapore's weaknesses include total public expenditure on education (65th out of 67), the number of women with degrees (41st), female researchers (44th) as well as investment in telecommunications (60th).

Switzerland

Following two years in fifth position, Switzerland climbs three ranks to reach the second position in the WDCR 2024. Remaining in the top spot for the Knowledge factor, Switzerland gains positions in both the Technology (fourth) and Future Readiness (fifth) factors. The country continues to perform strongly in the Talent (third), Regulatory Framework (second), and Business Agility (seventh) subfactors and experiences notable improvements in both the Scientific Concentration (second) and Technological Framework (seventh) subfactors. There is a one-position decline in both the Training & Education (eighth) and IT Integration (seventh); however, Switzerland stands out for its overall balanced performance across all the WDCR factors – ranking in the top 10 in seven of the nine subfactors.

This year, Switzerland progresses significantly in high-tech exports (ninth), E-participation (up 11 positions to 27th), as well as cyber security (11th). The country's main strengths remain in its attractiveness for foreign highly skilled personnel, its credit rating, as well as its effective enforcement of intellectual property rights and the availability of senior managers with significant international experience within its economy (all ranking first). Among other strengths, Switzerland can count on a strong inflow of international students (eighth), good quality and availability of employee training (second), secure internet servers (fifth), and large levels of internet retailing (ninth). The country also fares well in the newly introduced indicator on the number of AI articles published per capita, coming in third position. Some notable declines this year were recorded in the number of mobile subscribers (12th), the government's cyber security capacity (34th), and the entrepreneurial fear of failure (10th). Some of Switzerland's general weaknesses in the 2024 WDCR include enforcing contracts (40th), wireless broadband (52nd) as well as IT and media stock market capitalization (49th, though this represents a small improvement).

Denmark

Denmark returns to the top three of the ranking following improvements in all three digital competitiveness factors. Its two-rank improvement in the Knowledge factor to seventh place is primarily due to a strong leap of six positions in the Scientific Concentration (14th) subfactor, whereas the one-rank improvement in the Technology factor to sixth overall is mainly driven by an improvement in the country's Regulatory Framework (seventh) subfactor. Under the Future Readiness factor (up one position to second), Denmark's improvement is explained by strong performances across all three subfactors, namely Adaptive Attitudes (fourth), Business

Agility (third), and IT Integration (second). Similarly to Switzerland, Denmark ranks within the top ten in seven of the nine subfactors of the WDCR, demonstrating a very balanced performance in 2024.

At the indicator level, Denmark demonstrates a stable evolution with few steep improvements or declines compared to the previous year. However, some notable improvements are seen in executives' perceptions of immigration laws (33rd), the availability of venture capital (fourth), and levels of E-participation (climbing to the top spot, up from 12th). Declines in total public expenditure on education (to 17th) and the government's cyber security capacity (to 27th) are also worth highlighting. Denmark's main strengths lie in the quality and prioritization of its employee training, its excellent country credit rating, as well as having agile companies, an open attitude towards globalization, and an efficient E-government that relies on secure internet servers (all indicators ranking first out of 67). Room for improvement exists in Denmark's number of graduates in sciences and female researchers (30th and 34th respectively). Further weaknesses include the country's number of high-tech patent grants (37th) and IT and media stock market capitalization (56th).

US

The US drops three positions this year to achieve fourth spot in the overall WDCR. Though its performance improved in the Technology factor climbing up to second place, a two-rank decline in the Knowledge factor to fourth as well as a six-position slip in Future Readiness to eighth partially explain the country's overall decline in the digital ranking. Considerable improvements were achieved in the Training & Education (now ninth) and Regulatory Framework (third) subfactors. The biggest declines occurred in the Adaptive Attitudes (18th) and Business Agility (sixth) subfactors. The US's performance across all nine subfactors is relatively balanced, with six of them ranking in the top 10 and the three remaining subfactors ranking in the top 20.

Improvements in ranking at the indicator level were sparse in 2024. The US's most prominent advancements were achieved in the ability of its banking and financial services to effectively support business activities (10th), the agility of its domestic companies (13th), as well as the aptitude of communications technology to support businesses (19th). The country's core strengths continue to lie in the Scientific Concentration (first), Regulatory Framework (third), and Capital (second) factors, with particularly strong performances in the computer science education index (first), high-tech patent grants (fourth), and AI policies passed into law (first) subfactors. Funding for technological development (seventh) is also readily available and is supported by the prominence of venture capital (third). Conversely, a downward trend has been registered in the country's perceived attitude towards globalization (58th, down eight positions), an increasing entrepreneurial fear of failure (28th), and a notable decrease in the availability of international experience at the managerial level (28th). Other weaknesses appear in employee training (36th), immigration laws (46th), and concerns linked to general cybersecurity (37th) and the protection of privacy through law (45th).

Sweden

Sweden gains two positions in this year's WDCR to reach fifth place overall. This is the result of strong performances across all three digital factors in 2024. In the Knowledge factor, Sweden moves up to third position (up from fifth), whilst registering a four-rank improvement in Future Readiness (to fourth) and a one-position increase in the Technology factor to 10th. Similarly, the country shows a balanced performance across all components of the WDCR, ranking in the top ten in eight of the nine subfactors – with only Technological Framework faring less well (14th). Evident strengths appear in Training & Education (first), Scientific Concentration (third), and IT Integration (fifth). However, Sweden's largest improvements are in the Business Agility (ninth) and Talent (seventh) subfactors. Compared to 2023, the country's Regulatory Framework (10th) is the only subfactor to have recorded a decline, albeit minimal.

At the indicator level, there are improvements across all three digital factors. An increase in the availability of international experience (fifth), foreign high-skilled personnel (15th), and higher education achievement (19th) have driven improved performance under Talent for Sweden, whereas advancements in funding for technological development (fifth) and scientific research legislation (third) underpin the country's robust performance under the Technology factor. Business Agility improved significantly, following progress in the ability of Swedish firms to use big data and analytics (first) and better seize opportunities and threats (10th). Cyber security and public-private partnerships are also on the rise, both achieving 10th position in 2024. Other notable strengths are apparent in Sweden's level of digital and technological skills (fourth), scientific and technical employment (first), and protection against software piracy (sixth). Weaknesses on the other hand include the number of female researchers (36th), AI policies passed into law (39th), and investment in telecommunications (50th).

Korea

Korea maintains its sixth position in the overall WDCR, ranking third in the Future Readiness factor, eighth in the Knowledge factor, and 14th in the Technology factor. The country's strongest performances at the subfactor level are in Training and Education (fifth), Scientific Concentration (fourth), Adaptive Attitudes (sixth), Business Agility (second), and IT integration (sixth). Though making significant progress compared

to 2023 in those areas, Korea continues to perform less strongly under the Talent (19th), Capital (17th), and Regulatory Framework (18th) subfactors.

At the indicator level, Korea displays quite a stable performance, avoiding major shifts. Improvements are seen under the Business Agility subfactor, where there are positive shifts in terms of firms' agility (ninth), their ability to seize opportunities and threats (17th), and their use of big data and analytics (21st). Though the availability of senior managers with international experience and highly skilled foreign personnel have both recorded improvements in 2024, Korea's performance in these indicators remains feeble (45th and 38th respectively), partially explaining the country's relatively weak performance in the Talent subfactor (19th). However, Korea demonstrates strong performances in its total expenditure on R&D as a percentage of GDP (second), IT and media stock market capitalization (third), e-participation (third), volume of internet retailing (third), and demonstrates very low entrepreneurial fear of failure (second). The government also scores highly in its cyber security capacity (sixth) and the protection of privacy for its citizens by law (ninth), and its provision of e-government services is efficient (fourth).

Notable declines have been recorded in immigration laws (54th) as well as the volume of high-tech exports (27th). Further areas that demonstrate room for improvement include public-private partnerships (33rd), funding for technological development (33rd), the number of female researchers (55th) as well as scientific research legislation (35th).

Hong Kong SAR

Following a one-rank decline in 2023, Hong Kong SAR bounces back strongly in this edition of the WDCR, achieving its best ranking in the last three years to position itself in seventh, up three places. At the factor level, Hong Kong ranks fifth in Knowledge, third in Technology, and 15th in Future Readiness. These improvements are driven by the strong performance seen at the sub-factor level, where Hong Kong demonstrates positive developments in more than half of the recorded categories, namely: Training & Education, Capital, Adaptive Attitudes, Business Agility, and IT Integration. Overall, the country's rank in the WDCR for 2024 is underpinned by a very balanced performance across all sub-factors, finishing in the top ten for seven of the nine sub-factors. Hong Kong fairs particularly well in Training & Education (fourth), its Technological Framework (first), as well as Adaptive Attitudes (third).

At the indicator level, it is interesting to note that Hong Kong's performance in survey questions has improved slightly across most factors–indicating a more favorable sentiment towards the business environment in the domestic economy and possibly hinting at an improved environment for digital integration. The most prominent improvements are seen in employee training, where Hong Kong improves nine positions to 23rd, in the use of big data and analytics with a similar improvement to rank 14th, as well as a six-position improvement in executives' opinions towards public-private partnerships, now ranked ninth. Conversely, Hong Kong declines in the availability of international experience of its managers (13th), the level of digital/technological skills within the workforce (17th), the management of cities (sixth) as well as its credit rating (18th).

Hong Kong's main strengths are in educational attainment (fourth), measured via PISA math scores, the number of graduates in sciences (first), the number of high-tech patent grants (second), the ease of starting a business (fourth), the quality and speed of wireless broadband (third), and its banking and financial services (fifth). Despite an improvement in the IT Integration subfactor, it remains the area where Hong Kong has the most room for improvement, scoring below par in indicators such as software piracy (28th), government cyber security capacity (45th), and privacy protection by law (57th).

The Netherlands

The Netherlands records the biggest drop in this year's top ten, falling six positions overall to rank eighth in the WDCR. Small drops in all three factors explain this trend, with the Netherlands now ranking eighth in Technology, ninth in Knowledge, and seventh in Future Readiness. This downward trend is perceptible across all subfactors as well, with the country experiencing drops in eight of the nine subfactors–Scientific Concentration (11th) being the only exception with a one-rank improvement. Performance was notably weaker this year in the Regulatory Framework (13th) and Business Agility (14th) subfactors, with Training and Education (26th) remaining the country's main weakness.

At the indicator level, performance in the Knowledge factor was the most stable. The management of cities (17th) and employee training (16th) record the biggest declines, while the number of graduates in sciences improves significantly, though still low (43rd). However, the Netherlands remains strong in international experience (seventh), the net flow of international students (sixth), scientific and technical employment (fifth) and fares well in the new indicator measuring the number of AI articles published (11th). Under the Technology factor, the Netherlands experiences a large decline in its Regulatory Framework, driven by declines in business executives' perceptions of immigration laws (18th), the development and application of tech (17th), and scientific research legislation (11th). Enforcing contracts (46th) and investment in telecommunications (52nd) remain the main weaknesses in this factor, whilst intellectual property rights (sixth), IT and media stock market capitalization (second) and secure internet servers (third) remain the Netherlands' greatest strengths. Under the

Future Readiness factor, e-participation (11th), attitudes towards globalization (24th), and public-private partnerships (17th) all declined. Nevertheless, the Netherlands remains strong in internet retailing (seventh), the transfer of knowledge (fourth), and the protection of privacy by law (sixth).

Taiwan, Chinese Taipei

Taiwan, Chinese Taipei remains ninth overall in the Digital Competitiveness ranking this year, improving by one position in Future Readiness (sixth), whilst experiencing small declines under the Technology (seventh) and Knowledge (19th) factors. At the subfactor level, Taiwan continues to demonstrate strengths in Training and Education (seventh), Capital (third), Technological Framework (third), and Business Agility (fourth). Weaker subfactor performances include Talent (20th), Scientific Concentration (22nd), as well as Regulatory Framework (24th).

Positive developments at the indicator level for Taiwan include the management of cities (10th), in which it joins the top ten for the first time in three years; access to venture capital (11th), which recovered well from its 2023 decline; and an eight-position gain in investment in telecommunications (38th), though performance in the latter remains suboptimal. Conversely, it declines in the level of digital and technological skills within the workforce (42nd), the perceived effectiveness of immigration laws to support the economy (39th), as well as the entrepreneurial fear of failure which drops five positions to 23rd.

Taiwan demonstrates clear strengths in educational assessment in math and higher education attainment (ranking third in both) and has very high levels of R&D both in terms of expenditure (third) as well as the number of personnel per capita involved (second). It also tops the 2024 ranking in IT and media stock market capitalization, and fares well in high-tech exports (third) and the agility of its companies (second). Weaknesses, on the other hand, include total public expenditure on education (53rd), the pupil-teacher ratio in tertiary education (51st), the number of female researchers (54th), scientific and technical employment, as well as the protection of privacy by law (both ranking 46th). Overall, Taiwan's performance is underpinned by large variations between very strong performances in some areas of digital competitiveness, whilst also performing relatively poorly in others. Striking a balance between these variables could be key to the country's future advancement in the WDCR.

Norway

Norway completes this year's top 10 with a significant four-position improvement, driven by considerable advances in both the Technology (fifth) and Future Readiness (10th) factors as well as a more discreet three-position increase in the Knowledge factor to 17th. At the subfactor level, Norway improves in eight of the nine categories recorded in the WDCR and demonstrates that its 2024 leap is the result of a robust overall improvement across all areas of digital competitiveness. The country performs considerably well in the quality of its Regulatory Framework (sixth), Capital (FIFTH), IT Integration (ninth), as well as its Technological Framework (10th). Despite improving in the other subfactors, Norway continues to have room for improvement in its level of Scientific Concentration (16th), Business Agility (20th), and overall level of Talent (22nd).

At the indicator level, Norway's performance is partly driven by improved business sentiment from the country's top executives in areas such as intellectual property rights (12th), scientific research legislation (10th), and the ability of firms to recognize opportunities and threats (though only 30th). However, the country also improves in e-participation (19th), the government's cyber security capacity (20th), and investment in telecommunications (16th). Declines were limited for Norway in 2024. However, the country's performance dropped steeply with regard to its PISA math assessment score (now 32nd), with other noteworthy declines in wireless broadband (down five positions to 41st), and the entrepreneurial fear of failure, now 24th. Norway has a very good credit rating (tied 1st) and boasts other strengths such as its very low teacher-pupil ratio in tertiary education (fifth), the number of AI articles published (fourth), contract enforcement (third), and the number of internet users per capita (seventh). Room for improvement exists in its attractiveness for foreign talent, captured by a 48th rank in the net flow of international students, in the country's number of graduates in sciences (39th), its AI policies passed into law (21st), as well as the lack of extensive privacy protection by law (28th).

The 2024 edition of the WDCR illustrates how economies can reach digital competitiveness in different ways. Though it appears clear that the very top digitally competitive economies share strong and balanced performances across all aspects of the ranking, this condition becomes less significant as we move down the ranking. In essence, an economy's initial advancement in the WDCR can arise from a specific focus on one of the digital aspects that the ranking measures, for instance by converging efforts toward improving educational output. However, to remain at the top of the ranking, economies need to consolidate their performances across multiple factors. It is also important to note that both the public and private sectors have a crucial role to play, and building a digitally competitive ecosystem requires strong synergies between these two forces.

4. New indicators

The WDCR evolves gradually to best reflect the changing conditions of digital governance, business, and society. To this end, this year we have added five new indicators and tweaked an additional one.

4.1. Computer science education index

This IMD-WCC-developed index creates a country score by using data from the Times Higher Education university ranking. It balances the quantity and quality in both absolute and per capita measurements to indicate how the universities and graduates of an economy perform on the world stage. This is relevant for the development of home-grown talent and to attract the finest minds from around the world. The US takes the top spot by a large margin, followed by the UK and China.

01	US	100.2
02	United Kingdom	51.3
03	China	47.6
04	Germany	32.1
05	India	28.1

Table 2. Computer science education index, top performers
Source: IMD World Competitiveness Center (2024)

4.2. AI articles

Count of the number of AI articles in Scopus using the keywords “artificial intelligence,” by author’s institution, per capita. In absolute terms, the US and China dominate the publication of articles. But smaller economies with high-quality institutions outperform them on a per capita basis. This highlights that although the US and China are AI powerhouses, these are still niche within their superpower economies.

01	Cyprus	49.6
02	Luxembourg	46.9
03	Switzerland	43.0
38	US	11.5
50	China	3.0

Table 3. AI articles, differences in performance
Source: IMD World Competitiveness Center (2024)

4.3. AI policies passed into law

Cumulative count of AI-related bills passed into law, taken from the Digital Policy Alert. This counts the foresight and attention that the government pays to new technologies. We do acknowledge that a simple count does not necessarily reflect ongoing internal debate on new technologies nor is the count of countries always directly comparable, for instance, the EU economies are somewhat undercounted because of EU-level laws.

01	US	95
02	United Kingdom	33
03	China	27
04	Canada	19
05	Korea Rep.	18

Table 4. AI policies, top performers
Source: IMD World Competitiveness Center (2024)

4.4. Secure internet servers

The count of publicly trusted TLS/SSL certificates, from Netcraft Secure Server Survey. The ranking is dominated by both large economies such as the US (second) and smaller economies with strong and reliable technical infrastructures and strong rule of law including Denmark (first) and the Netherlands (second). China ranks low in this criterion, partly because it is on a per capita basis, but also because SSL is a less widely used protocol. This is so because of the Chinese Great Firewall and the need for low encryption between browsers and servers.

01	Denmark	277,082
02	US	140,804
03	Netherlands	136,863
51	China	949
52	India	474

Table 5. Secure internet servers, differences in performance
Source: IMD World Competitiveness Center (2024)

4.5. Flexibility and adaptability

This survey question captures whether the flexibility and adaptability of people are high when faced with new challenges. It has been taken from the IMD World Competitiveness Ranking and captures how well executives perceive citizens are adapting to change. While we know that both China and the US have large clusters where entrepreneurs flock, this criterion suggests that, in general, smaller economies are more flexible.

01	Ireland	8.47
03	Iceland	8.25
05	Singapore	7.86
17	China	7.29
22	US	7.07

Table 6. Flexibility and adaptability, differences in performance
Source: IMD World Competitiveness Center (2024)

Finally, privacy protection by law exists measures the extent to which a legal framework to protect Internet users' privacy exists. This criterion has replaced its sibling, Privacy protection by law content which we have used for several years. The two are highly correlated, but we have selected the former as it is based on a larger expert sample, thus improving the indicator's robustness.

Technological advancement and inclusive governance: striking a balance

Digital competitiveness in 2024 is influenced by a careful balance of governance, technological advancement, and innovation, which together shape the economic and social transformation of economies. Those which prioritize strong governance frameworks, invest in knowledge and technology, and demonstrate agility in adapting to emerging trends tend to outperform others in digital competitiveness. For instance, countries like Switzerland, Singapore, and Denmark consistently exhibit strong performances across multiple factors, underscoring the importance of a balanced approach to digital development.

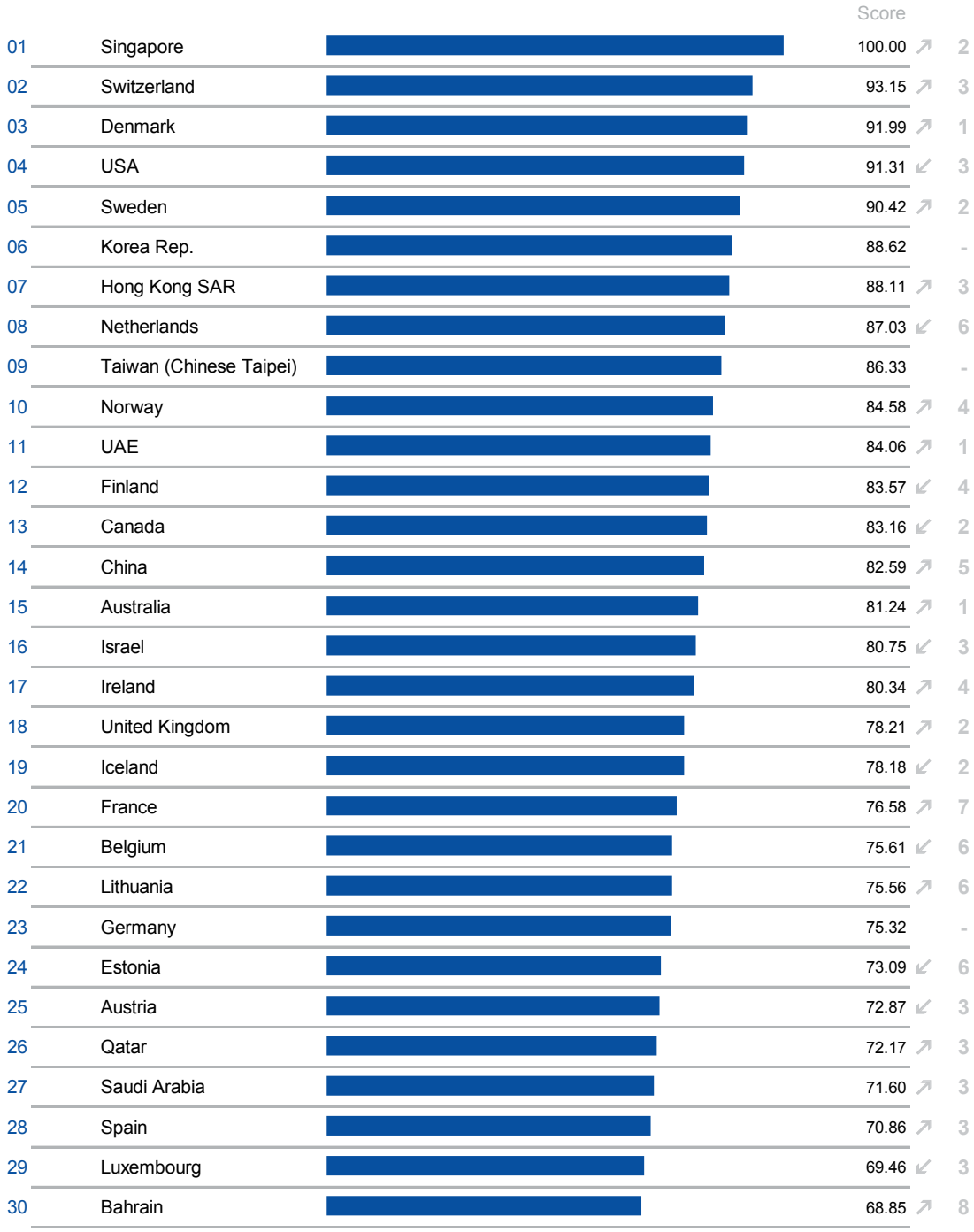
The inclusion of new indicators in this year's WDCR – such as those measuring AI-related advancements, computer science education, and cybersecurity – reflects the rapid pace of technological change and the need for economies to stay flexible and future-ready. As digital infrastructure becomes more intertwined with societal functions, it is increasingly important for governments to prioritize inclusive, transparent, and secure digital ecosystems to foster equitable growth.

However, as much as digital competitiveness presents opportunities, it also poses risks, particularly in areas such as intellectual property enforcement and cybersecurity. This reinforces the notion that a competitive digital economy requires not only innovation and knowledge transfer but also strong regulatory frameworks to protect citizens from exposure to higher risk, including in areas such as data privacy.

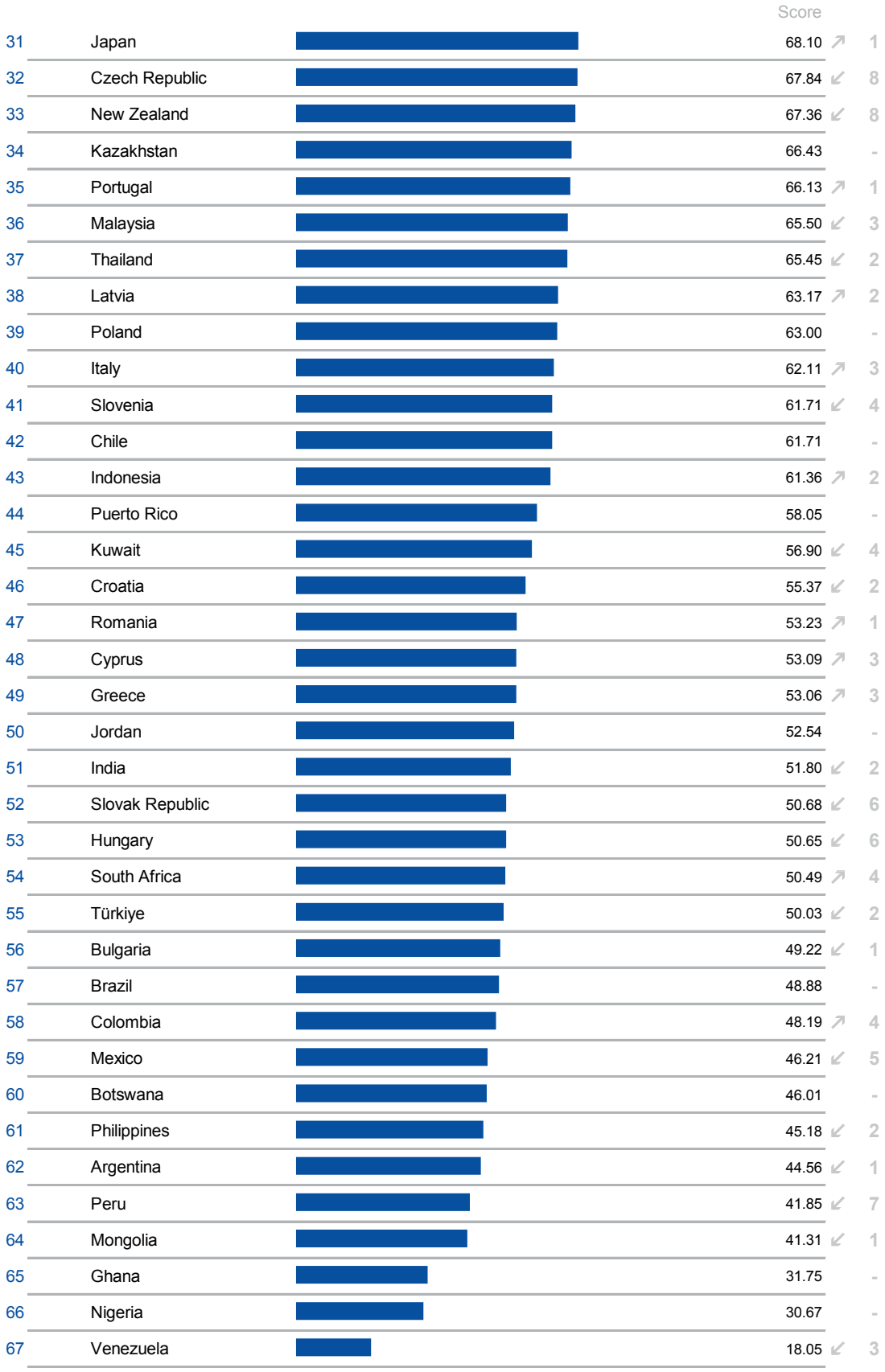
The evolving digital landscape necessitates continuous adaptation, collaboration between the public and private sectors, and a commitment to addressing emerging challenges. Economies that manage to strike a balance between technological advancement and inclusive governance will likely remain at the forefront of digital competitiveness in the coming years.

IMD World Digital Competitiveness Ranking 2024

The 2024 IMD World Digital Competitiveness Ranking



The IMD World Digital Competitiveness Ranking presents the 2024 overall ranking for the 67 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


Score
31 Japan 68.10 ↗ 1
32 Czech Republic 67.84 ↙ 8
33 New Zealand 67.36 ↙ 8
34 Kazakhstan 66.43 -
35 Portugal 66.13 ↗ 1
36 Malaysia 65.50 ↙ 3
37 Thailand 65.45 ↙ 2
38 Latvia 63.17 ↗ 2
39 Poland 63.00 -
40 Italy 62.11 ↗ 3
41 Slovenia 61.71 ↙ 4
42 Chile 61.71 -
43 Indonesia 61.36 ↗ 2
44 Puerto Rico 58.05 -
45 Kuwait 56.90 ↙ 4
46 Croatia 55.37 ↙ 2
47 Romania 53.23 ↗ 1
48 Cyprus 53.09 ↗ 3
49 Greece 53.06 ↗ 3
50 Jordan 52.54 -
51 India 51.80 ↙ 2
52 Slovak Republic 50.68 ↙ 6
53 Hungary 50.65 ↙ 6
54 South Africa 50.49 ↗ 4
55 Türkiye 50.03 ↙ 2
56 Bulgaria 49.22 ↙ 1
57 Brazil 48.88 -
58 Colombia 48.19 ↗ 4
59 Mexico 46.21 ↙ 5
60 Botswana 46.01 -
61 Philippines 45.18 ↙ 2
62 Argentina 44.56 ↙ 1
63 Peru 41.85 ↙ 7
64 Mongolia 41.31 ↙ 1
65 Ghana 31.75 -
66 Nigeria 30.67 -
67 Venezuela 18.05 ↙ 3

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 59 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 59 criteria include 22 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 Digital 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.

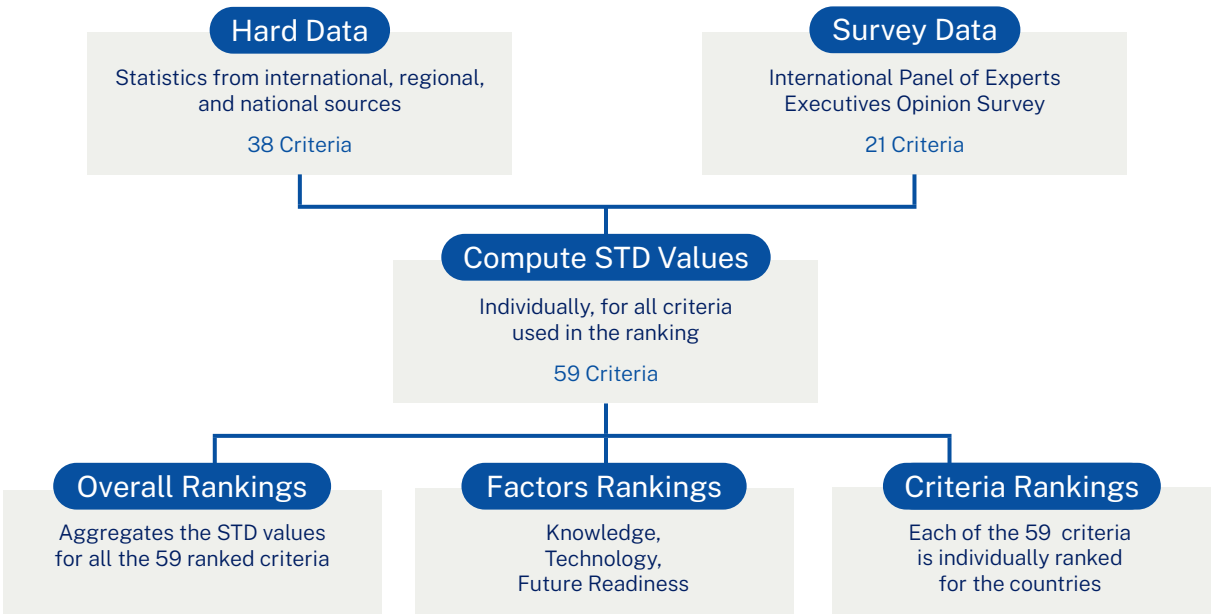
- Regulatory Framework
- Capital
- Technological Framework

Future Readiness

Level of country preparedness to exploit digital transformation.

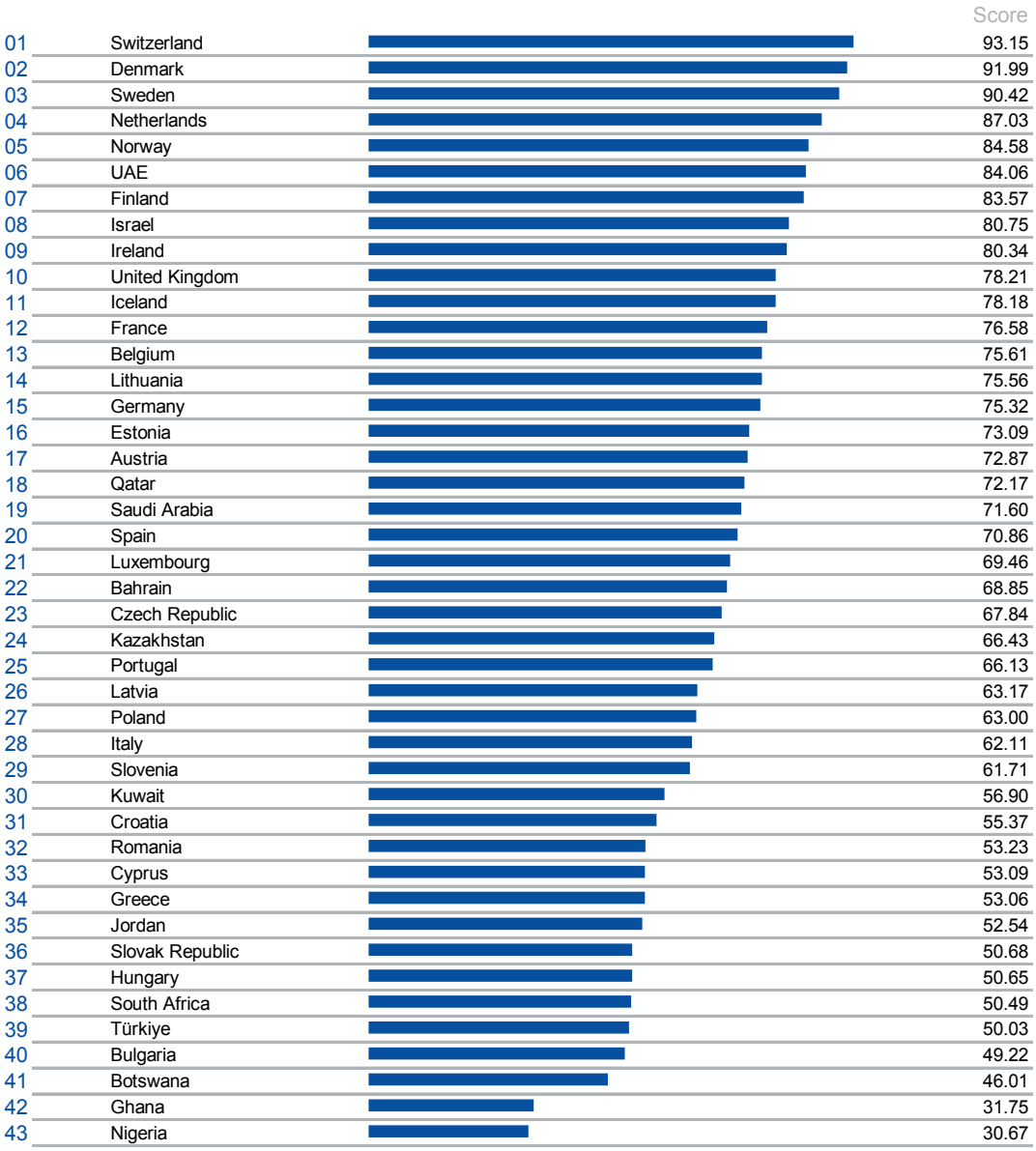
- Adaptive Attitudes
- Business Agility
- IT Integration

Computing the Rankings



Selected Breakdowns

Europe - Middle East - Africa



		Score
01	Switzerland	93.15
02	Denmark	91.99
03	Sweden	90.42
04	Netherlands	87.03
05	Norway	84.58
06	UAE	84.06
07	Finland	83.57
08	Israel	80.75
09	Ireland	80.34
10	United Kingdom	78.21
11	Iceland	78.18
12	France	76.58
13	Belgium	75.61
14	Lithuania	75.56
15	Germany	75.32
16	Estonia	73.09
17	Austria	72.87
18	Qatar	72.17
19	Saudi Arabia	71.60
20	Spain	70.86
21	Luxembourg	69.46
22	Bahrain	68.85
23	Czech Republic	67.84
24	Kazakhstan	66.43
25	Portugal	66.13
26	Latvia	63.17
27	Poland	63.00
28	Italy	62.11
29	Slovenia	61.71
30	Kuwait	56.90
31	Croatia	55.37
32	Romania	53.23
33	Cyprus	53.09
34	Greece	53.06
35	Jordan	52.54
36	Slovak Republic	50.68
37	Hungary	50.65
38	South Africa	50.49
39	Türkiye	50.03
40	Bulgaria	49.22
41	Botswana	46.01
42	Ghana	31.75
43	Nigeria	30.67

Asia - Pacific

		Score
01	Singapore	100.00
02	Korea Rep.	88.62
03	Hong Kong SAR	88.11
04	Taiwan (Chinese Taipei)	86.33
05	China	82.59
06	Australia	81.24
07	Japan	68.10
08	New Zealand	67.36
09	Malaysia	65.50
10	Thailand	65.45
11	Indonesia	61.36
12	India	51.80
13	Philippines	45.18
14	Mongolia	41.31

The Americas

		Score
01	USA	91.31
02	Canada	83.16
03	Chile	61.71
04	Puerto Rico	58.05
05	Brazil	48.88
06	Colombia	48.19
07	Mexico	46.21
08	Argentina	44.56
09	Peru	41.85
10	Venezuela	18.05

GDP per capita greater than $20,000

		Score
01	Singapore	100.00
02	Switzerland	93.15
03	Denmark	91.99
04	USA	91.31
05	Sweden	90.42
06	Korea Rep.	88.62
07	Hong Kong SAR	88.11
08	Netherlands	87.03
09	Taiwan (Chinese Taipei)	86.33
10	Norway	84.58
11	UAE	84.06
12	Finland	83.57
13	Canada	83.16
14	Australia	81.24
15	Israel	80.75
16	Ireland	80.34
17	United Kingdom	78.21
18	Iceland	78.18
19	France	76.58
20	Belgium	75.61
21	Lithuania	75.56
22	Germany	75.32
23	Estonia	73.09
24	Austria	72.87
25	Qatar	72.17
26	Saudi Arabia	71.60
27	Spain	70.86
28	Luxembourg	69.46
29	Bahrain	68.85
30	Japan	68.10
31	Czech Republic	67.84
32	New Zealand	67.36
33	Portugal	66.13
34	Latvia	63.17
35	Poland	63.00
36	Italy	62.11
37	Slovenia	61.71
38	Puerto Rico	58.05
39	Kuwait	56.90
40	Croatia	55.37
41	Cyprus	53.09
42	Greece	53.06
43	Slovak Republic	50.68
44	Hungary	50.65

GDP per capita less than $20,000

		Score
01	China	82.59
02	Kazakhstan	66.43
03	Malaysia	65.50
04	Thailand	65.45
05	Chile	61.71
06	Indonesia	61.36
07	Romania	53.23
08	Jordan	52.54
09	India	51.80
10	South Africa	50.49
11	Türkiye	50.03
12	Bulgaria	49.22
13	Brazil	48.88
14	Colombia	48.19
15	Mexico	46.21
16	Botswana	46.01
17	Philippines	45.18
18	Argentina	44.56
19	Peru	41.85
20	Mongolia	41.31
21	Ghana	31.75
22	Nigeria	30.67
23	Venezuela	18.05

Population over 20 million

		Score
01	USA	91.31
02	Korea Rep.	88.62
03	Taiwan (Chinese Taipei)	86.33
04	Canada	83.16
05	China	82.59
06	Australia	81.24
07	United Kingdom	78.21
08	France	76.58
09	Germany	75.32
10	Saudi Arabia	71.60
11	Spain	70.86
12	Japan	68.10
13	Kazakhstan	66.43
14	Malaysia	65.50
15	Thailand	65.45
16	Poland	63.00
17	Italy	62.11
18	Indonesia	61.36
19	India	51.80
20	South Africa	50.49
21	Türkiye	50.03
22	Brazil	48.88
23	Colombia	48.19
24	Mexico	46.21
25	Philippines	45.18
26	Argentina	44.56
27	Peru	41.85
28	Ghana	31.75
29	Nigeria	30.67
30	Venezuela	18.05

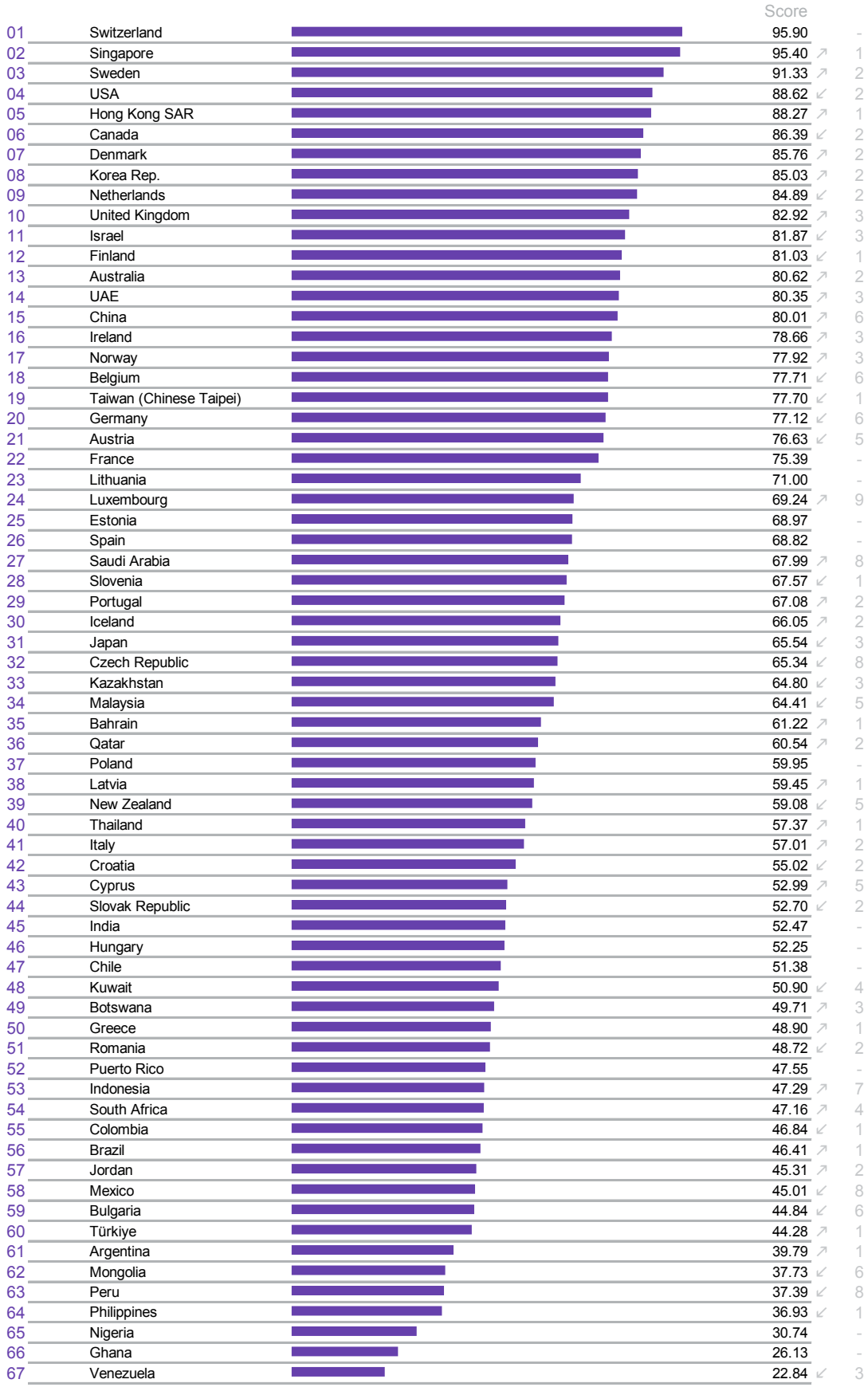
Population under 20 million

		Score
01	Singapore	100.00
02	Switzerland	93.15
03	Denmark	91.99
04	Sweden	90.42
05	Hong Kong SAR	88.11
06	Netherlands	87.03
07	Norway	84.58
08	UAE	84.06
09	Finland	83.57
10	Israel	80.75
11	Ireland	80.34
12	Iceland	78.18
13	Belgium	75.61
14	Lithuania	75.56
15	Estonia	73.09
16	Austria	72.87
17	Qatar	72.17
18	Luxembourg	69.46
19	Bahrain	68.85
20	Czech Republic	67.84
21	New Zealand	67.36
22	Portugal	66.13
23	Latvia	63.17
24	Slovenia	61.71
25	Chile	61.71
26	Puerto Rico	58.05
27	Kuwait	56.90
28	Croatia	55.37
29	Romania	53.23
30	Cyprus	53.09
31	Greece	53.06
32	Jordan	52.54
33	Slovak Republic	50.68
34	Hungary	50.65
35	Bulgaria	49.22
36	Botswana	46.01
37	Mongolia	41.31

Selected Breakdowns

KNOWLEDGE

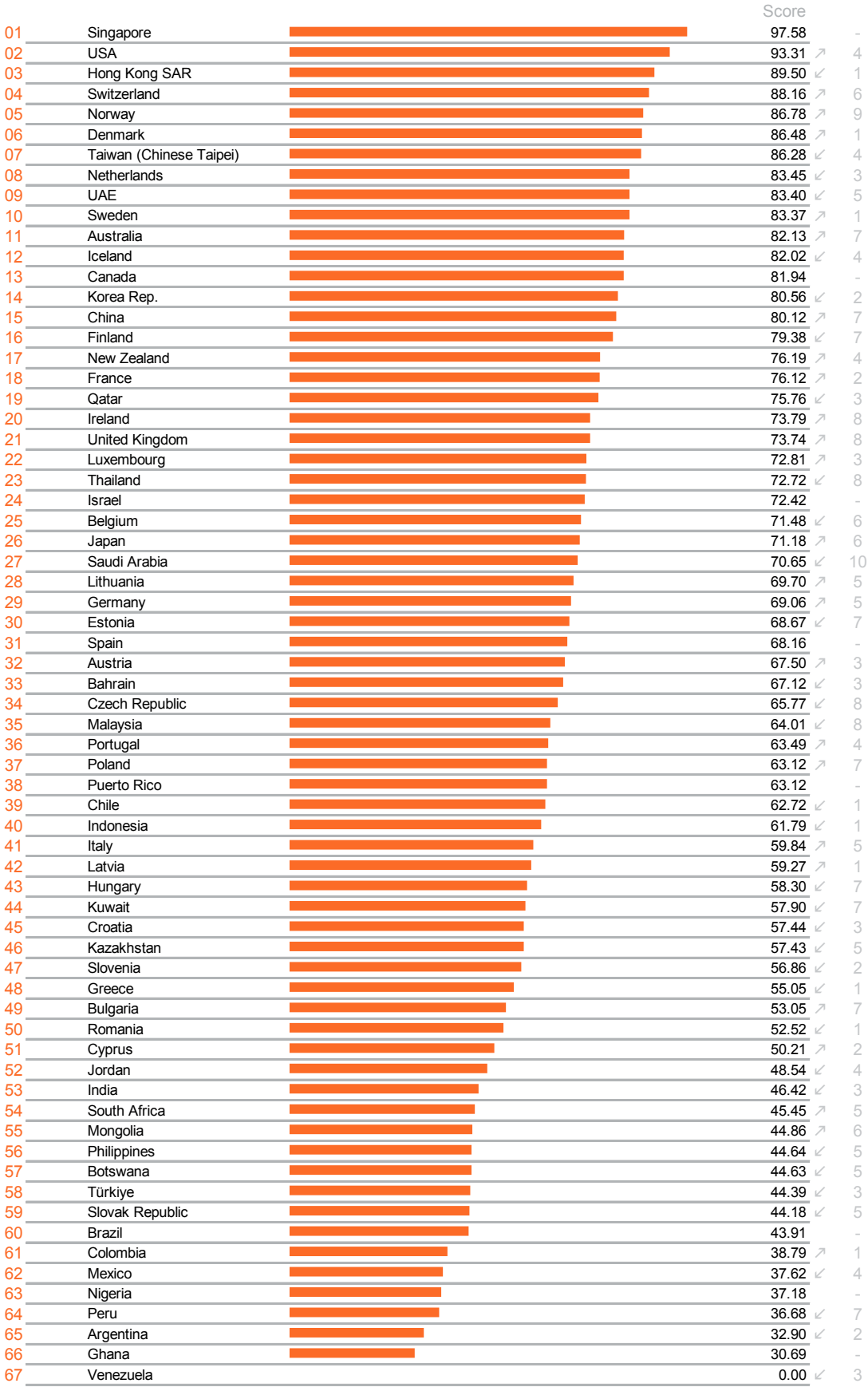
Know-how necessary to discover, understand and build new technologies



		Score		
01	Switzerland	95.90	-	
02	Singapore	95.40	↗	1
03	Sweden	91.33	↗	2
04	USA	88.62	↙	2
05	Hong Kong SAR	88.27	↗	1
06	Canada	86.39	↙	2
07	Denmark	85.76	↗	2
08	Korea Rep.	85.03	↗	2
09	Netherlands	84.89	↙	2
10	United Kingdom	82.92	↗	3
11	Israel	81.87	↙	3
12	Finland	81.03	↙	1
13	Australia	80.62	↗	2
14	UAE	80.35	↗	3
15	China	80.01	↗	6
16	Ireland	78.66	↗	3
17	Norway	77.92	↗	3
18	Belgium	77.71	↙	6
19	Taiwan (Chinese Taipei)	77.70	↙	1
20	Germany	77.12	↙	6
21	Austria	76.63	↙	5
22	France	75.39	-	
23	Lithuania	71.00	-	
24	Luxembourg	69.24	↗	9
25	Estonia	68.97	-	
26	Spain	68.82	-	
27	Saudi Arabia	67.99	↗	8
28	Slovenia	67.57	↙	1
29	Portugal	67.08	↗	2
30	Iceland	66.05	↗	2
31	Japan	65.54	↙	3
32	Czech Republic	65.34	↙	8
33	Kazakhstan	64.80	↙	3
34	Malaysia	64.41	↙	5
35	Bahrain	61.22	↗	1
36	Qatar	60.54	↗	2
37	Poland	59.95	-	
38	Latvia	59.45	↗	1
39	New Zealand	59.08	↙	5
40	Thailand	57.37	↗	1
41	Italy	57.01	↗	2
42	Croatia	55.02	↙	2
43	Cyprus	52.99	↗	5
44	Slovak Republic	52.70	↙	2
45	India	52.47	-	
46	Hungary	52.25	-	
47	Chile	51.38	-	
48	Kuwait	50.90	↙	4
49	Botswana	49.71	↗	3
50	Greece	48.90	↗	1
51	Romania	48.72	↙	2
52	Puerto Rico	47.55	-	
53	Indonesia	47.29	↗	7
54	South Africa	47.16	↗	4
55	Colombia	46.84	↙	1
56	Brazil	46.41	↗	1
57	Jordan	45.31	↗	2
58	Mexico	45.01	↙	8
59	Bulgaria	44.84	↙	6
60	Türkiye	44.28	↗	1
61	Argentina	39.79	↗	1
62	Mongolia	37.73	↙	6
63	Peru	37.39	↙	8
64	Philippines	36.93	↙	1
65	Nigeria	30.74	-	
66	Ghana	26.13	-	
67	Venezuela	22.84	↙	3

TECHNOLOGY

Overall context that enables the development of digital technologies

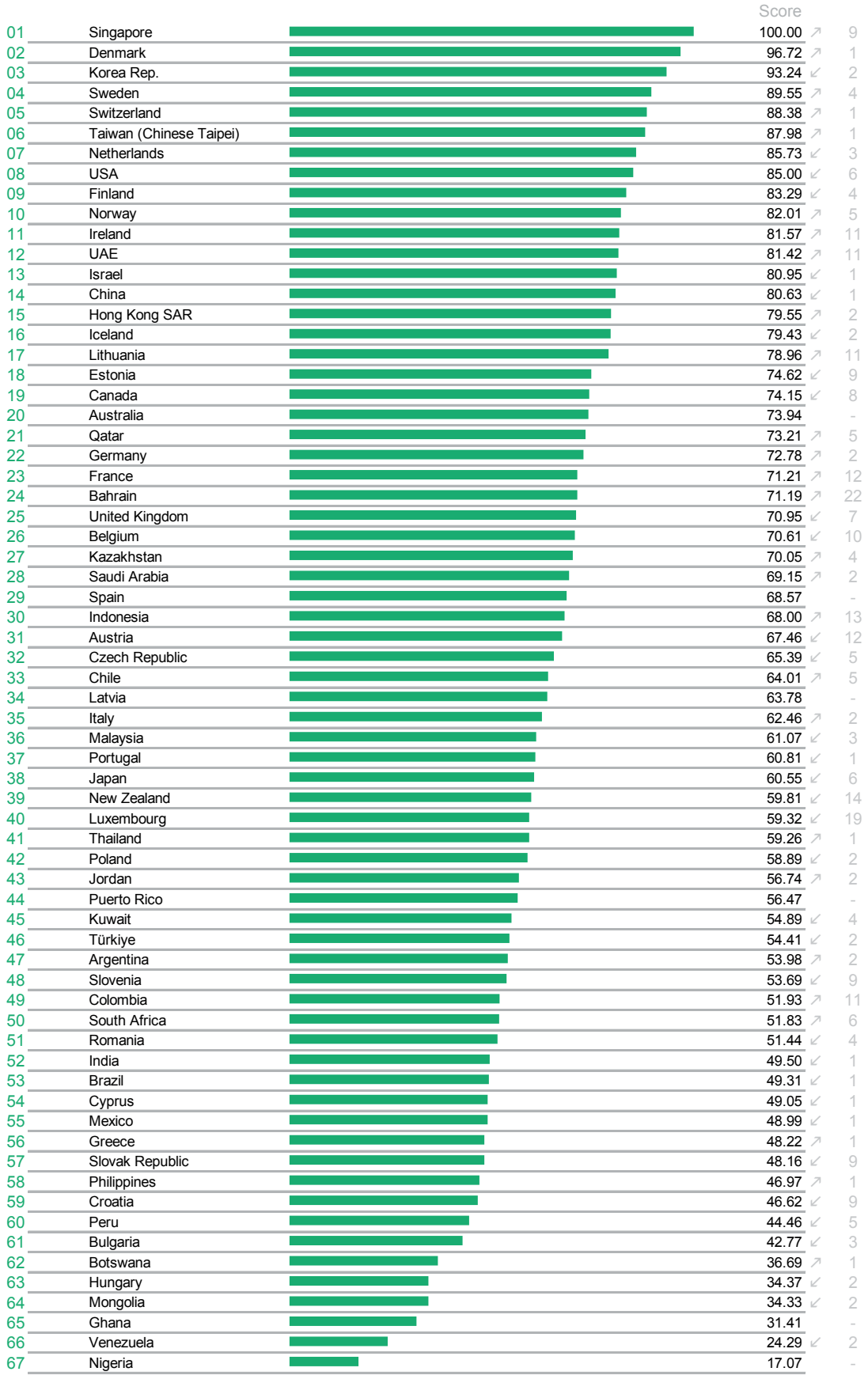


		Score		
01	Singapore	97.58		-
02	USA	93.31	↗	4
03	Hong Kong SAR	89.50	↙	1
04	Switzerland	88.16	↗	6
05	Norway	86.78	↗	9
06	Denmark	86.48	↗	1
07	Taiwan (Chinese Taipei)	86.28	↙	4
08	Netherlands	83.45	↙	3
09	UAE	83.40	↙	5
10	Sweden	83.37	↗	1
11	Australia	82.13	↗	7
12	Iceland	82.02	↙	4
13	Canada	81.94		-
14	Korea Rep.	80.56	↙	2
15	China	80.12	↗	7
16	Finland	79.38	↙	7
17	New Zealand	76.19	↗	4
18	France	76.12	↗	2
19	Qatar	75.76	↙	3
20	Ireland	73.79	↗	8
21	United Kingdom	73.74	↗	8
22	Luxembourg	72.81	↗	3
23	Thailand	72.72	↙	8
24	Israel	72.42		-
25	Belgium	71.48	↙	6
26	Japan	71.18	↗	6
27	Saudi Arabia	70.65	↙	10
28	Lithuania	69.70	↗	5
29	Germany	69.06	↗	5
30	Estonia	68.67	↙	7
31	Spain	68.16		-
32	Austria	67.50	↗	3
33	Bahrain	67.12	↙	3
34	Czech Republic	65.77	↙	8
35	Malaysia	64.01	↙	8
36	Portugal	63.49	↗	4
37	Poland	63.12	↗	7
38	Puerto Rico	63.12		-
39	Chile	62.72	↙	1
40	Indonesia	61.79	↙	1
41	Italy	59.84	↗	5
42	Latvia	59.27	↗	1
43	Hungary	58.30	↙	7
44	Kuwait	57.90	↙	7
45	Croatia	57.44	↙	3
46	Kazakhstan	57.43	↙	5
47	Slovenia	56.86	↙	2
48	Greece	55.05	↙	1
49	Bulgaria	53.05	↗	7
50	Romania	52.52	↙	1
51	Cyprus	50.21	↗	2
52	Jordan	48.54	↙	4
53	India	46.42	↙	3
54	South Africa	45.45	↗	5
55	Mongolia	44.86	↗	6
56	Philippines	44.64	↙	5
57	Botswana	44.63	↙	5
58	Türkiye	44.39	↙	3
59	Slovak Republic	44.18	↙	5
60	Brazil	43.91		-
61	Colombia	38.79	↗	1
62	Mexico	37.62	↙	4
63	Nigeria	37.18		-
64	Peru	36.68	↙	7
65	Argentina	32.90	↙	2
66	Ghana	30.69		-
67	Venezuela	0.00	↙	3

Selected Breakdowns

FUTURE READINESS

Level of country preparedness to exploit digital transformation



Factor Rankings: five-year overview

	OVERALL					KNOWLEDGE				
	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
Argentina	59	61	59	61	62	50	55	58	62	61
Australia	15	20	14	16	15	17	19	14	15	13
Austria	17	16	18	22	25	11	10	13	16	21
Bahrain	-	-	32	38	30	-	-	34	36	35
Belgium	25	26	23	15	21	21	21	21	12	18
Botswana	-	63	61	60	60	-	64	55	52	49
Brazil	51	51	52	57	57	57	51	51	57	56
Bulgaria	45	52	48	55	56	47	53	48	53	59
Canada	12	13	10	11	13	05	07	03	04	06
Chile	41	39	41	42	42	49	49	50	47	47
China	16	15	17	19	14	08	06	17	21	15
Colombia	61	59	60	62	58	59	56	57	54	55
Croatia	52	55	43	44	46	41	47	40	40	42
Cyprus	40	43	45	51	48	40	39	39	48	43
Czech Republic	35	33	33	24	32	37	35	32	24	32
Denmark	03	04	01	04	03	06	08	06	09	07
Estonia	21	25	20	18	24	23	27	23	25	25
Finland	10	11	07	08	12	15	09	09	11	12
France	24	24	22	27	20	20	20	20	22	22
Germany	18	18	19	23	23	12	14	11	14	20
Ghana	-	-	-	-	65	-	-	-	-	66
Greece	46	44	50	52	49	48	45	47	51	50
Hong Kong SAR	05	02	09	10	07	07	05	07	06	05
Hungary	47	45	42	47	53	44	43	43	46	46
Iceland	23	21	21	17	19	27	33	31	32	30
India	48	46	44	49	51	39	41	46	45	45
Indonesia	56	53	51	45	43	63	60	60	60	53
Ireland	20	19	24	21	17	24	23	22	19	16
Israel	19	17	15	13	16	09	12	10	08	11
Italy	42	40	39	43	40	42	40	41	43	41
Japan	27	28	29	32	31	22	25	28	28	31
Jordan	53	49	53	50	50	54	48	53	59	57
Kazakhstan	36	32	36	34	34	34	36	30	30	33
Korea Rep.	08	12	08	06	06	10	15	16	10	08
Kuwait	-	-	-	41	45	-	-	-	44	48
Latvia	38	37	34	40	38	36	34	36	39	38
Lithuania	29	30	25	28	22	25	26	24	23	23
Luxembourg	28	22	30	26	29	35	29	35	33	24
Malaysia	26	27	31	33	36	19	22	25	29	34
Mexico	54	56	55	54	59	52	54	52	50	58
Mongolia	62	62	62	63	64	58	58	61	56	62
Netherlands	07	07	06	02	08	14	11	08	07	09
New Zealand	22	23	27	25	33	28	28	33	34	39
Nigeria	-	-	-	-	66	-	-	-	-	65
Norway	09	09	12	14	10	16	17	19	20	17
Peru	55	57	57	56	63	55	59	56	55	63
Philippines	57	58	56	59	61	62	63	62	63	64
Poland	32	41	46	39	39	30	38	42	37	37
Portugal	37	34	38	36	35	33	32	29	31	29
Puerto Rico	-	-	-	-	44	-	-	-	-	52
Qatar	30	29	26	29	26	45	44	38	38	36
Romania	49	50	49	48	47	53	52	49	49	51
Saudi Arabia	34	36	35	30	27	46	50	37	35	27
Singapore	02	05	04	03	01	02	04	05	03	02
Slovak Republic	50	47	47	46	52	51	46	44	42	44
Slovenia	31	35	37	37	41	29	30	26	27	28
South Africa	60	60	58	58	54	60	62	54	58	54
Spain	33	31	28	31	28	32	31	27	26	26
Sweden	04	03	03	07	05	04	02	02	05	03
Switzerland	06	06	05	05	02	03	01	01	01	01
Taiwan (Chinese Taipei)	11	08	11	09	09	18	16	18	18	19
Thailand	39	38	40	35	37	43	42	45	41	40
Türkiye	44	48	54	53	55	56	57	59	61	60
UAE	14	10	13	12	11	31	18	15	17	14
United Kingdom	13	14	16	20	18	13	13	12	13	10
USA	01	01	02	01	04	01	03	04	02	04
Venezuela	63	64	63	64	67	61	61	63	64	67

TECHNOLOGY					FUTURE READINESS					
2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	
62	62	62	63	65	47	52	46	49	47	Argentina
14	18	15	18	11	17	22	17	20	20	Australia
28	32	36	35	32	16	16	13	19	31	Austria
-	-	23	30	33	-	-	36	46	24	Bahrain
19	23	24	19	25	25	26	25	16	26	Belgium
-	63	59	52	57	-	63	61	63	62	Botswana
57	55	55	60	60	43	45	47	52	53	Brazil
45	51	51	56	49	44	55	50	58	61	Bulgaria
13	15	14	13	13	15	15	11	11	19	Canada
40	35	41	38	39	39	36	33	38	33	Chile
27	20	18	22	15	18	17	15	13	14	China
61	60	61	62	61	50	53	56	60	49	Colombia
49	50	42	42	45	62	60	48	50	59	Croatia
52	53	52	53	51	29	34	39	53	54	Cyprus
36	37	35	26	34	36	37	29	27	32	Czech Republic
09	09	07	07	06	01	02	01	03	02	Denmark
23	25	21	23	30	20	20	12	09	18	Estonia
10	12	08	09	16	09	09	06	05	09	Finland
15	16	16	20	18	31	31	34	35	23	France
31	31	27	34	29	19	18	19	24	22	Germany
-	-	-	-	66	-	-	-	-	65	Ghana
43	46	47	47	48	46	43	60	57	56	Greece
02	01	02	02	03	10	10	18	17	15	Hong Kong SAR
39	36	31	36	43	60	61	57	61	63	Hungary
21	10	11	08	12	22	25	21	14	16	Iceland
50	44	43	50	53	56	50	42	51	52	India
54	49	45	39	40	48	48	52	43	30	Indonesia
30	28	37	28	20	14	14	22	22	11	Ireland
32	27	22	24	24	23	21	14	12	13	Israel
46	42	44	46	41	38	30	38	37	35	Italy
26	30	30	32	26	26	27	28	32	38	Japan
44	43	50	48	52	58	56	55	45	43	Jordan
41	40	40	41	46	33	28	30	31	27	Kazakhstan
12	13	13	12	14	03	05	02	01	03	Korea Rep.
-	-	-	37	44	-	-	-	41	45	Kuwait
34	34	34	43	42	42	42	32	34	34	Latvia
29	29	32	33	28	30	33	24	28	17	Lithuania
17	14	19	25	22	27	24	35	21	40	Luxembourg
20	26	29	27	35	32	29	31	33	36	Malaysia
56	57	56	58	62	52	51	53	54	55	Mexico
60	61	60	61	55	59	62	62	62	64	Mongolia
08	07	04	05	08	04	04	05	04	07	Netherlands
18	21	28	21	17	21	19	26	25	39	New Zealand
-	-	-	-	63	-	-	-	-	67	Nigeria
03	06	10	14	05	06	08	09	15	10	Norway
58	56	57	57	64	55	54	54	55	60	Peru
53	54	49	51	56	54	57	58	59	58	Philippines
37	41	46	44	37	35	39	43	40	42	Poland
38	38	39	40	36	41	38	40	36	37	Portugal
-	-	-	-	38	-	-	-	-	44	Puerto Rico
25	19	17	16	19	24	23	23	26	21	Qatar
48	47	48	49	50	49	49	51	47	51	Romania
24	24	26	17	27	28	32	37	30	28	Saudi Arabia
01	03	01	01	01	12	11	10	10	01	Singapore
51	45	53	54	59	51	46	45	48	57	Slovak Republic
35	39	38	45	47	37	40	41	39	48	Slovenia
55	59	58	59	54	57	59	59	56	50	South Africa
33	33	33	31	31	40	35	27	29	29	Spain
06	08	05	11	10	07	06	04	08	04	Sweden
11	11	12	10	04	05	03	07	06	05	Switzerland
05	02	06	03	07	08	07	08	07	06	Taiwan (Chinese Taipei)
22	22	20	15	23	45	44	49	42	41	Thailand
42	52	54	55	58	34	41	44	44	46	Türkiye
04	05	03	04	09	11	12	20	23	12	UAE
16	17	25	29	21	13	13	16	18	25	United Kingdom
07	04	09	06	02	02	01	03	02	08	USA
63	64	63	64	67	63	64	63	64	66	Venezuela

Sub-factor Rankings

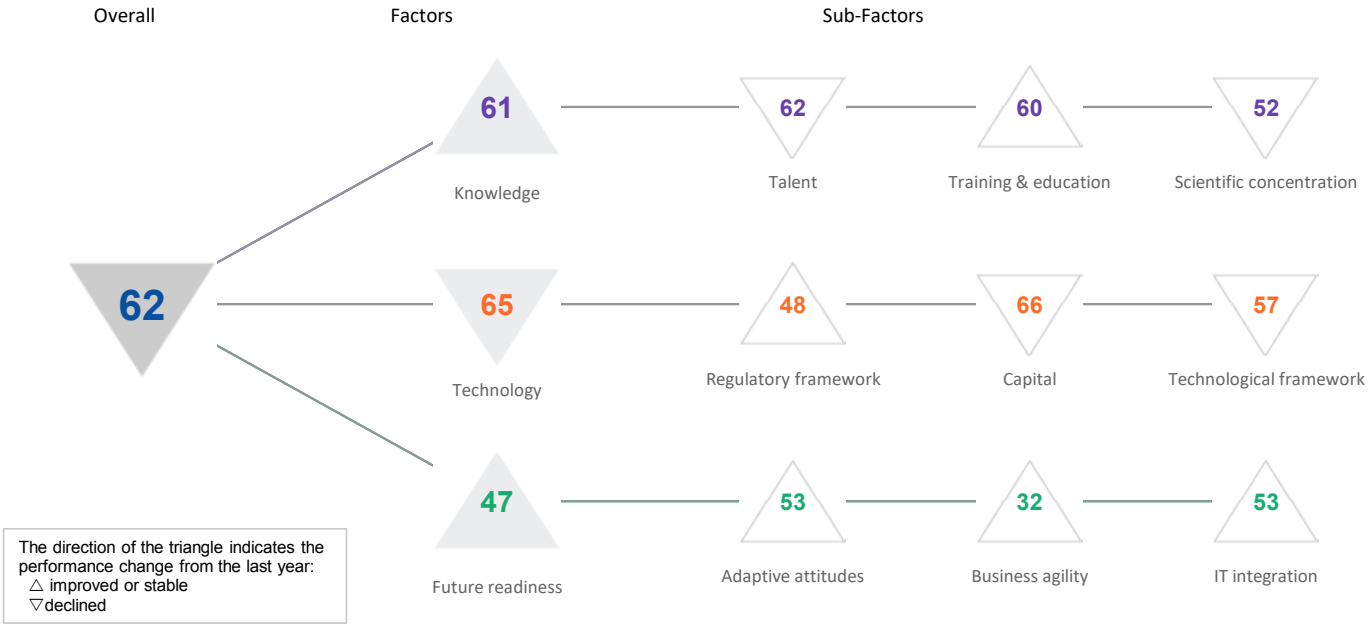
	KNOWLEDGE			TECHNOLOGY			FUTURE READINESS		
	Talent	Training & education	Scientific concentration	Regulatory framework	Capital	Technological framework	Adaptive attitudes	Business agility	IT integration
Argentina	62	60	52	48	66	57	53	32	53
Australia	09	27	15	05	19	12	16	38	15
Austria	23	18	17	32	41	23	38	28	20
Bahrain	11	59	31	31	29	38	07	26	41
Belgium	15	23	19	30	18	33	39	15	29
Botswana	31	37	66	56	26	64	63	51	62
Brazil	66	51	29	53	59	54	47	63	50
Bulgaria	61	54	47	61	37	49	61	57	60
Canada	14	03	06	09	12	16	23	29	11
Chile	38	45	58	33	46	35	25	40	33
China	10	32	10	04	20	25	19	08	26
Colombia	56	43	59	59	57	60	59	36	52
Croatia	57	38	38	54	33	47	45	62	59
Cyprus	63	44	25	60	58	36	40	66	47
Czech Republic	26	36	32	38	22	39	34	27	30
Denmark	05	12	14	07	09	08	04	03	02
Estonia	33	11	36	29	43	20	17	37	10
Finland	16	17	12	19	14	18	10	24	04
France	25	21	20	15	21	31	35	23	16
Germany	29	10	13	22	25	43	32	19	18
Ghana	47	65	67	57	65	65	64	55	64
Greece	54	58	35	50	51	48	57	60	44
Hong Kong SAR	08	04	08	08	07	01	03	12	36
Hungary	55	41	44	40	54	40	66	65	42
Iceland	35	30	30	20	24	02	02	16	34
India	30	52	53	49	39	63	62	34	57
Indonesia	27	63	60	45	01	59	41	10	39
Ireland	12	25	18	16	40	19	11	11	24
Israel	24	06	07	27	23	30	29	17	03
Italy	50	48	23	35	53	44	27	39	38
Japan	53	20	24	39	38	06	37	58	17
Jordan	43	49	65	41	42	62	56	22	54
Kazakhstan	44	02	49	28	52	52	30	05	56
Korea Rep.	19	05	04	18	17	09	06	02	06
Kuwait	36	61	39	52	35	46	48	41	51
Latvia	32	33	51	43	56	27	31	45	25
Lithuania	21	24	33	25	36	32	21	13	19
Luxembourg	37	13	28	21	34	17	60	42	23
Malaysia	41	22	40	44	31	34	33	47	31
Mexico	58	56	50	63	60	58	42	53	61
Mongolia	65	53	62	64	55	50	51	67	65
Netherlands	04	26	11	13	06	13	09	14	08
New Zealand	46	35	34	11	32	15	14	64	43
Nigeria	49	66	63	51	28	67	67	50	66
Norway	22	15	16	06	05	10	12	20	09
Peru	64	47	64	58	62	61	54	49	63
Philippines	60	62	61	66	45	53	52	54	58
Poland	40	39	37	46	44	28	43	43	35
Portugal	28	34	26	26	50	42	24	61	28
Puerto Rico	48	50	57	42	48	22	49	44	37
Qatar	06	55	54	23	16	24	28	18	27
Romania	45	57	48	47	64	41	44	56	48
Saudi Arabia	18	28	46	12	15	51	20	30	32
Singapore	01	14	09	01	04	04	01	01	01
Slovak Republic	52	42	43	65	61	45	58	59	45
Slovenia	42	19	27	55	49	37	50	48	46
South Africa	59	46	55	62	47	55	55	52	40
Spain	34	31	21	34	30	26	26	33	22
Sweden	07	01	03	10	08	14	08	09	05
Switzerland	03	08	02	02	11	07	15	07	07
Taiwan (Chinese Taipei)	20	07	22	24	03	03	13	04	14
Thailand	39	40	42	36	13	21	36	25	55
Türkiye	51	64	45	37	63	56	46	46	49
UAE	02	29	41	14	10	11	05	21	13
United Kingdom	17	16	05	17	27	29	22	31	21
USA	13	09	01	03	02	05	18	06	12
Venezuela	67	67	56	67	67	66	65	35	67

IMD World Digital Competitiveness Country Profiles

ARGENTINA

DIGITAL TRENDS - OVERALL

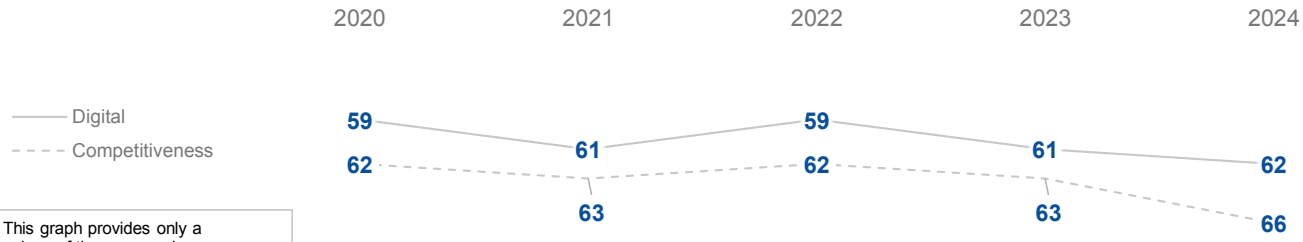
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	59	61	59	61	62
Knowledge	50	55	58	62	61
Technology	62	62	62	63	65
Future readiness	47	52	46	49	47

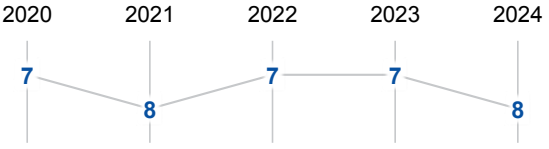
COMPETITIVENESS & DIGITAL RANKINGS



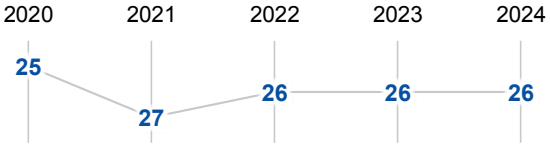
N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

THE AMERICAS (10 economies)



POPULATIONS > 20 MILLION (30 economies)



ARGENTINA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	56	62	61	61	62
Training & education	43	46	49	60	60
Scientific concentration	55	48	48	50	52

Talent	Rank
Educational assessment PISA - Math	55
International experience	59
Foreign highly skilled personnel	63
Management of cities	59
Digital/Technological skills	55
Net flow of international students	19

Training & education	Rank
Employee training	63
Total public expenditure on education	26
Higher education achievement	59
Pupil-teacher ratio (tertiary education)	22
Graduates in Sciences	60
Women with degrees	47
Computer science education index	61

Scientific concentration	Rank
Total expenditure on R&D (%)	51
Total R&D personnel per capita	47
▶ Female researchers	05
R&D productivity by publication	26
Scientific and technical employment	52
High-tech patent grants	55
Robots in Education and R&D	38
AI articles	60

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	57	57	61	57	48
Capital	62	63	62	63	66
Technological framework	56	56	55	56	57

Regulatory framework	Rank
Starting a business	63
Enforcing contracts	50
▶ Immigration laws	02
Development & application of tech.	61
Scientific research legislation	60
Intellectual property rights	57
▶ AI policies passed into law	12

Capital	Rank
IT & media stock market capitalization	48
▷ Funding for technological development	65
▷ Banking and financial services	66
▷ Country credit rating	64
▷ Venture capital	66
Investment in Telecommunications	49

Technological framework	Rank
▷ Communications technology	64
Mobile broadband subscribers	52
Wireless broadband	60
Internet users	39
Internet bandwidth speed	55
High-tech exports (%)	56
Secure internet servers	44

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	49	50	49	55	53
Business agility	39	43	37	38	32
IT integration	52	59	53	53	53

Adaptive attitudes	Rank
E-Participation	53
Internet retailing	46
Tablet possession	34
Smartphone possession	48
Attitudes toward globalization	63
Flexibility and adaptability	30

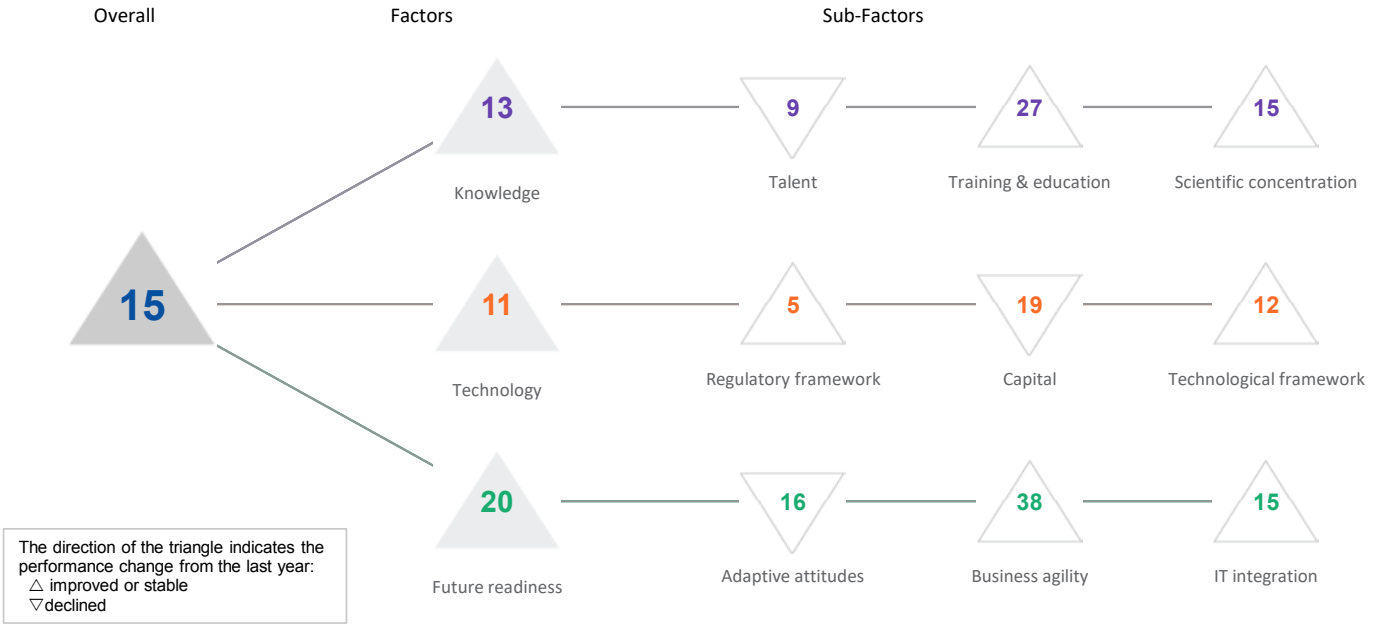
Business agility	Rank
Opportunities and threats	15
World robots distribution	36
Agility of companies	58
Use of big data and analytics	41
Knowledge transfer	49
▶ Entrepreneurial fear of failure	06

IT integration	Rank
E-Government	37
Public-private partnerships	51
Cyber security	62
Software piracy	59
Government cyber security capacity	37
▶ Privacy protection by law exists	08

AUSTRALIA

DIGITAL TRENDS - OVERALL

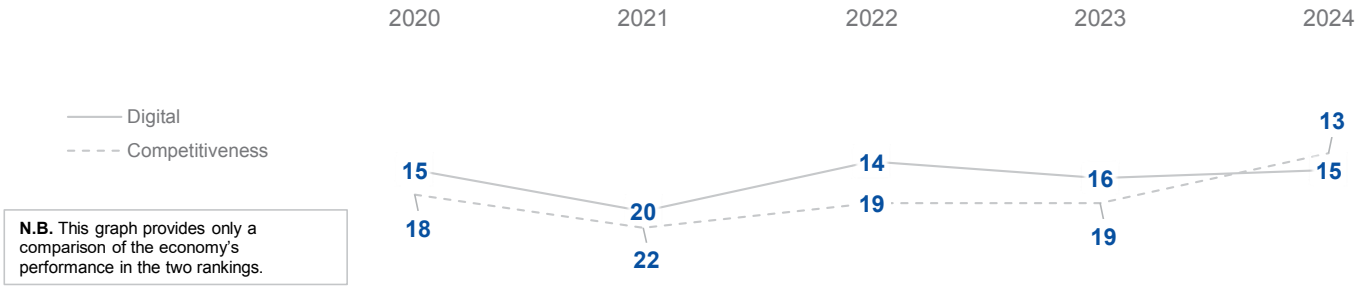
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

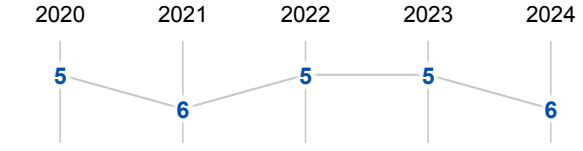
	2020	2021	2022	2023	2024
OVERALL	15	20	14	16	15
Knowledge	17	19	14	15	13
Technology	14	18	15	18	11
Future readiness	17	22	17	20	20

COMPETITIVENESS & DIGITAL RANKINGS

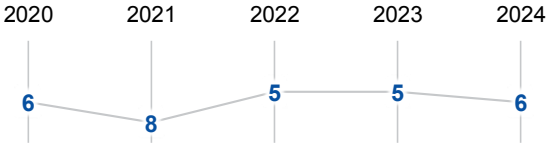


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)



POPULATIONS > 20 MILLION (30 economies)



AUSTRALIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	06	08	07	08	09
Training & education	28	37	29	28	27
Scientific concentration	19	18	16	16	15

Talent	Rank
Educational assessment PISA - Math	16
▷ International experience	44
Foreign highly skilled personnel	12
Management of cities	16
Digital/Technological skills	38
▶ Net flow of international students	02

Training & education	Rank
Employee training	40
Total public expenditure on education	21
Higher education achievement	17
Pupil-teacher ratio (tertiary education)	-
▷ Graduates in Sciences	49
Women with degrees	15
Computer science education index	10

Scientific concentration	Rank
Total expenditure on R&D (%)	23
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	14
Scientific and technical employment	12
High-tech patent grants	34
Robots in Education and R&D	20
AI articles	13

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	06	17	10	15	05
Capital	13	17	13	16	19
Technological framework	20	27	26	31	12

Regulatory framework	Rank
Starting a business	05
Enforcing contracts	06
Immigration laws	27
Development & application of tech.	26
Scientific research legislation	25
Intellectual property rights	14
AI policies passed into law	08

Capital	Rank
IT & media stock market capitalization	37
Funding for technological development	34
Banking and financial services	13
▶ Country credit rating	01
Venture capital	24
Investment in Telecommunications	40

Technological framework	Rank
▷ Communications technology	45
▶ Mobile broadband subscribers	01
Wireless broadband	16
Internet users	20
▷ Internet bandwidth speed	50
High-tech exports (%)	12
Secure internet servers	18

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	05	14	08	04	16
Business agility	43	55	40	42	38
IT integration	12	21	15	23	15

Adaptive attitudes	Rank
E-Participation	19
Internet retailing	05
▶ Tablet possession	04
Smartphone possession	36
Attitudes toward globalization	36
Flexibility and adaptability	25

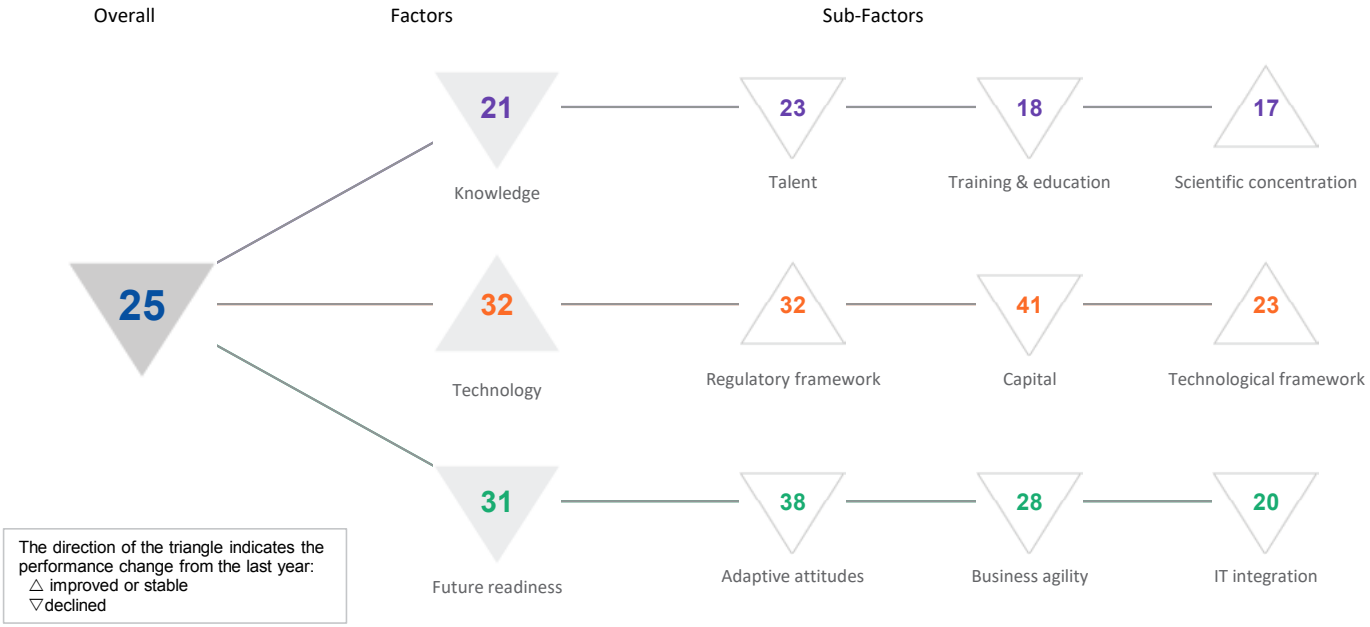
Business agility	Rank
Opportunities and threats	37
World robots distribution	30
Agility of companies	39
Use of big data and analytics	22
Knowledge transfer	32
Entrepreneurial fear of failure	35

IT integration	Rank
E-Government	08
Public-private partnerships	26
Cyber security	34
▶ Software piracy	05
▷ Government cyber security capacity	46
Privacy protection by law exists	21

AUSTRIA

DIGITAL TRENDS - OVERALL

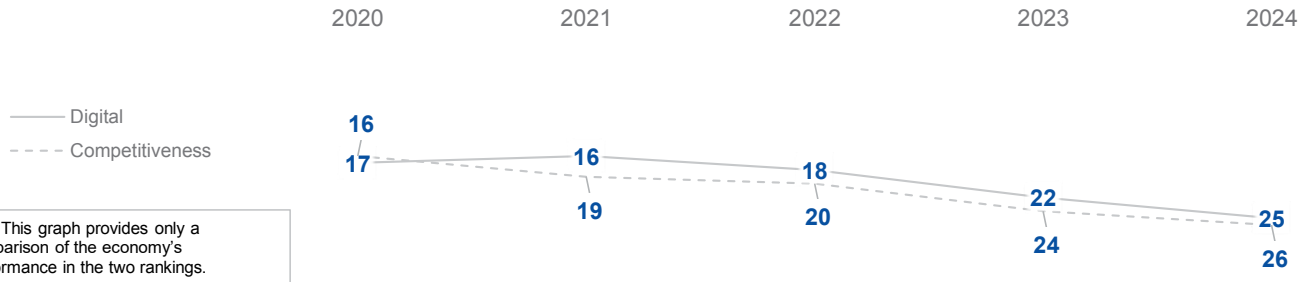
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

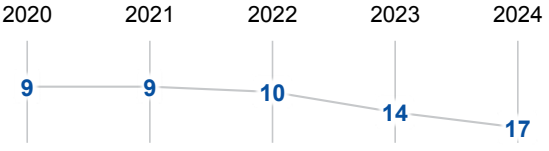
	2020	2021	2022	2023	2024
OVERALL	17	16	18	22	25
Knowledge	11	10	13	16	21
Technology	28	32	36	35	32
Future readiness	16	16	13	19	31

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)

AUSTRIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	12	15	16	20	23
Training & education	12	05	12	11	18
Scientific concentration	14	15	15	17	17

Talent	Rank
Educational assessment PISA - Math	16
International experience	25
Foreign highly skilled personnel	33
Management of cities	20
Digital/Technological skills	53
▶ Net flow of international students	07

Training & education	Rank
▶ Employee training	03
Total public expenditure on education	33
Higher education achievement	35
▶ Pupil-teacher ratio (tertiary education)	02
▶ Graduates in Sciences	07
Women with degrees	38
Computer science education index	47

Scientific concentration	Rank
Total expenditure on R&D (%)	09
Total R&D personnel per capita	11
Female researchers	46
R&D productivity by publication	48
Scientific and technical employment	17
High-tech patent grants	21
Robots in Education and R&D	11
AI articles	17

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	24	26	29	34	32
Capital	30	32	36	34	41
Technological framework	33	38	37	38	23

Regulatory framework	Rank
▷ Starting a business	55
Enforcing contracts	10
▷ Immigration laws	56
Development & application of tech.	52
Scientific research legislation	24
Intellectual property rights	09
AI policies passed into law	28

Capital	Rank
IT & media stock market capitalization	46
Funding for technological development	25
Banking and financial services	33
Country credit rating	13
Venture capital	43
Investment in Telecommunications	48

Technological framework	Rank
Communications technology	27
Mobile broadband subscribers	11
Wireless broadband	27
Internet users	24
Internet bandwidth speed	43
High-tech exports (%)	29
Secure internet servers	22

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	21	21	19	24	38
Business agility	21	18	21	22	28
IT integration	09	11	11	13	20

Adaptive attitudes	Rank
E-Participation	32
Internet retailing	22
Tablet possession	24
Smartphone possession	17
▷ Attitudes toward globalization	62
▷ Flexibility and adaptability	60

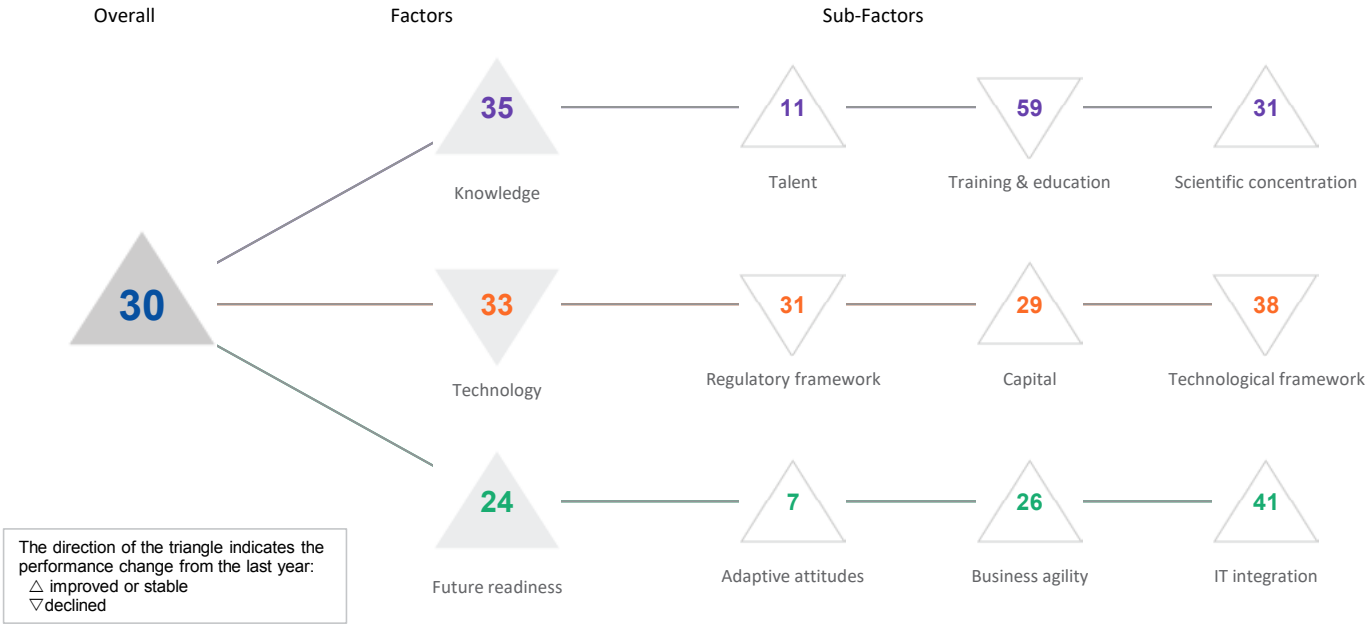
Business agility	Rank
Opportunities and threats	43
World robots distribution	23
Agility of companies	29
▷ Use of big data and analytics	55
Knowledge transfer	15
Entrepreneurial fear of failure	12

IT integration	Rank
E-Government	22
Public-private partnerships	43
Cyber security	12
▶ Software piracy	06
Government cyber security capacity	38
Privacy protection by law exists	40

BAHRAIN

DIGITAL TRENDS - OVERALL

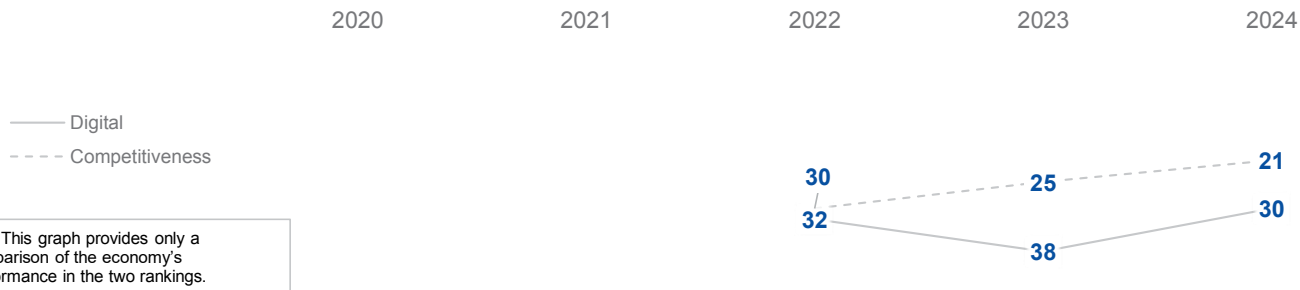
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	-	-	32	38	30
Knowledge	-	-	34	36	35
Technology	-	-	23	30	33
Future readiness	-	-	36	46	24

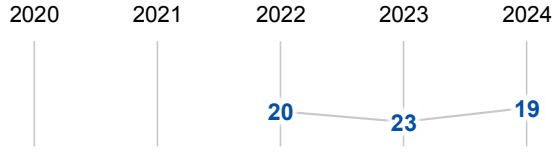
COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS < 20 MILLION (37 economies)



BAHRAIN

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	-	-	13	15	11
Training & education	-	-	48	55	59
Scientific concentration	-	-	31	34	31

Talent	Rank
Educational assessment PISA - Math	-
International experience	10
Foreign highly skilled personnel	10
Management of cities	11
Digital/Technological skills	06
Net flow of international students	35

Training & education	Rank
Employee training	18
▷ Total public expenditure on education	63
Higher education achievement	56
Pupil-teacher ratio (tertiary education)	56
Graduates in Sciences	58
▶ Women with degrees	04
▷ Computer science education index	61

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	38
Robots in Education and R&D	-
AI articles	31

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	-	-	32	29	31
Capital	-	-	34	47	29
Technological framework	-	-	17	14	38

Regulatory framework	Rank
Starting a business	33
Enforcing contracts	42
▶ Immigration laws	01
Development & application of tech.	10
Scientific research legislation	36
Intellectual property rights	39
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	20
Funding for technological development	19
Banking and financial services	09
▷ Country credit rating	60
Venture capital	28
Investment in Telecommunications	28

Technological framework	Rank
Communications technology	04
Mobile broadband subscribers	07
Wireless broadband	14
▶ Internet users	01
Internet bandwidth speed	31
▷ High-tech exports (%)	64
Secure internet servers	54

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	-	-	23	49	07
Business agility	-	-	29	32	26
IT integration	-	-	46	50	41

Adaptive attitudes	Rank
E-Participation	17
▶ Internet retailing	01
Tablet possession	41
Smartphone possession	25
Attitudes toward globalization	17
▶ Flexibility and adaptability	02

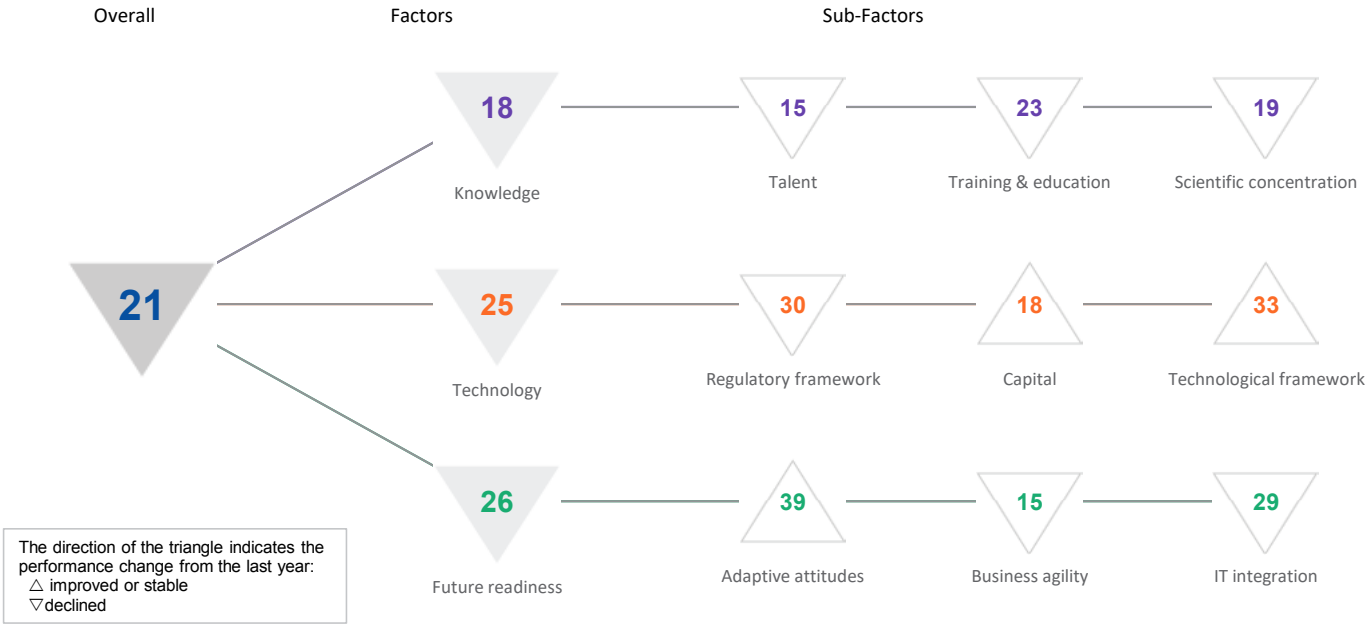
Business agility	Rank
Opportunities and threats	29
World robots distribution	-
Agility of companies	23
Use of big data and analytics	35
Knowledge transfer	29
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	18
Public-private partnerships	08
Cyber security	05
Software piracy	47
Government cyber security capacity	50
▷ Privacy protection by law exists	64

BELGIUM

DIGITAL TRENDS - OVERALL

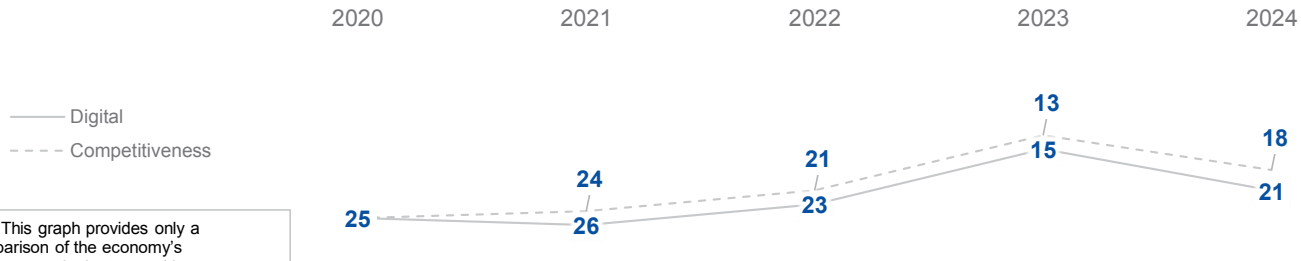
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	25	26	23	15	21
Knowledge	21	21	21	12	18
Technology	19	23	24	19	25
Future readiness	25	26	25	16	26

COMPETITIVENESS & DIGITAL RANKINGS

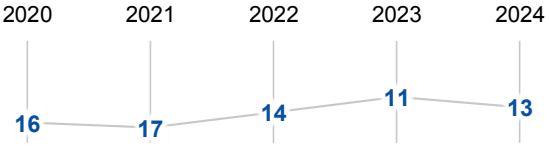


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS < 20 MILLION (37 economies)



BELGIUM

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	20	20	17	07	15
Training & education	31	31	30	22	23
Scientific concentration	21	20	19	18	19

Talent	Rank
Educational assessment PISA - Math	12
International experience	14
Foreign highly skilled personnel	23
Management of cities	35
Digital/Technological skills	19
Net flow of international students	14

Training & education	Rank
Employee training	09
▶ Total public expenditure on education	06
Higher education achievement	20
Pupil-teacher ratio (tertiary education)	32
▷ Graduates in Sciences	51
Women with degrees	20
Computer science education index	28

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	06
▶ Total R&D personnel per capita	06
Female researchers	39
R&D productivity by publication	47
Scientific and technical employment	16
High-tech patent grants	31
Robots in Education and R&D	18
AI articles	24

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	19	18	17	05	30
Capital	21	20	23	18	18
Technological framework	29	37	39	39	33

Regulatory framework	Rank
Starting a business	27
Enforcing contracts	39
Immigration laws	15
Development & application of tech.	23
Scientific research legislation	17
Intellectual property rights	28
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	43
Funding for technological development	09
Banking and financial services	18
Country credit rating	22
Venture capital	17
Investment in Telecommunications	34

Technological framework	Rank
Communications technology	29
Mobile broadband subscribers	20
▷ Wireless broadband	61
Internet users	22
Internet bandwidth speed	34
High-tech exports (%)	16
Secure internet servers	28

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	24	22	28	39	39
Business agility	35	38	27	09	15
IT integration	26	26	22	15	29

Adaptive attitudes	Rank
▷ E-Participation	59
Internet retailing	12
Tablet possession	36
▷ Smartphone possession	51
Attitudes toward globalization	29
Flexibility and adaptability	34

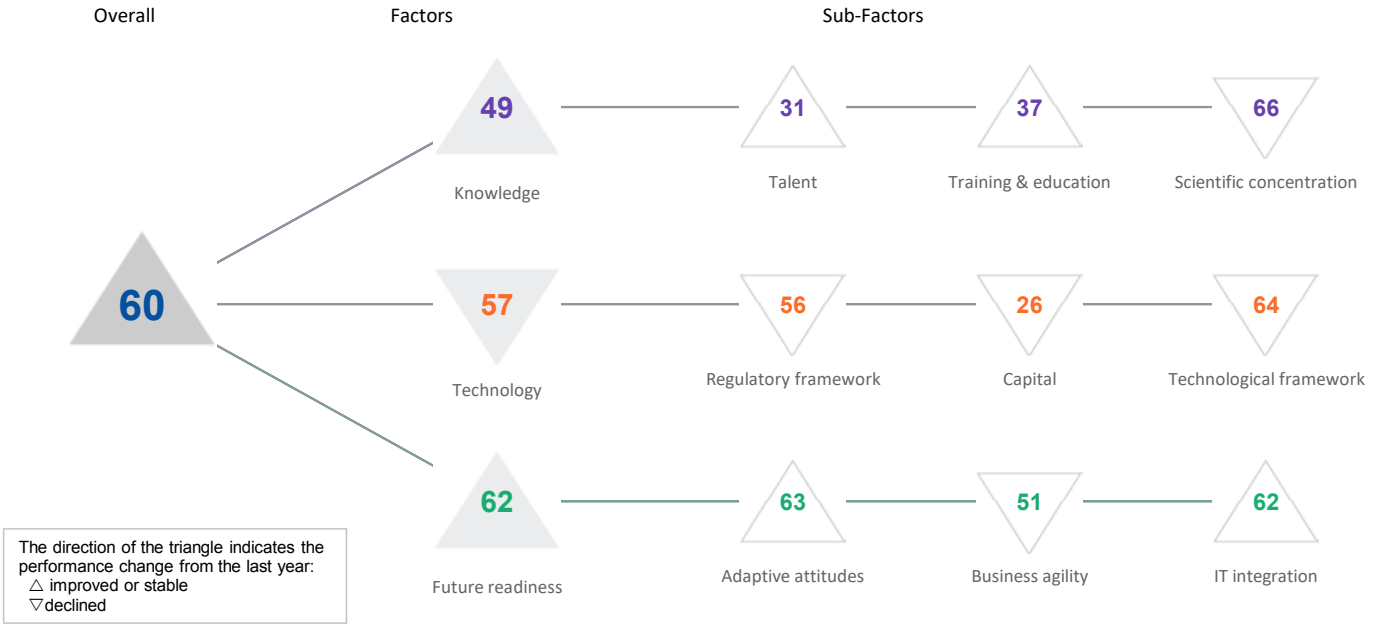
Business agility	Rank
Opportunities and threats	23
World robots distribution	26
Agility of companies	14
▶ Use of big data and analytics	08
Knowledge transfer	12
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	48
Public-private partnerships	34
Cyber security	19
Software piracy	13
▷ Government cyber security capacity	53
▶ Privacy protection by law exists	06

BOTSWANA

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

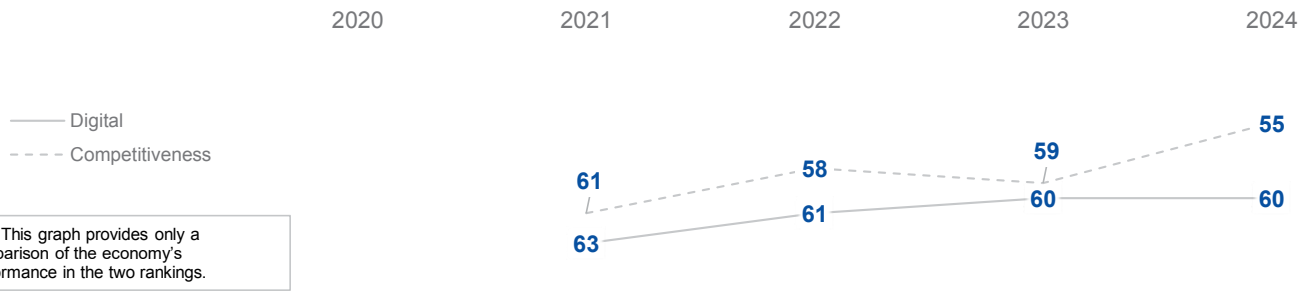


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	-	63	61	60	60
Knowledge	-	64	55	52	49
Technology	-	63	59	52	57
Future readiness	-	63	61	63	62

COMPETITIVENESS & DIGITAL RANKINGS

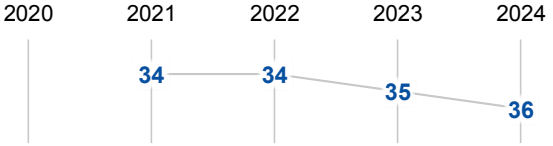


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS < 20 MILLION (37 economies)



BOTSWANA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	-	53	42	37	31
Training & education	-	48	39	41	37
Scientific concentration	-	63	63	64	66

Talent	Rank
Educational assessment PISA - Math	-
International experience	31
▶ Foreign highly skilled personnel	17
▶ Management of cities	27
Digital/Technological skills	40
Net flow of international students	50

Training & education	Rank
Employee training	47
▶ Total public expenditure on education	01
Higher education achievement	-
Pupil-teacher ratio (tertiary education)	38
Graduates in Sciences	50
Women with degrees	-
Computer science education index	61

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	53
High-tech patent grants	-
Robots in Education and R&D	-
AI articles	51

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	-	63	54	54	56
Capital	-	56	47	06	26
Technological framework	-	64	62	63	64

Regulatory framework	Rank
▷ Starting a business	64
Enforcing contracts	59
Immigration laws	28
Development & application of tech.	30
Scientific research legislation	40
Intellectual property rights	34
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	39
Banking and financial services	50
Country credit rating	41
Venture capital	35
▶ Investment in Telecommunications	07

Technological framework	Rank
Communications technology	59
Mobile broadband subscribers	58
Wireless broadband	49
Internet users	57
▷ Internet bandwidth speed	67
▷ High-tech exports (%)	65
Secure internet servers	60

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	-	63	59	63	63
Business agility	-	46	51	46	51
IT integration	-	63	61	63	62

Adaptive attitudes	Rank
E-Participation	63
Internet retailing	-
Tablet possession	-
Smartphone possession	58
Attitudes toward globalization	57
Flexibility and adaptability	57

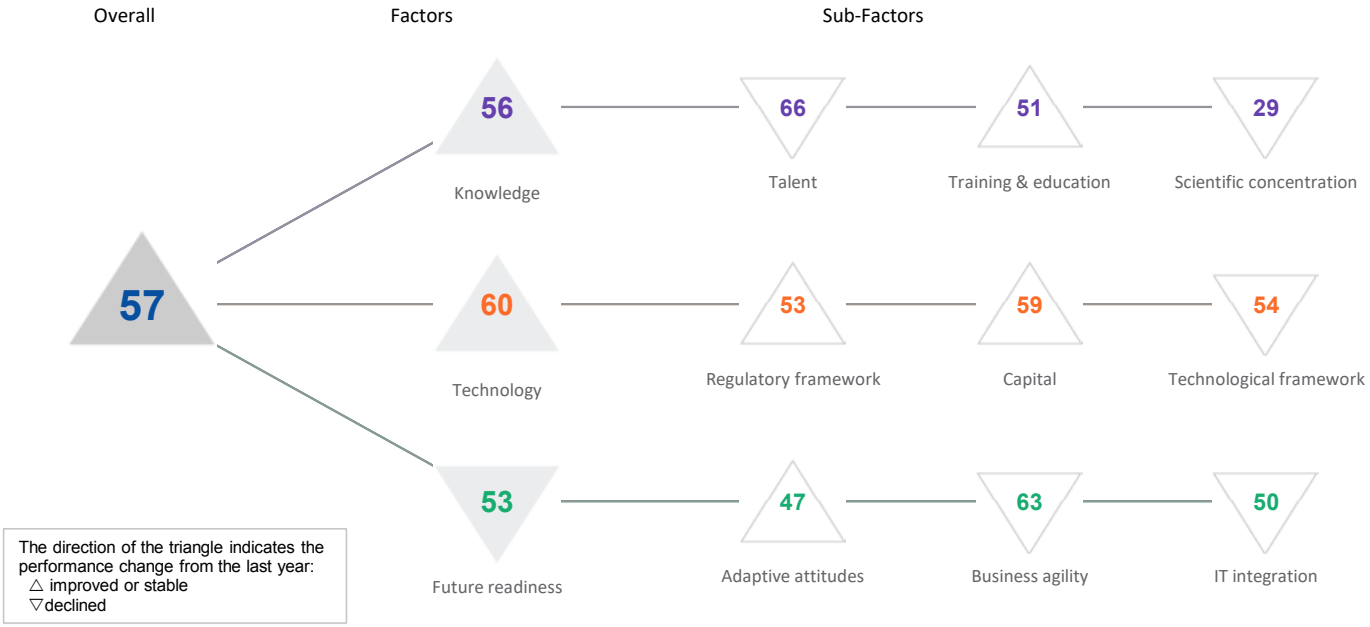
Business agility	Rank
▷ Opportunities and threats	64
World robots distribution	-
▷ Agility of companies	64
Use of big data and analytics	43
▶ Knowledge transfer	23
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	62
Public-private partnerships	29
Cyber security	41
Software piracy	61
Government cyber security capacity	60
Privacy protection by law exists	29

BRAZIL

DIGITAL TRENDS - OVERALL

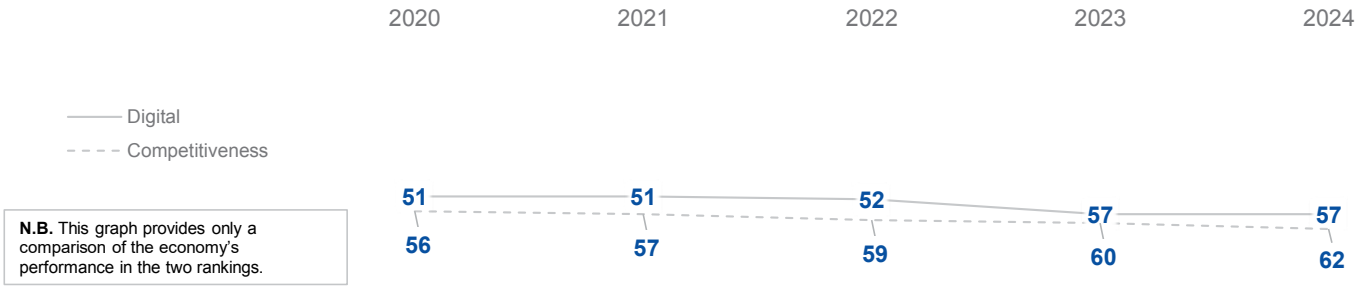
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

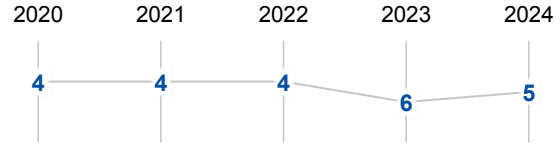
	2020	2021	2022	2023	2024
OVERALL	51	51	52	57	57
Knowledge	57	51	51	57	56
Technology	57	55	55	60	60
Future readiness	43	45	47	52	53

COMPETITIVENESS & DIGITAL RANKINGS

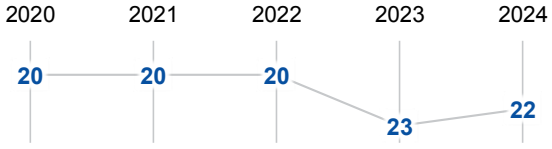


PEER GROUPS RANKINGS

THE AMERICAS (10 economies)



POPULATIONS > 20 MILLION (30 economies)



BRAZIL

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	62	63	62	64	66
Training & education	61	58	51	57	51
Scientific concentration	27	21	25	25	29

Talent	Rank
Educational assessment PISA - Math	54
International experience	62
▷ Foreign highly skilled personnel	65
Management of cities	63
Digital/Technological skills	63
Net flow of international students	47

Training & education	Rank
Employee training	53
▶ Total public expenditure on education	07
Higher education achievement	54
Pupil-teacher ratio (tertiary education)	48
Graduates in Sciences	59
Women with degrees	53
Computer science education index	17

Scientific concentration	Rank
Total expenditure on R&D (%)	36
Total R&D personnel per capita	22
Female researchers	16
▶ R&D productivity by publication	07
Scientific and technical employment	38
High-tech patent grants	47
Robots in Education and R&D	17
AI articles	54

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	52	51	55	58	53
Capital	58	59	57	62	59
Technological framework	50	51	51	51	54

Regulatory framework	Rank
Starting a business	60
Enforcing contracts	41
Immigration laws	30
Development & application of tech.	63
▷ Scientific research legislation	63
Intellectual property rights	58
▶ AI policies passed into law	09

Capital	Rank
IT & media stock market capitalization	47
▷ Funding for technological development	64
Banking and financial services	63
Country credit rating	57
▷ Venture capital	64
▶ Investment in Telecommunications	14

Technological framework	Rank
Communications technology	60
Mobile broadband subscribers	54
Wireless broadband	54
Internet users	54
Internet bandwidth speed	37
High-tech exports (%)	44
Secure internet servers	46

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	39	40	43	51	47
Business agility	41	42	52	61	63
IT integration	48	49	43	45	50

Adaptive attitudes	Rank
E-Participation	19
Internet retailing	44
Tablet possession	58
▶ Smartphone possession	14
Attitudes toward globalization	42
Flexibility and adaptability	35

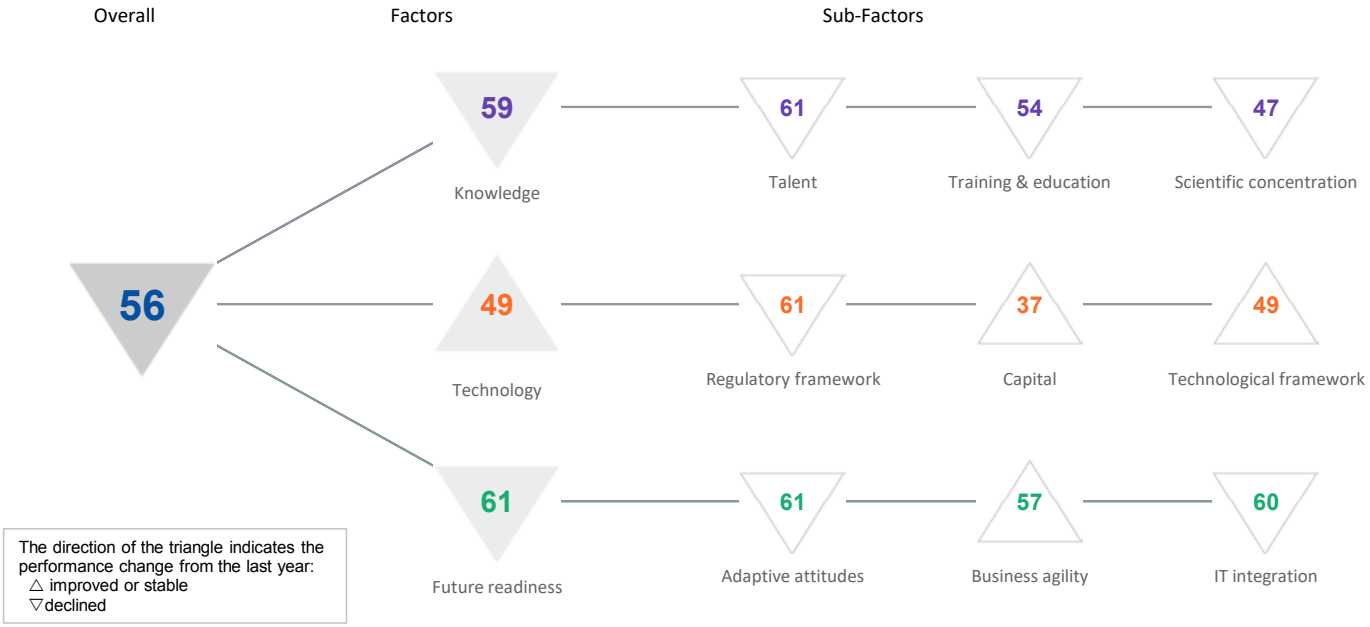
Business agility	Rank
Opportunities and threats	53
World robots distribution	19
Agility of companies	59
Use of big data and analytics	60
▷ Knowledge transfer	66
Entrepreneurial fear of failure	32

IT integration	Rank
E-Government	42
Public-private partnerships	53
Cyber security	59
Software piracy	37
Government cyber security capacity	29
Privacy protection by law exists	44

BULGARIA

DIGITAL TRENDS - OVERALL

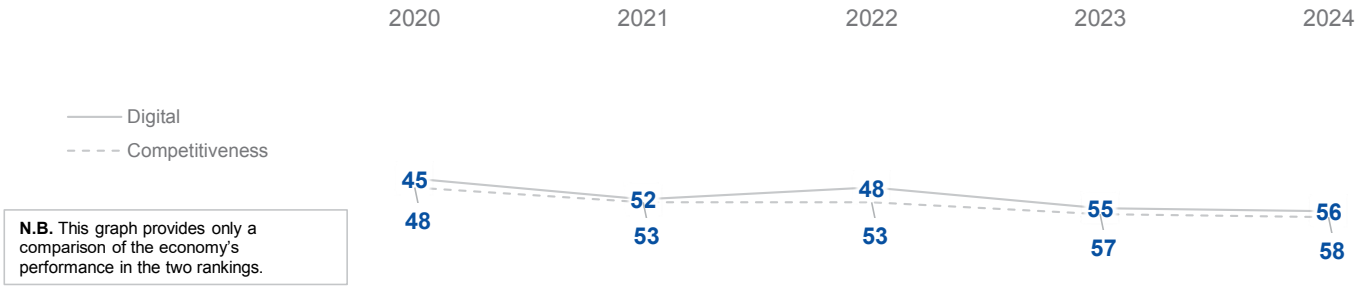
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

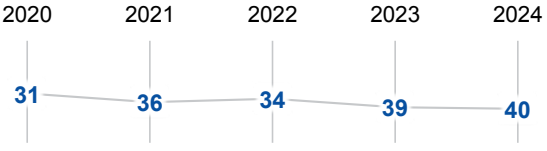
	2020	2021	2022	2023	2024
OVERALL	45	52	48	55	56
Knowledge	47	53	48	53	59
Technology	45	51	51	56	49
Future readiness	44	55	50	58	61

COMPETITIVENESS & DIGITAL RANKINGS

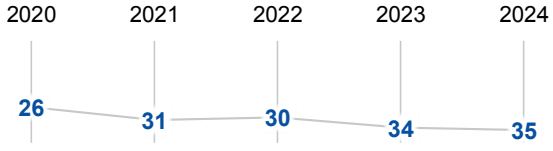


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



BULGARIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	48	54	56	58	61
Training & education	50	53	52	46	54
Scientific concentration	42	46	40	44	47

Talent	Rank
Educational assessment PISA - Math	45
International experience	55
Foreign highly skilled personnel	60
Management of cities	60
Digital/Technological skills	49
Net flow of international students	45

Training & education	Rank
▷ Employee training	67
Total public expenditure on education	44
Higher education achievement	48
▶ Pupil-teacher ratio (tertiary education)	14
Graduates in Sciences	46
Women with degrees	34
Computer science education index	54

Scientific concentration	Rank
Total expenditure on R&D (%)	44
Total R&D personnel per capita	41
▶ Female researchers	12
R&D productivity by publication	43
Scientific and technical employment	39
High-tech patent grants	19
Robots in Education and R&D	48
AI articles	49

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	55	55	52	60	61
Capital	48	53	52	54	37
Technological framework	39	42	46	50	49

Regulatory framework	Rank
Starting a business	48
Enforcing contracts	31
Immigration laws	62
Development & application of tech.	58
Scientific research legislation	58
Intellectual property rights	62
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	17
Funding for technological development	48
Banking and financial services	40
Country credit rating	44
Venture capital	41
Investment in Telecommunications	18

Technological framework	Rank
Communications technology	50
Mobile broadband subscribers	41
Wireless broadband	19
Internet users	55
Internet bandwidth speed	49
High-tech exports (%)	46
▶ Secure internet servers	14

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	41	45	39	50	61
Business agility	40	61	56	62	57
IT integration	47	53	49	57	60

Adaptive attitudes	Rank
E-Participation	48
Internet retailing	50
Tablet possession	38
Smartphone possession	17
▷ Attitudes toward globalization	64
▷ Flexibility and adaptability	65

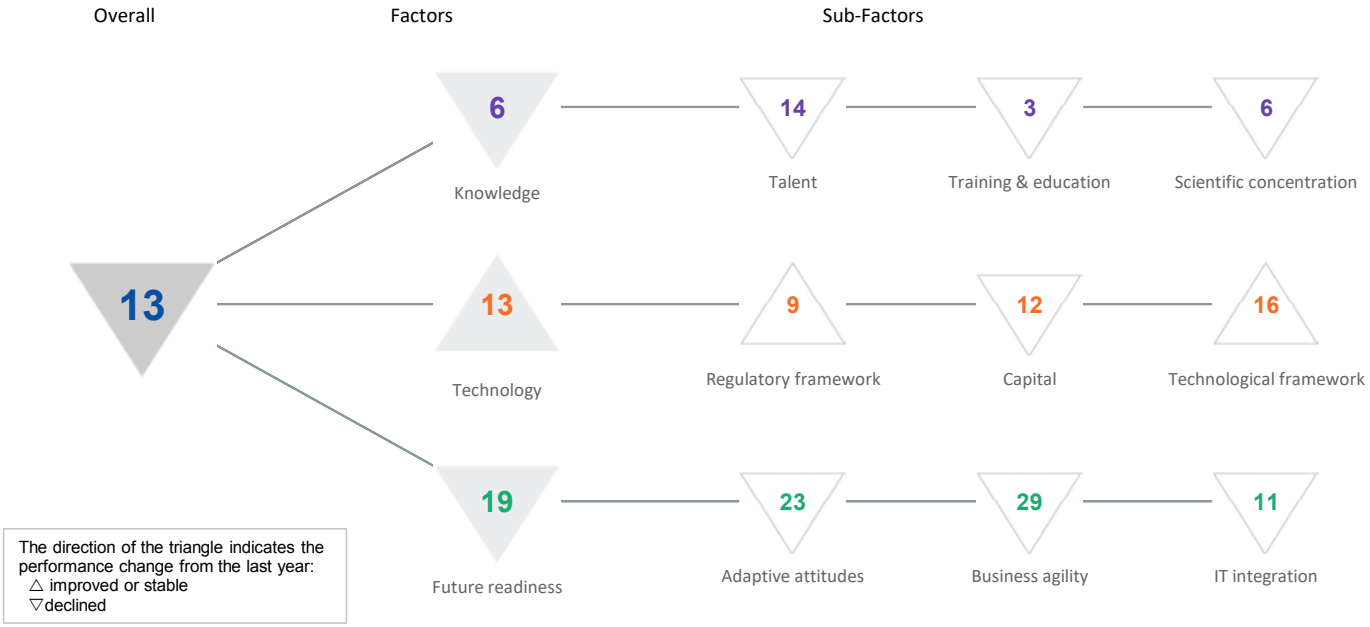
Business agility	Rank
▷ Opportunities and threats	63
World robots distribution	43
▷ Agility of companies	65
Use of big data and analytics	45
Knowledge transfer	62
▶ Entrepreneurial fear of failure	05

IT integration	Rank
E-Government	47
Public-private partnerships	57
Cyber security	63
Software piracy	52
Government cyber security capacity	59
▶ Privacy protection by law exists	04

CANADA

DIGITAL TRENDS - OVERALL

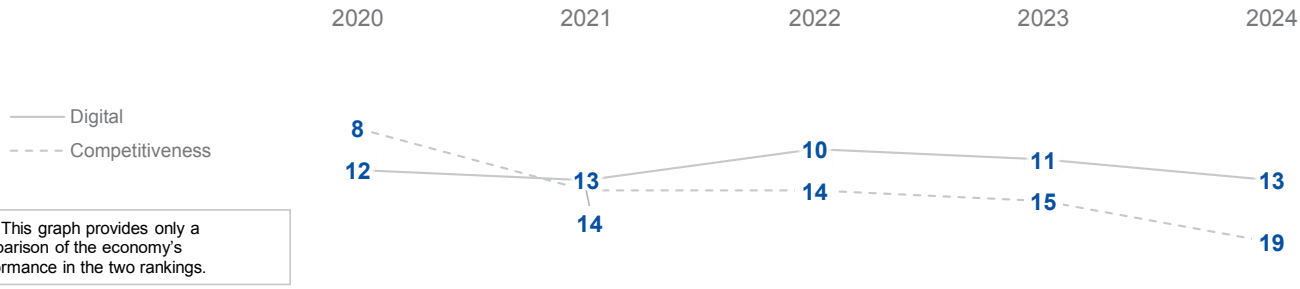
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	12	13	10	11	13
Knowledge	05	07	03	04	06
Technology	13	15	14	13	13
Future readiness	15	15	11	11	19

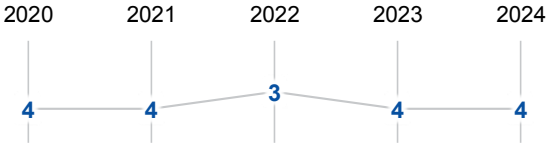
COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (10 economies)

POPULATIONS > 20 MILLION (30 economies)



CANADA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	08	09	08	09	14
Training & education	06	10	03	02	03
Scientific concentration	07	05	04	05	06

Talent	Rank
Educational assessment PISA - Math	09
International experience	38
Foreign highly skilled personnel	16
Management of cities	33
Digital/Technological skills	23
Net flow of international students	05

Training & education	Rank
Employee training	29
Total public expenditure on education	37
Higher education achievement	05
Pupil-teacher ratio (tertiary education)	09
Graduates in Sciences	24
▶ Women with degrees	02
Computer science education index	08

Scientific concentration	Rank
Total expenditure on R&D (%)	24
Total R&D personnel per capita	24
Female researchers	-
R&D productivity by publication	10
▶ Scientific and technical employment	02
High-tech patent grants	15
Robots in Education and R&D	09
AI articles	22

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	12	13	13	19	09
Capital	03	09	06	04	12
Technological framework	26	29	31	26	16

Regulatory framework	Rank
▶ Starting a business	02
▷ Enforcing contracts	51
Immigration laws	11
Development & application of tech.	25
Scientific research legislation	20
Intellectual property rights	19
▶ AI policies passed into law	04

Capital	Rank
IT & media stock market capitalization	26
Funding for technological development	20
Banking and financial services	25
Country credit rating	10
Venture capital	26
Investment in Telecommunications	15

Technological framework	Rank
Communications technology	42
Mobile broadband subscribers	09
▷ Wireless broadband	58
Internet users	23
Internet bandwidth speed	06
High-tech exports (%)	34
Secure internet servers	17

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	16	17	18	18	23
Business agility	16	20	19	24	29
IT integration	13	14	02	04	11

Adaptive attitudes	Rank
E-Participation	14
Internet retailing	13
Tablet possession	16
▷ Smartphone possession	56
Attitudes toward globalization	37
▷ Flexibility and adaptability	43

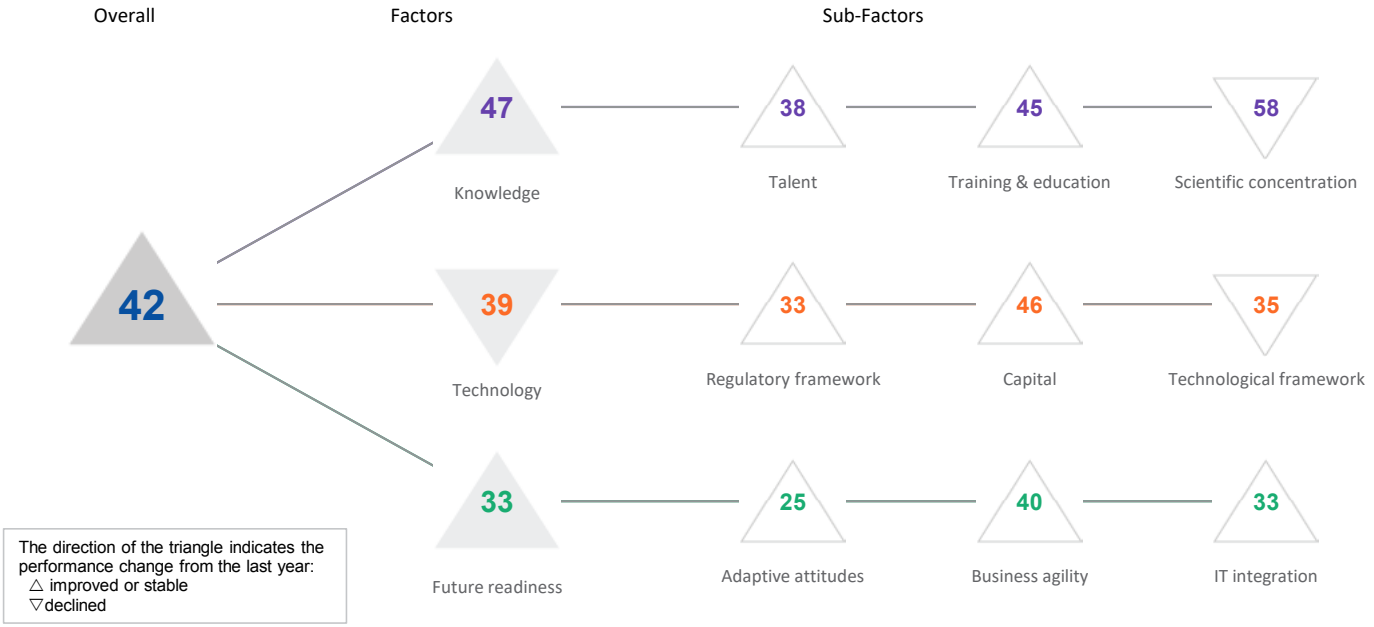
Business agility	Rank
Opportunities and threats	38
World robots distribution	13
Agility of companies	37
Use of big data and analytics	16
Knowledge transfer	13
▷ Entrepreneurial fear of failure	48

IT integration	Rank
E-Government	40
Public-private partnerships	28
Cyber security	25
Software piracy	13
▶ Government cyber security capacity	05
Privacy protection by law exists	33

CHILE

DIGITAL TRENDS - OVERALL

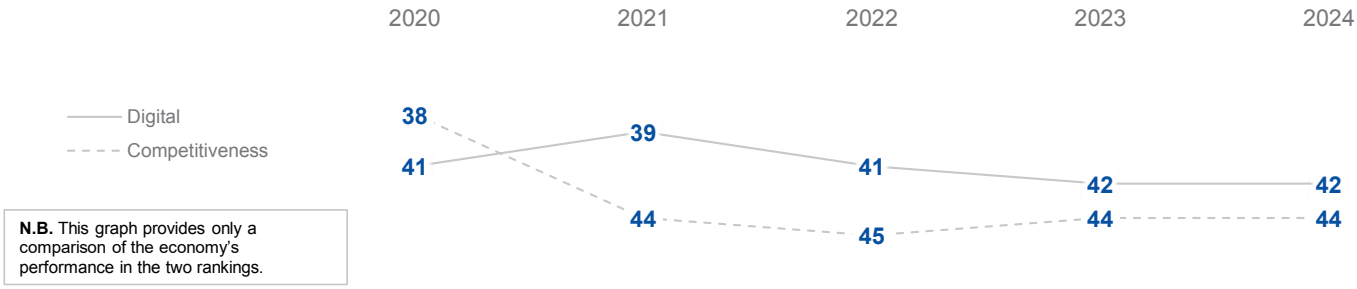
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

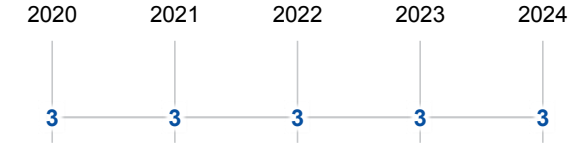
	2020	2021	2022	2023	2024
OVERALL	41	39	41	42	42
Knowledge	49	49	50	47	47
Technology	40	35	41	38	39
Future readiness	39	36	33	38	33

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (10 economies)



POPULATIONS < 20 MILLION (37 economies)

CHILE

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	37	36	39	41	38
Training & education	49	51	54	45	45
Scientific concentration	58	57	55	56	58

Talent	Rank
Educational assessment PISA - Math	47
International experience	37
Foreign highly skilled personnel	14
Management of cities	52
Digital/Technological skills	25
Net flow of international students	44

Training & education	Rank
▷ Employee training	56
▶ Total public expenditure on education	12
Higher education achievement	39
Pupil-teacher ratio (tertiary education)	-
Graduates in Sciences	41
Women with degrees	43
Computer science education index	43

Scientific concentration	Rank
Total expenditure on R&D (%)	54
Total R&D personnel per capita	53
Female researchers	35
R&D productivity by publication	20
Scientific and technical employment	41
▷ High-tech patent grants	57
Robots in Education and R&D	42
AI articles	48

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	33	33	41	37	33
Capital	40	38	43	50	46
Technological framework	44	36	36	30	35

Regulatory framework	Rank
Starting a business	30
Enforcing contracts	37
Immigration laws	20
Development & application of tech.	51
▷ Scientific research legislation	60
Intellectual property rights	39
AI policies passed into law	17

Capital	Rank
▷ IT & media stock market capitalization	55
Funding for technological development	53
Banking and financial services	29
Country credit rating	36
Venture capital	47
▶ Investment in Telecommunications	10

Technological framework	Rank
Communications technology	13
Mobile broadband subscribers	40
Wireless broadband	46
Internet users	33
▶ Internet bandwidth speed	09
High-tech exports (%)	52
Secure internet servers	38

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	22	24	26	25	25
Business agility	54	54	43	52	40
IT integration	40	39	34	34	33

Adaptive attitudes	Rank
E-Participation	24
Internet retailing	35
Tablet possession	25
Smartphone possession	32
▶ Attitudes toward globalization	12
▷ Flexibility and adaptability	59

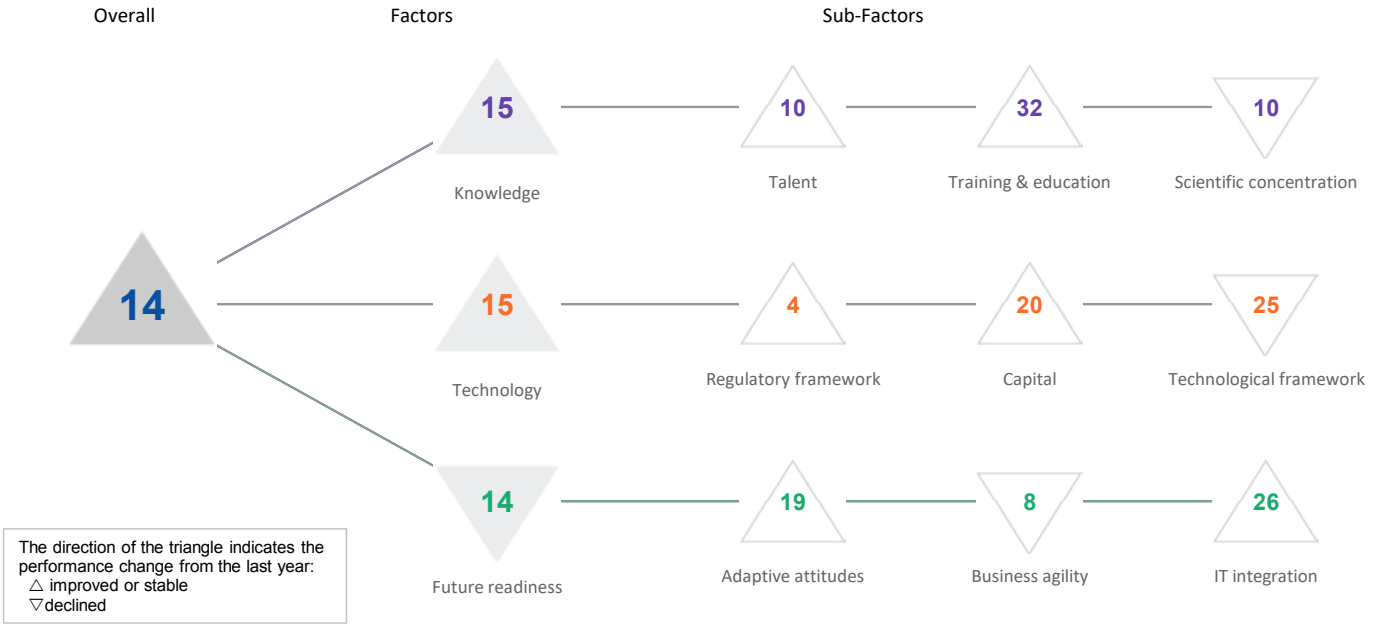
Business agility	Rank
Opportunities and threats	26
World robots distribution	47
Agility of companies	26
Use of big data and analytics	51
Knowledge transfer	54
Entrepreneurial fear of failure	20

IT integration	Rank
E-Government	28
Public-private partnerships	20
Cyber security	49
Software piracy	48
▶ Government cyber security capacity	11
Privacy protection by law exists	43

CHINA

DIGITAL TRENDS - OVERALL

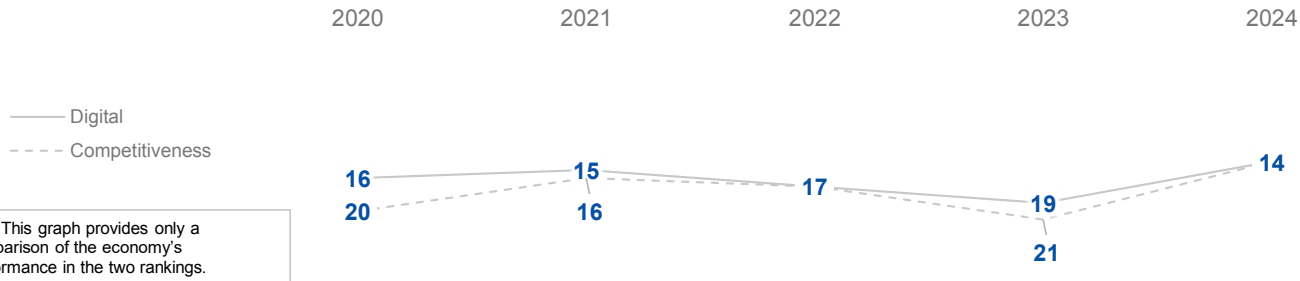
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	16	15	17	19	14
Knowledge	08	06	17	21	15
Technology	27	20	18	22	15
Future readiness	18	17	15	13	14

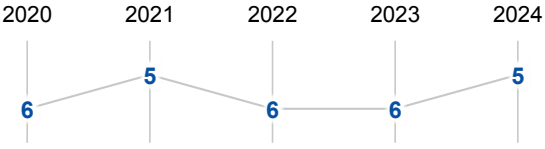
COMPETITIVENESS & DIGITAL RANKINGS



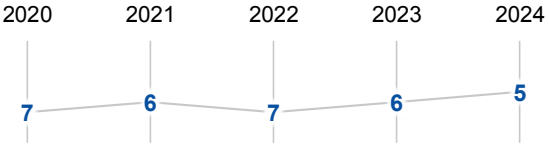
N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)



POPULATIONS > 20 MILLION (30 economies)



CHINA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	13	12	12	14	10
Training & education	40	35	33	43	32
Scientific concentration	02	01	09	09	10

Talent	Rank
▶ Educational assessment PISA - Math	01
International experience	23
Foreign highly skilled personnel	34
Management of cities	08
Digital/Technological skills	16
Net flow of international students	52

Training & education	Rank
Employee training	12
▷ Total public expenditure on education	54
Higher education achievement	11
Pupil-teacher ratio (tertiary education)	46
Graduates in Sciences	-
▷ Women with degrees	56
Computer science education index	03

Scientific concentration	Rank
Total expenditure on R&D (%)	15
Total R&D personnel per capita	39
Female researchers	53
▶ R&D productivity by publication	01
Scientific and technical employment	-
High-tech patent grants	05
▶ Robots in Education and R&D	01
AI articles	50

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	18	15	16	20	04
Capital	31	27	27	26	20
Technological framework	32	28	24	20	25

Regulatory framework	Rank
Starting a business	16
Enforcing contracts	05
Immigration laws	36
Development & application of tech.	16
Scientific research legislation	14
Intellectual property rights	33
▶ AI policies passed into law	03

Capital	Rank
IT & media stock market capitalization	25
Funding for technological development	15
Banking and financial services	27
Country credit rating	27
Venture capital	23
Investment in Telecommunications	32

Technological framework	Rank
Communications technology	18
Mobile broadband subscribers	03
Wireless broadband	18
▷ Internet users	58
Internet bandwidth speed	25
High-tech exports (%)	15
Secure internet servers	51

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	17	19	22	20	19
Business agility	04	03	03	04	08
IT integration	35	32	32	32	26

Adaptive attitudes	Rank
E-Participation	11
Internet retailing	19
Tablet possession	39
Smartphone possession	53
Attitudes toward globalization	10
Flexibility and adaptability	17

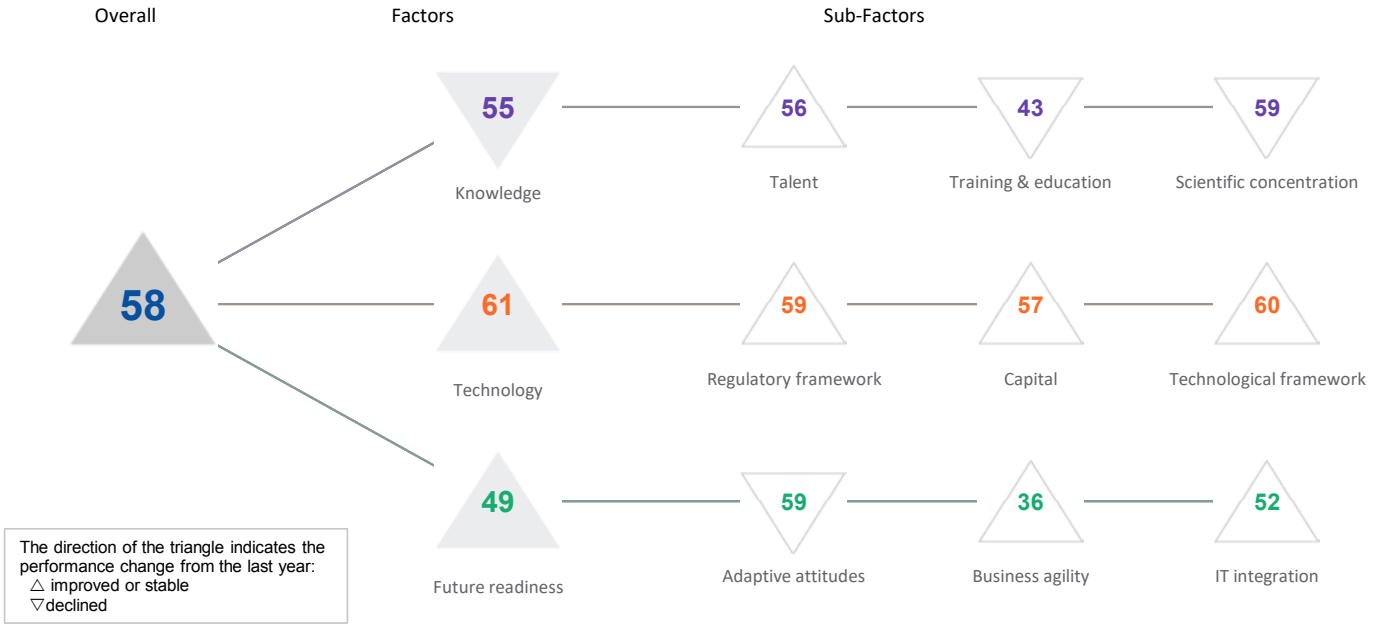
Business agility	Rank
Opportunities and threats	14
▶ World robots distribution	01
Agility of companies	15
Use of big data and analytics	11
Knowledge transfer	19
Entrepreneurial fear of failure	53

IT integration	Rank
E-Government	32
Public-private partnerships	07
Cyber security	09
▷ Software piracy	57
Government cyber security capacity	03
▷ Privacy protection by law exists	58

COLOMBIA

DIGITAL TRENDS - OVERALL

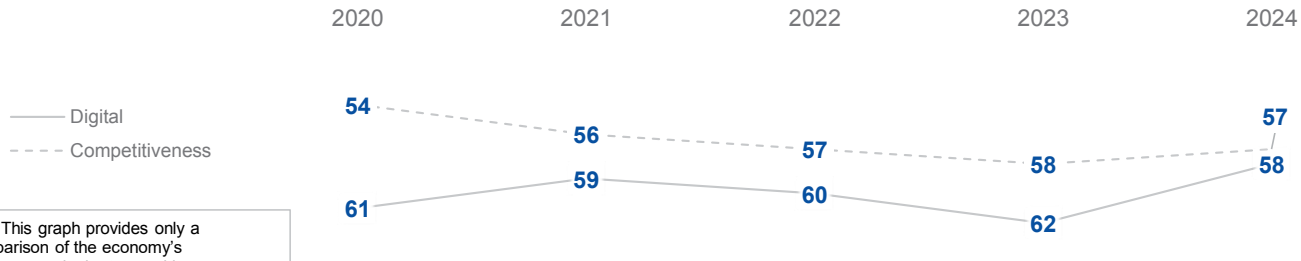
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	61	59	60	62	58
Knowledge	59	56	57	54	55
Technology	61	60	61	62	61
Future readiness	50	53	56	60	49

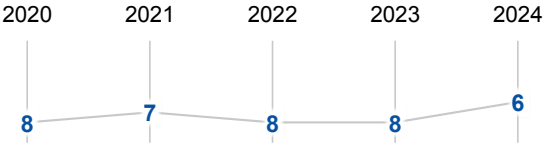
COMPETITIVENESS & DIGITAL RANKINGS



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

PEER GROUPS RANKINGS

THE AMERICAS (10 economies)



POPULATIONS > 20 MILLION (30 economies)

COLOMBIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	54	57	58	57	56
Training & education	48	50	46	42	43
Scientific concentration	57	58	56	57	59

Talent	Rank
Educational assessment PISA - Math	53
International experience	47
Foreign highly skilled personnel	45
Management of cities	42
Digital/Technological skills	48
Net flow of international students	55

Training & education	Rank
Employee training	25
▶ Total public expenditure on education	18
Higher education achievement	47
Pupil-teacher ratio (tertiary education)	33
Graduates in Sciences	31
Women with degrees	50
Computer science education index	55

Scientific concentration	Rank
Total expenditure on R&D (%)	57
Total R&D personnel per capita	51
Female researchers	28
▶ R&D productivity by publication	15
Scientific and technical employment	44
High-tech patent grants	56
Robots in Education and R&D	48
AI articles	53

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	60	61	59	62	59
Capital	56	49	56	57	57
Technological framework	61	59	61	62	60

Regulatory framework	Rank
Starting a business	40
▷ Enforcing contracts	66
Immigration laws	44
Development & application of tech.	37
Scientific research legislation	57
Intellectual property rights	52
AI policies passed into law	20

Capital	Rank
IT & media stock market capitalization	58
Funding for technological development	55
Banking and financial services	59
Country credit rating	56
Venture capital	48
▶ Investment in Telecommunications	04

Technological framework	Rank
Communications technology	58
Mobile broadband subscribers	-
▷ Wireless broadband	65
▷ Internet users	62
Internet bandwidth speed	44
High-tech exports (%)	49
Secure internet servers	58

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	60	58	48	58	59
Business agility	38	47	54	59	36
IT integration	49	46	58	58	52

Adaptive attitudes	Rank
E-Participation	40
Internet retailing	54
▷ Tablet possession	61
Smartphone possession	34
Attitudes toward globalization	26
Flexibility and adaptability	49

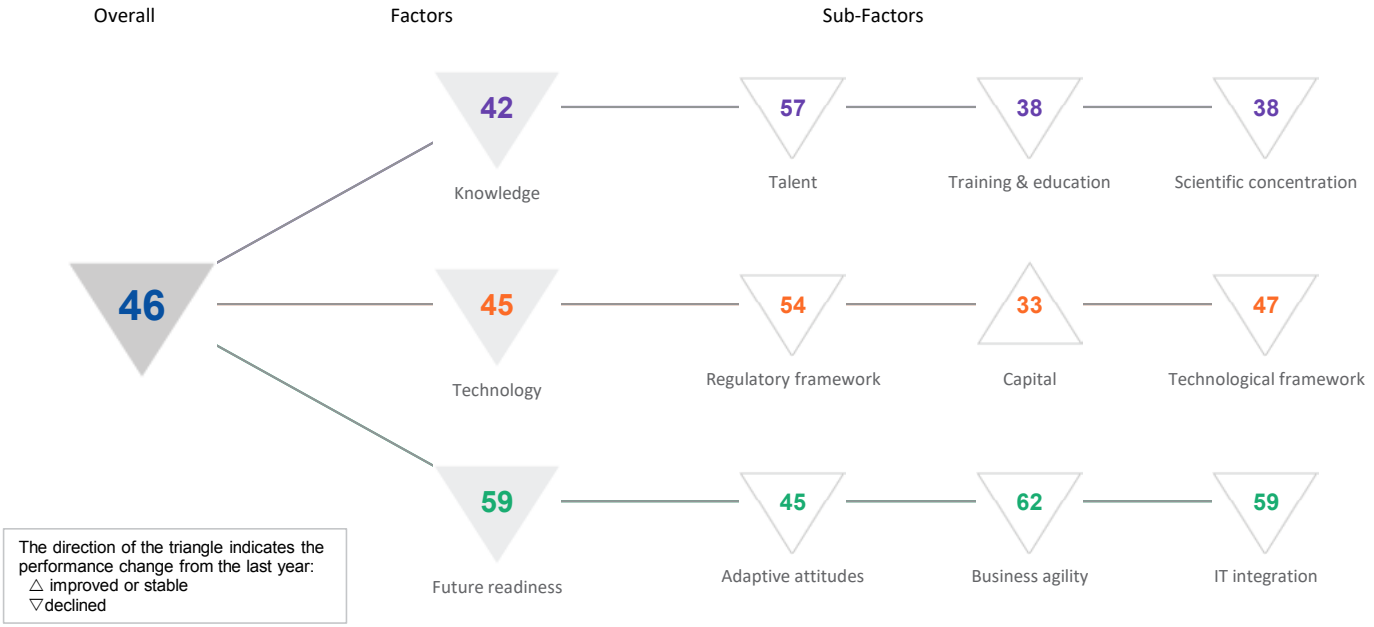
Business agility	Rank
Opportunities and threats	58
World robots distribution	49
Agility of companies	34
Use of big data and analytics	33
Knowledge transfer	38
▶ Entrepreneurial fear of failure	09

IT integration	Rank
E-Government	56
Public-private partnerships	23
Cyber security	55
Software piracy	41
▷ Government cyber security capacity	63
▶ Privacy protection by law exists	03

CROATIA

DIGITAL TRENDS - OVERALL

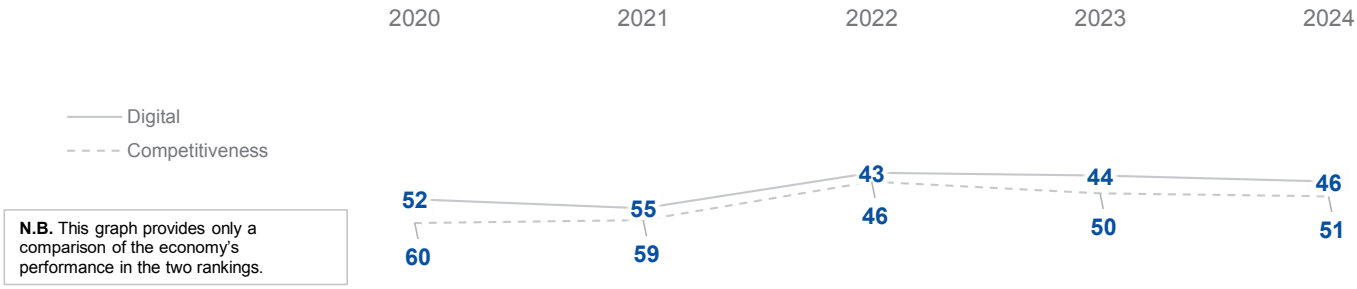
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

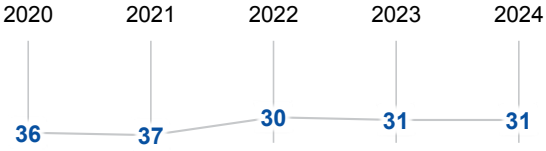
	2020	2021	2022	2023	2024
OVERALL	52	55	43	44	46
Knowledge	41	47	40	40	42
Technology	49	50	42	42	45
Future readiness	62	60	48	50	59

COMPETITIVENESS & DIGITAL RANKINGS

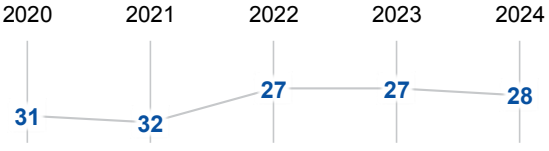


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



CROATIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	61	61	52	54	57
Training & education	26	42	34	36	38
Scientific concentration	32	34	34	32	38

Talent	Rank
Educational assessment PISA - Math	35
International experience	63
▷ Foreign highly skilled personnel	64
Management of cities	55
Digital/Technological skills	26
Net flow of international students	56

Training & education	Rank
Employee training	59
Total public expenditure on education	31
Higher education achievement	45
▶ Pupil-teacher ratio (tertiary education)	08
▶ Graduates in Sciences	15
Women with degrees	45
Computer science education index	49

Scientific concentration	Rank
Total expenditure on R&D (%)	30
Total R&D personnel per capita	36
▶ Female researchers	08
R&D productivity by publication	50
Scientific and technical employment	31
High-tech patent grants	24
Robots in Education and R&D	39
AI articles	35

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	59	56	46	47	54
Capital	43	50	35	33	33
Technological framework	40	41	42	44	47

Regulatory framework	Rank
Starting a business	49
Enforcing contracts	23
Immigration laws	21
▷ Development & application of tech.	65
Scientific research legislation	56
Intellectual property rights	54
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	23
Funding for technological development	47
Banking and financial services	47
Country credit rating	43
Venture capital	50
▶ Investment in Telecommunications	05

Technological framework	Rank
Communications technology	22
Mobile broadband subscribers	25
Wireless broadband	53
Internet users	53
Internet bandwidth speed	59
High-tech exports (%)	39
Secure internet servers	30

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	46	39	40	41	45
Business agility	63	64	58	57	62
IT integration	59	58	44	48	59

Adaptive attitudes	Rank
▶ E-Participation	14
Internet retailing	52
Tablet possession	28
Smartphone possession	15
▷ Attitudes toward globalization	66
Flexibility and adaptability	56

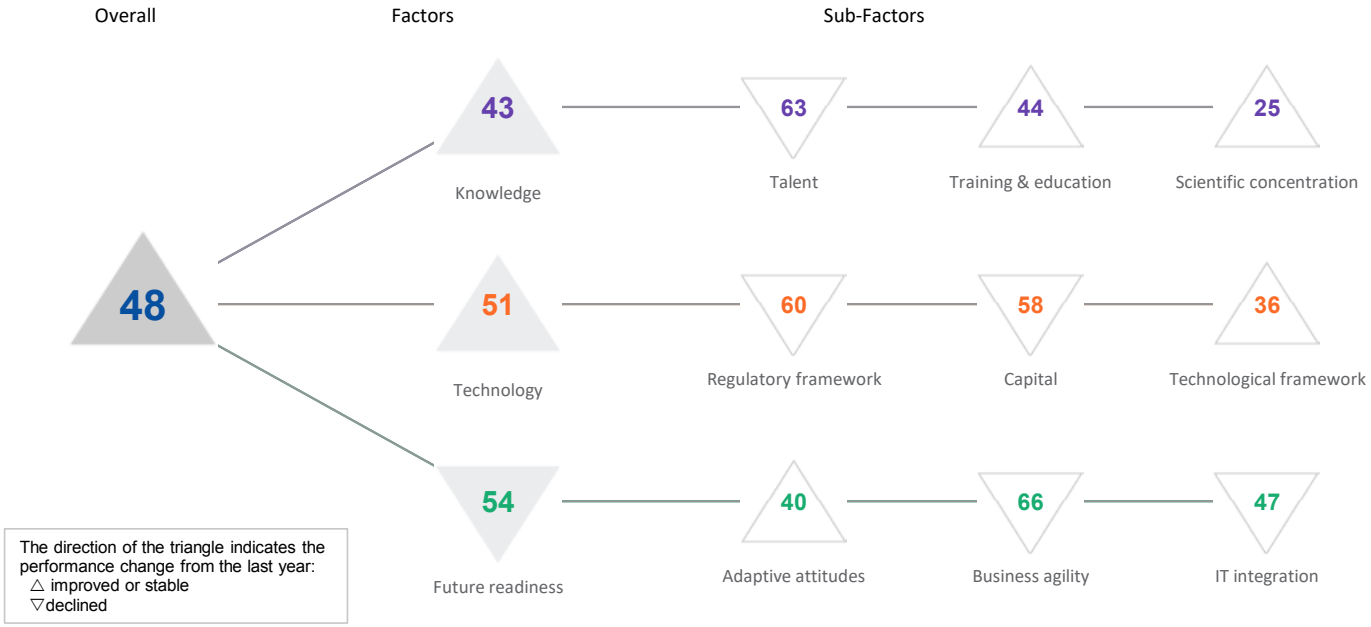
Business agility	Rank
Opportunities and threats	59
World robots distribution	48
Agility of companies	40
Use of big data and analytics	57
▷ Knowledge transfer	65
Entrepreneurial fear of failure	29

IT integration	Rank
E-Government	29
▷ Public-private partnerships	67
Cyber security	47
Software piracy	44
Government cyber security capacity	49
Privacy protection by law exists	53

CYPRUS

DIGITAL TRENDS - OVERALL

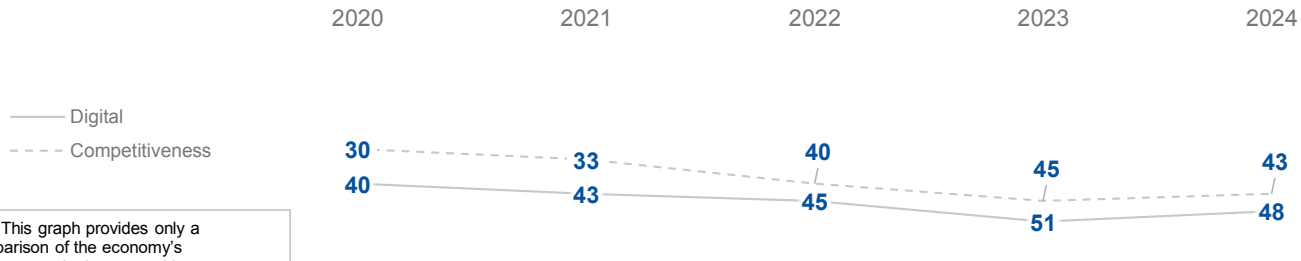
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	40	43	45	51	48
Knowledge	40	39	39	48	43
Technology	52	53	52	53	51
Future readiness	29	34	39	53	54

COMPETITIVENESS & DIGITAL RANKINGS

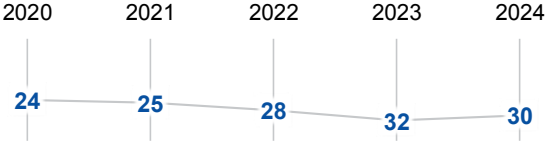


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS < 20 MILLION (37 economies)



CYPRUS

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	57	56	53	55	63
Training & education	30	29	40	44	44
Scientific concentration	35	29	26	40	25

Talent	Rank
Educational assessment PISA - Math	44
International experience	33
Foreign highly skilled personnel	24
Management of cities	48
Digital/Technological skills	51
▷ Net flow of international students	62

Training & education	Rank
Employee training	51
Total public expenditure on education	22
▶ Higher education achievement	12
Pupil-teacher ratio (tertiary education)	57
Graduates in Sciences	62
▶ Women with degrees	19
Computer science education index	30

Scientific concentration	Rank
Total expenditure on R&D (%)	45
Total R&D personnel per capita	44
Female researchers	25
R&D productivity by publication	54
▶ Scientific and technical employment	06
High-tech patent grants	28
Robots in Education and R&D	-
▶ AI articles	01

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	47	47	50	53	60
Capital	52	54	54	56	58
Technological framework	52	52	49	49	36

Regulatory framework	Rank
Starting a business	28
Enforcing contracts	61
▷ Immigration laws	64
Development & application of tech.	57
Scientific research legislation	52
Intellectual property rights	53
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	42
Funding for technological development	56
▷ Banking and financial services	65
Country credit rating	46
▷ Venture capital	65
Investment in Telecommunications	21

Technological framework	Rank
Communications technology	37
Mobile broadband subscribers	36
Wireless broadband	20
Internet users	35
Internet bandwidth speed	52
High-tech exports (%)	26
Secure internet servers	27

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	28	27	36	46	40
Business agility	42	50	53	63	66
IT integration	29	33	29	39	47

Adaptive attitudes	Rank
E-Participation	43
Internet retailing	-
Tablet possession	42
▶ Smartphone possession	06
Attitudes toward globalization	51
Flexibility and adaptability	50

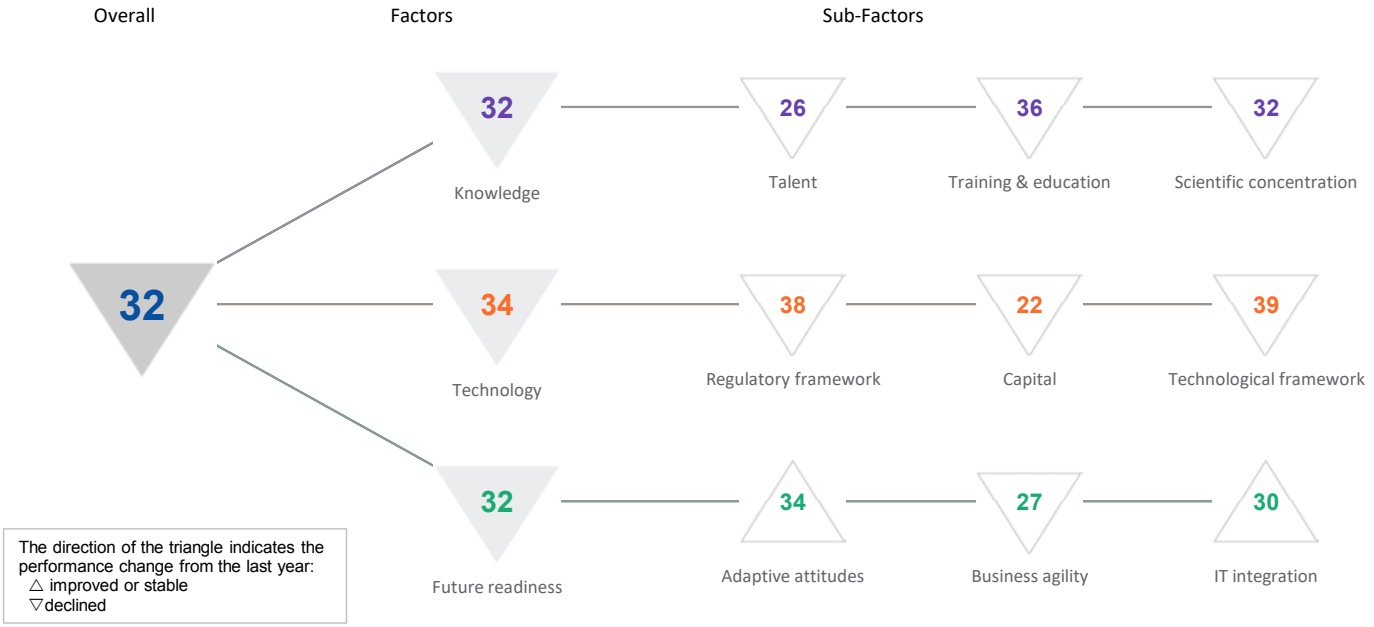
Business agility	Rank
Opportunities and threats	51
World robots distribution	-
Agility of companies	60
▷ Use of big data and analytics	66
Knowledge transfer	57
Entrepreneurial fear of failure	47

IT integration	Rank
E-Government	35
Public-private partnerships	61
Cyber security	56
Software piracy	35
Government cyber security capacity	47
Privacy protection by law exists	26

CZECH REPUBLIC

DIGITAL TRENDS - OVERALL

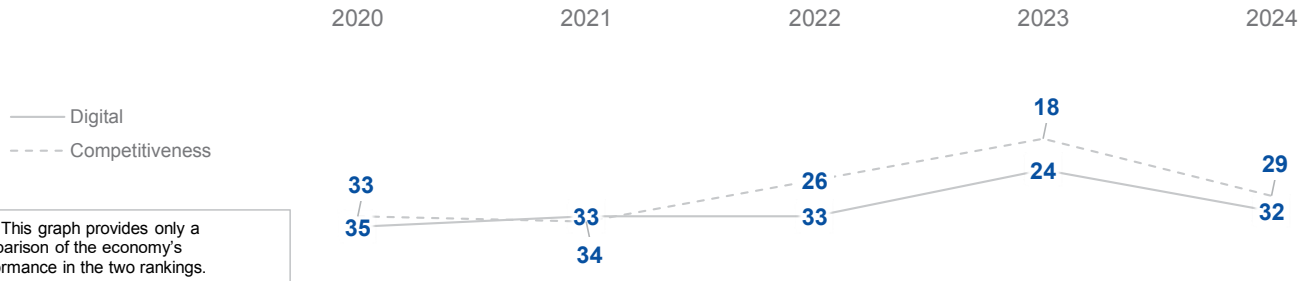
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	35	33	33	24	32
Knowledge	37	35	32	24	32
Technology	36	37	35	26	34
Future readiness	36	37	29	27	32

COMPETITIVENESS & DIGITAL RANKINGS



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PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS < 20 MILLION (37 economies)

CZECH REPUBLIC

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	26	28	22	17	26
Training & education	46	45	38	33	36
Scientific concentration	31	30	29	27	32

Talent	Rank
Educational assessment PISA - Math	16
International experience	17
Foreign highly skilled personnel	40
Management of cities	38
Digital/Technological skills	34
▶ Net flow of international students	11

Training & education	Rank
Employee training	26
Total public expenditure on education	27
Higher education achievement	46
Pupil-teacher ratio (tertiary education)	31
Graduates in Sciences	27
Women with degrees	45
Computer science education index	35

Scientific concentration	Rank
Total expenditure on R&D (%)	19
Total R&D personnel per capita	19
▷ Female researchers	52
R&D productivity by publication	37
Scientific and technical employment	26
High-tech patent grants	30
▶ Robots in Education and R&D	15
AI articles	34

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	45	44	37	33	38
Capital	27	29	26	13	22
Technological framework	28	32	30	28	39

Regulatory framework	Rank
▷ Starting a business	58
▷ Enforcing contracts	53
Immigration laws	19
Development & application of tech.	40
Scientific research legislation	26
Intellectual property rights	26
AI policies passed into law	28

Capital	Rank
IT & media stock market capitalization	24
Funding for technological development	28
Banking and financial services	21
Country credit rating	24
Venture capital	21
Investment in Telecommunications	46

Technological framework	Rank
Communications technology	33
Mobile broadband subscribers	39
Wireless broadband	29
Internet users	48
Internet bandwidth speed	51
High-tech exports (%)	19
▶ Secure internet servers	12

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	34	35	31	34	34
Business agility	27	32	24	12	27
IT integration	36	36	36	30	30

Adaptive attitudes	Rank
▷ E-Participation	56
Internet retailing	21
Tablet possession	46
▶ Smartphone possession	13
Attitudes toward globalization	30
Flexibility and adaptability	31

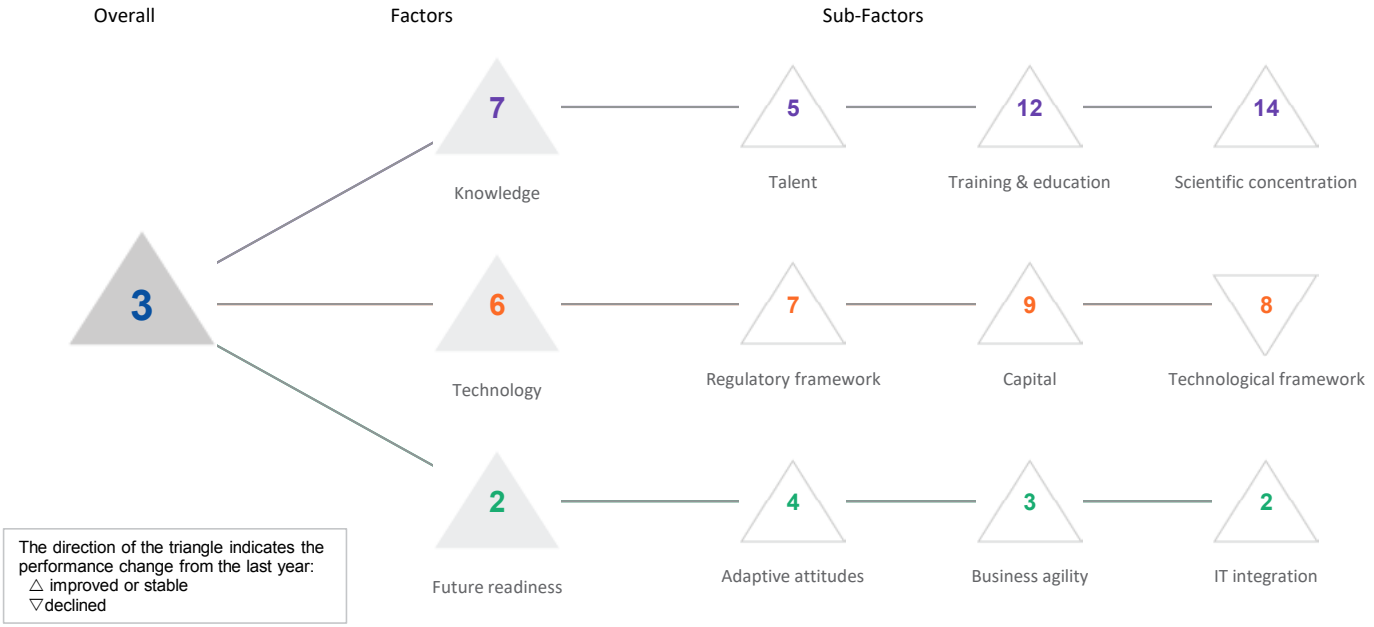
Business agility	Rank
Opportunities and threats	25
World robots distribution	16
Agility of companies	25
Use of big data and analytics	34
Knowledge transfer	35
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	46
▷ Public-private partnerships	54
Cyber security	35
Software piracy	20
Government cyber security capacity	24
▶ Privacy protection by law exists	11

DENMARK

DIGITAL TRENDS - OVERALL

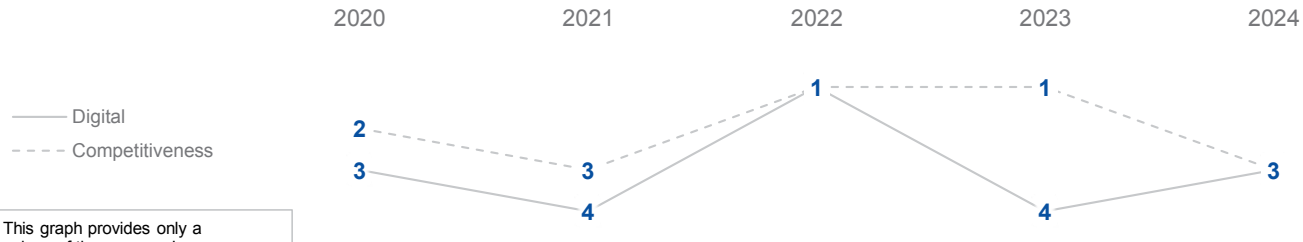
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	03	04	01	04	03
Knowledge	06	08	06	09	07
Technology	09	09	07	07	06
Future readiness	01	02	01	03	02

COMPETITIVENESS & DIGITAL RANKINGS



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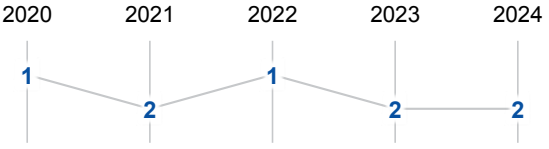
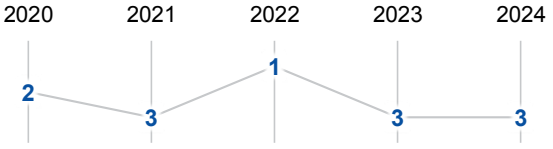
PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



DENMARK

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	04	05	05	05	05
Training & education	09	04	07	12	12
Scientific concentration	15	17	17	20	14

Talent	Rank
Educational assessment PISA - Math	12
International experience	12
Foreign highly skilled personnel	11
Management of cities	04
Digital/Technological skills	08
Net flow of international students	09

Training & education	Rank
▶ Employee training	01
Total public expenditure on education	17
Higher education achievement	25
Pupil-teacher ratio (tertiary education)	19
Graduates in Sciences	30
Women with degrees	25
Computer science education index	27

Scientific concentration	Rank
Total expenditure on R&D (%)	13
Total R&D personnel per capita	04
Female researchers	34
▷ R&D productivity by publication	44
Scientific and technical employment	20
▷ High-tech patent grants	37
Robots in Education and R&D	24
AI articles	07

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	04	04	06	10	07
Capital	23	13	14	10	09
Technological framework	06	06	06	06	08

Regulatory framework	Rank
Starting a business	25
Enforcing contracts	13
Immigration laws	33
Development & application of tech.	03
Scientific research legislation	05
Intellectual property rights	04
AI policies passed into law	28

Capital	Rank
▷ IT & media stock market capitalization	56
Funding for technological development	03
Banking and financial services	07
Country credit rating	01
Venture capital	04
Investment in Telecommunications	17

Technological framework	Rank
Communications technology	02
▷ Mobile broadband subscribers	48
Wireless broadband	12
Internet users	09
Internet bandwidth speed	15
High-tech exports (%)	32
▶ Secure internet servers	01

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	02	04	05	08	04
Business agility	05	07	01	06	03
IT integration	01	01	01	02	02

Adaptive attitudes	Rank
E-Participation	01
Internet retailing	08
▷ Tablet possession	37
Smartphone possession	44
▶ Attitudes toward globalization	01
Flexibility and adaptability	06

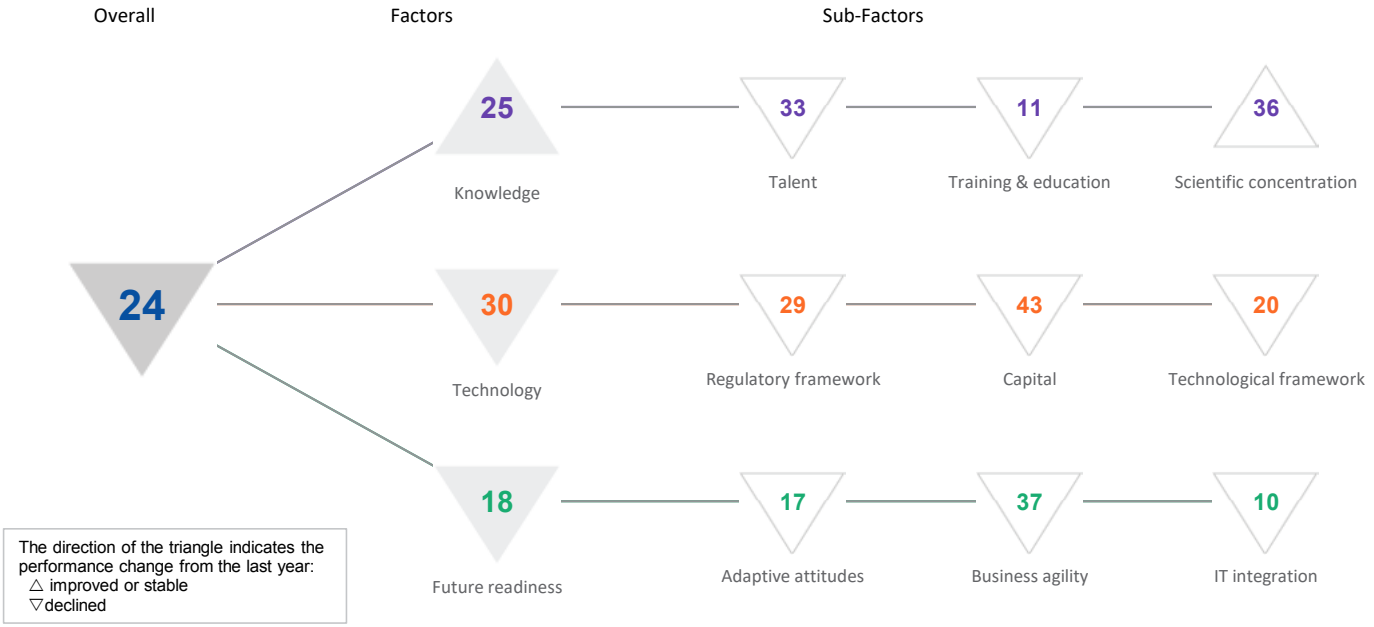
Business agility	Rank
Opportunities and threats	02
World robots distribution	29
▶ Agility of companies	01
Use of big data and analytics	10
Knowledge transfer	03
Entrepreneurial fear of failure	-

IT integration	Rank
▶ E-Government	01
Public-private partnerships	03
Cyber security	07
Software piracy	08
Government cyber security capacity	27
Privacy protection by law exists	18

ESTONIA

DIGITAL TRENDS - OVERALL

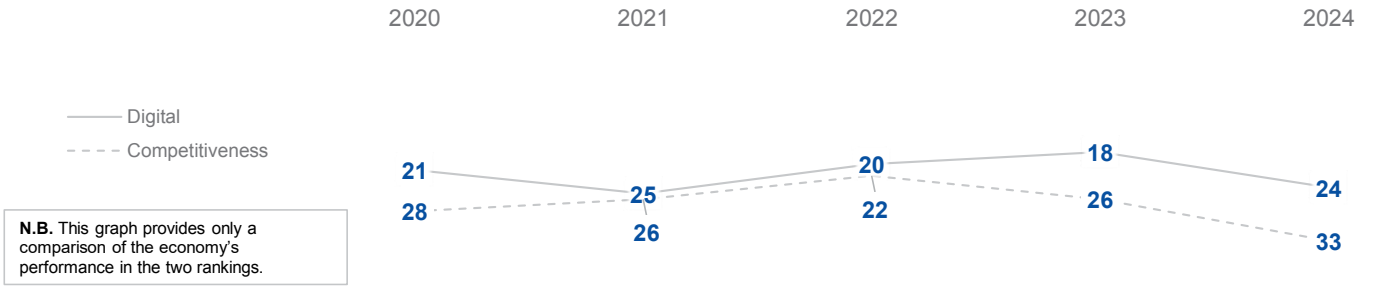
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

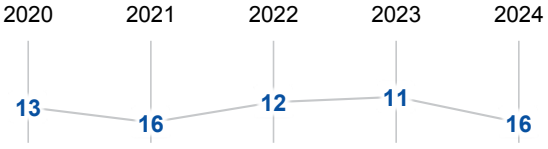
	2020	2021	2022	2023	2024
OVERALL	21	25	20	18	24
Knowledge	23	27	23	25	25
Technology	23	25	21	23	30
Future readiness	20	20	12	09	18

COMPETITIVENESS & DIGITAL RANKINGS

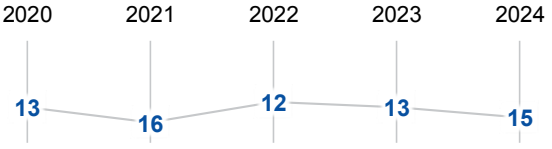


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



ESTONIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	31	29	30	28	33
Training & education	03	08	05	08	11
Scientific concentration	47	45	43	43	36

Talent	Rank
Educational assessment PISA - Math	07
▷ International experience	52
Foreign highly skilled personnel	29
Management of cities	49
Digital/Technological skills	41
Net flow of international students	31

Training & education	Rank
Employee training	15
Total public expenditure on education	09
Higher education achievement	34
Pupil-teacher ratio (tertiary education)	13
Graduates in Sciences	19
Women with degrees	17
Computer science education index	29

Scientific concentration	Rank
Total expenditure on R&D (%)	22
Total R&D personnel per capita	30
Female researchers	20
▷ R&D productivity by publication	59
Scientific and technical employment	28
High-tech patent grants	11
Robots in Education and R&D	48
AI articles	21

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	30	28	30	18	29
Capital	29	33	29	35	43
Technological framework	17	20	21	13	20

Regulatory framework	Rank
Starting a business	07
Enforcing contracts	08
▷ Immigration laws	63
Development & application of tech.	22
Scientific research legislation	38
Intellectual property rights	16
AI policies passed into law	28

Capital	Rank
▷ IT & media stock market capitalization	53
Funding for technological development	37
Banking and financial services	28
Country credit rating	26
Venture capital	30
Investment in Telecommunications	41

Technological framework	Rank
Communications technology	28
Mobile broadband subscribers	46
▶ Wireless broadband	04
Internet users	30
Internet bandwidth speed	41
High-tech exports (%)	25
Secure internet servers	08

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	18	20	14	09	17
Business agility	26	25	20	23	37
IT integration	22	25	07	05	10

Adaptive attitudes	Rank
▶ E-Participation	06
Internet retailing	20
▶ Tablet possession	05
Smartphone possession	15
Attitudes toward globalization	40
Flexibility and adaptability	45

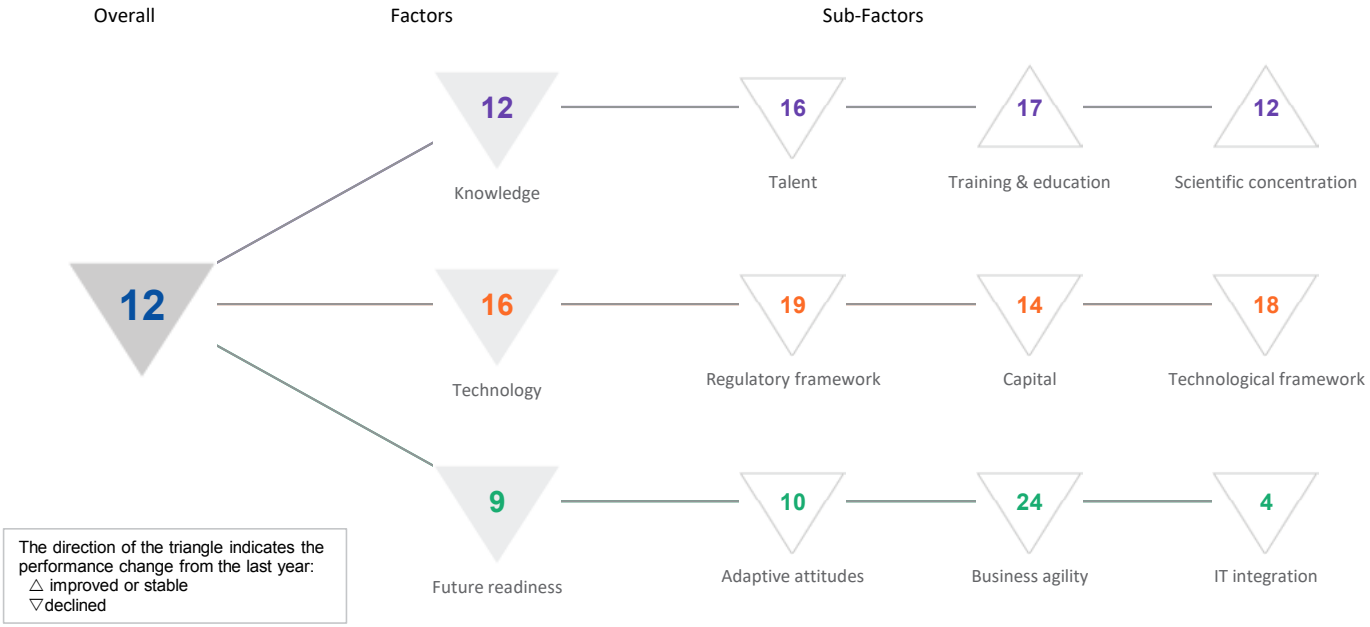
Business agility	Rank
Opportunities and threats	41
World robots distribution	46
Agility of companies	22
Use of big data and analytics	49
Knowledge transfer	34
Entrepreneurial fear of failure	19

IT integration	Rank
▶ E-Government	02
▷ Public-private partnerships	58
Cyber security	31
Software piracy	30
▶ Government cyber security capacity	01
Privacy protection by law exists	32

FINLAND

DIGITAL TRENDS - OVERALL

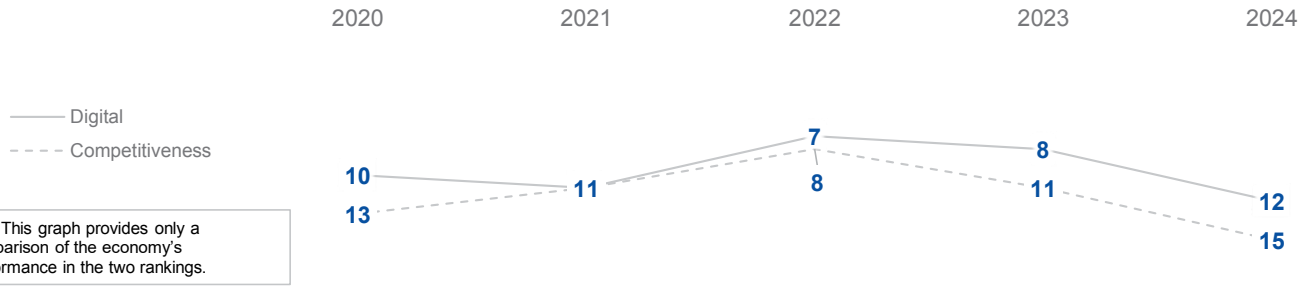
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	10	11	07	08	12
Knowledge	15	09	09	11	12
Technology	10	12	08	09	16
Future readiness	09	09	06	05	09

COMPETITIVENESS & DIGITAL RANKINGS



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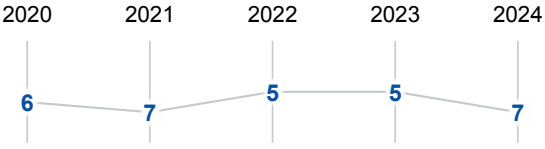
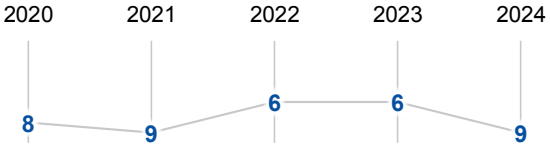
PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



FINLAND

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	11	10	09	11	16
Training & education	20	19	17	19	17
Scientific concentration	12	10	10	13	12

Talent	Rank
Educational assessment PISA - Math	20
International experience	24
▷ Foreign highly skilled personnel	52
Management of cities	09
▶ Digital/Technological skills	03
Net flow of international students	15

Training & education	Rank
Employee training	11
Total public expenditure on education	11
Higher education achievement	38
▷ Pupil-teacher ratio (tertiary education)	45
Graduates in Sciences	11
Women with degrees	21
Computer science education index	15

Scientific concentration	Rank
Total expenditure on R&D (%)	11
Total R&D personnel per capita	10
Female researchers	40
▷ R&D productivity by publication	49
Scientific and technical employment	09
High-tech patent grants	09
Robots in Education and R&D	25
AI articles	08

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	13	11	05	03	19
Capital	06	10	05	07	14
Technological framework	10	14	12	11	18

Regulatory framework	Rank
Starting a business	18
Enforcing contracts	33
Immigration laws	43
Development & application of tech.	07
Scientific research legislation	06
▶ Intellectual property rights	03
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	16
Funding for technological development	10
Banking and financial services	17
Country credit rating	13
Venture capital	12
▷ Investment in Telecommunications	54

Technological framework	Rank
▶ Communications technology	04
Mobile broadband subscribers	31
Wireless broadband	07
Internet users	25
Internet bandwidth speed	36
▷ High-tech exports (%)	50
Secure internet servers	09

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	10	07	03	03	10
Business agility	22	21	16	21	24
IT integration	02	02	03	03	04

Adaptive attitudes	Rank
E-Participation	18
Internet retailing	16
▶ Tablet possession	06
Smartphone possession	24
Attitudes toward globalization	08
Flexibility and adaptability	32

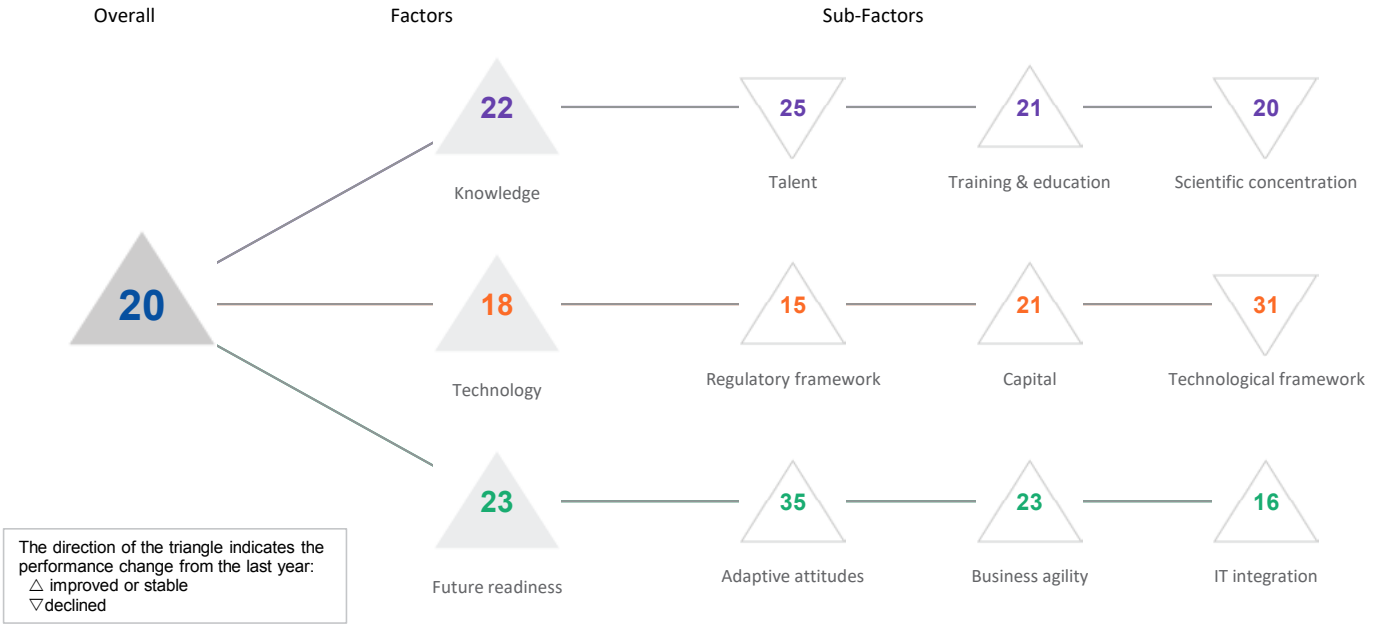
Business agility	Rank
Opportunities and threats	36
World robots distribution	34
Agility of companies	33
Use of big data and analytics	19
Knowledge transfer	11
Entrepreneurial fear of failure	27

IT integration	Rank
E-Government	09
Public-private partnerships	13
▶ Cyber security	04
Software piracy	13
Government cyber security capacity	25
Privacy protection by law exists	30

FRANCE

DIGITAL TRENDS - OVERALL

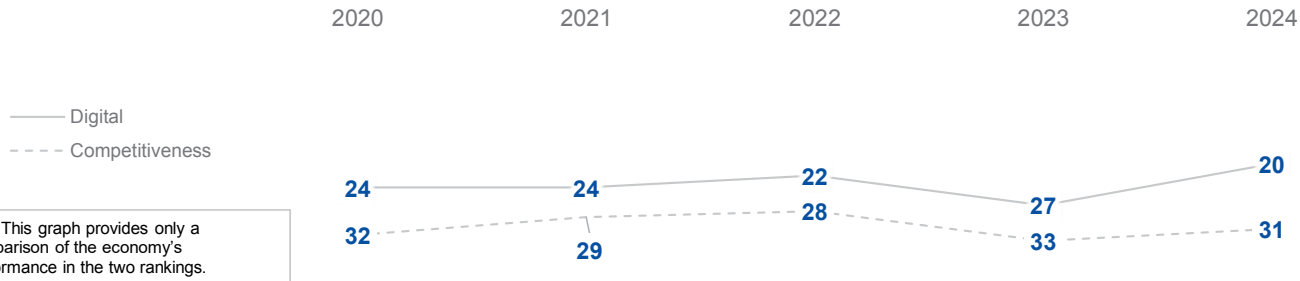
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	24	24	22	27	20
Knowledge	20	20	20	22	22
Technology	15	16	16	20	18
Future readiness	31	31	34	35	23

COMPETITIVENESS & DIGITAL RANKINGS



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

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS > 20 MILLION (30 economies)

FRANCE

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	25	23	23	24	25
Training & education	36	27	27	29	21
Scientific concentration	13	12	13	14	20

Talent	Rank
Educational assessment PISA - Math	27
International experience	22
Foreign highly skilled personnel	20
Management of cities	25
Digital/Technological skills	34
Net flow of international students	21

Training & education	Rank
Employee training	27
Total public expenditure on education	19
Higher education achievement	24
Pupil-teacher ratio (tertiary education)	41
▶ Graduates in Sciences	08
Women with degrees	29
Computer science education index	12

Scientific concentration	Rank
Total expenditure on R&D (%)	17
Total R&D personnel per capita	20
▷ Female researchers	48
R&D productivity by publication	19
▶ Scientific and technical employment	11
High-tech patent grants	16
▶ Robots in Education and R&D	05
AI articles	40

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	09	10	15	21	15
Capital	20	21	19	28	21
Technological framework	19	17	20	19	31

Regulatory framework	Rank
Starting a business	21
Enforcing contracts	15
Immigration laws	23
Development & application of tech.	27
Scientific research legislation	23
Intellectual property rights	25
AI policies passed into law	12

Capital	Rank
IT & media stock market capitalization	32
Funding for technological development	25
Banking and financial services	34
Country credit rating	18
Venture capital	29
Investment in Telecommunications	19

Technological framework	Rank
▷ Communications technology	46
Mobile broadband subscribers	33
Wireless broadband	40
Internet users	45
▶ Internet bandwidth speed	03
High-tech exports (%)	20
Secure internet servers	21

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	36	48	41	43	35
Business agility	36	33	38	41	23
IT integration	21	22	21	24	16

Adaptive attitudes	Rank
E-Participation	28
Internet retailing	23
Tablet possession	21
Smartphone possession	32
▷ Attitudes toward globalization	59
▷ Flexibility and adaptability	61

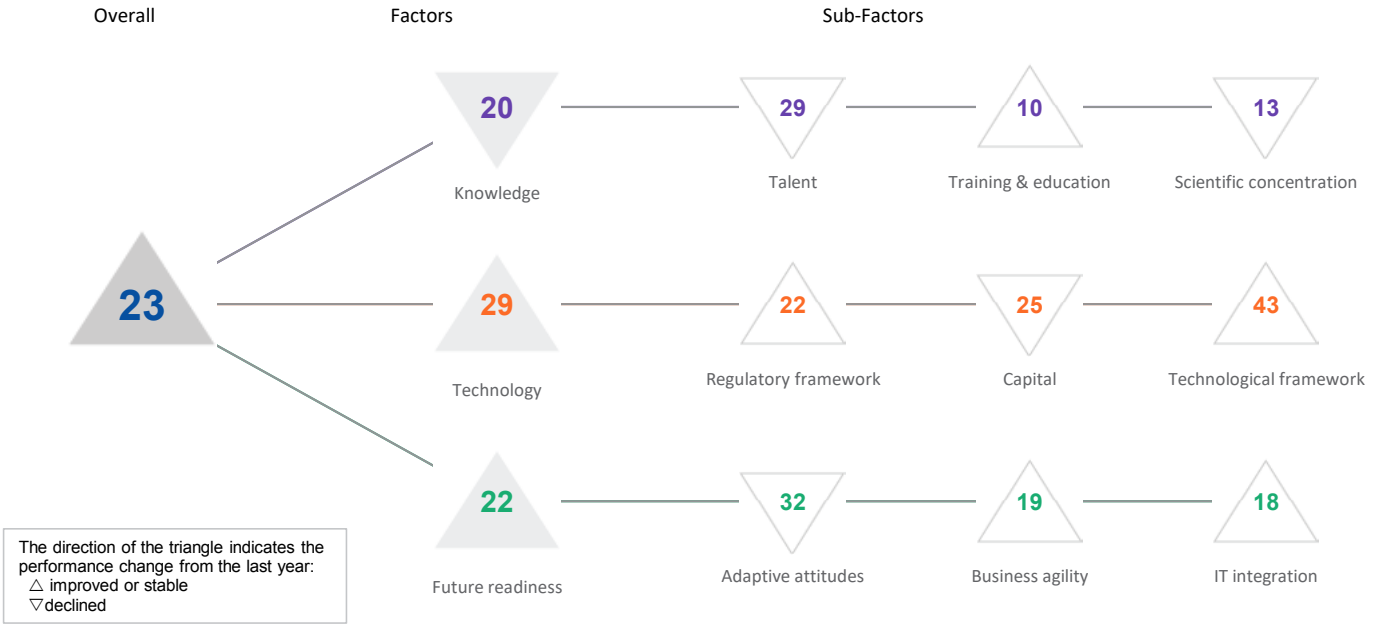
Business agility	Rank
▷ Opportunities and threats	46
▶ World robots distribution	08
Agility of companies	32
Use of big data and analytics	28
Knowledge transfer	21
Entrepreneurial fear of failure	16

IT integration	Rank
E-Government	31
Public-private partnerships	22
Cyber security	30
Software piracy	20
Government cyber security capacity	18
Privacy protection by law exists	22

GERMANY

DIGITAL TRENDS - OVERALL

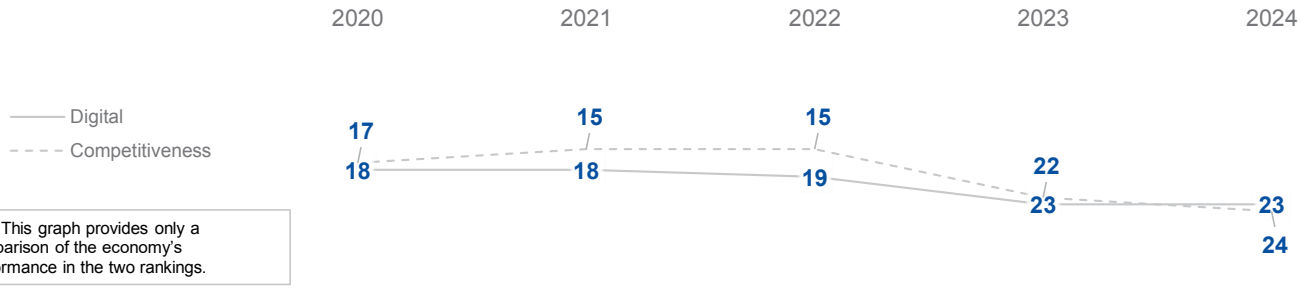
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	18	18	19	23	23
Knowledge	12	14	11	14	20
Technology	31	31	27	34	29
Future readiness	19	18	19	24	22

COMPETITIVENESS & DIGITAL RANKINGS



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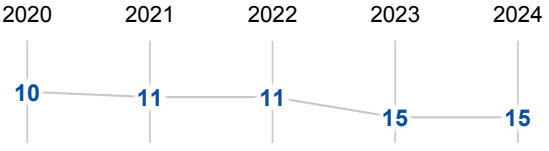
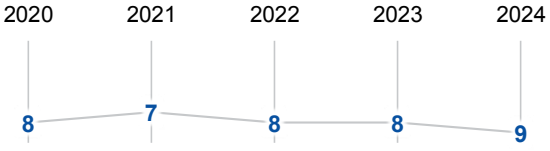
PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS > 20 MILLION (30 economies)



GERMANY

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	22	21	20	26	29
Training & education	17	17	15	14	10
Scientific concentration	05	06	07	07	13

Talent	Rank
Educational assessment PISA - Math	25
International experience	20
Foreign highly skilled personnel	35
Management of cities	32
▷ Digital/Technological skills	59
Net flow of international students	13

Training & education	Rank
Employee training	14
Total public expenditure on education	39
Higher education achievement	43
Pupil-teacher ratio (tertiary education)	04
▶ Graduates in Sciences	04
Women with degrees	44
▶ Computer science education index	04

Scientific concentration	Rank
Total expenditure on R&D (%)	10
Total R&D personnel per capita	14
Female researchers	50
R&D productivity by publication	13
Scientific and technical employment	25
High-tech patent grants	18
▶ Robots in Education and R&D	02
AI articles	33

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	28	25	20	32	22
Capital	16	23	16	21	25
Technological framework	45	43	43	47	43

Regulatory framework	Rank
Starting a business	53
Enforcing contracts	12
Immigration laws	38
▷ Development & application of tech.	54
Scientific research legislation	31
Intellectual property rights	17
AI policies passed into law	06

Capital	Rank
IT & media stock market capitalization	08
Funding for technological development	40
Banking and financial services	44
▶ Country credit rating	01
Venture capital	40
Investment in Telecommunications	35

Technological framework	Rank
▷ Communications technology	55
Mobile broadband subscribers	42
Wireless broadband	46
Internet users	29
Internet bandwidth speed	33
High-tech exports (%)	31
Secure internet servers	07

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	23	23	27	28	32
Business agility	15	15	15	20	19
IT integration	20	20	19	18	18

Adaptive attitudes	Rank
▶ E-Participation	03
Internet retailing	15
Tablet possession	33
Smartphone possession	54
Attitudes toward globalization	46
▷ Flexibility and adaptability	64

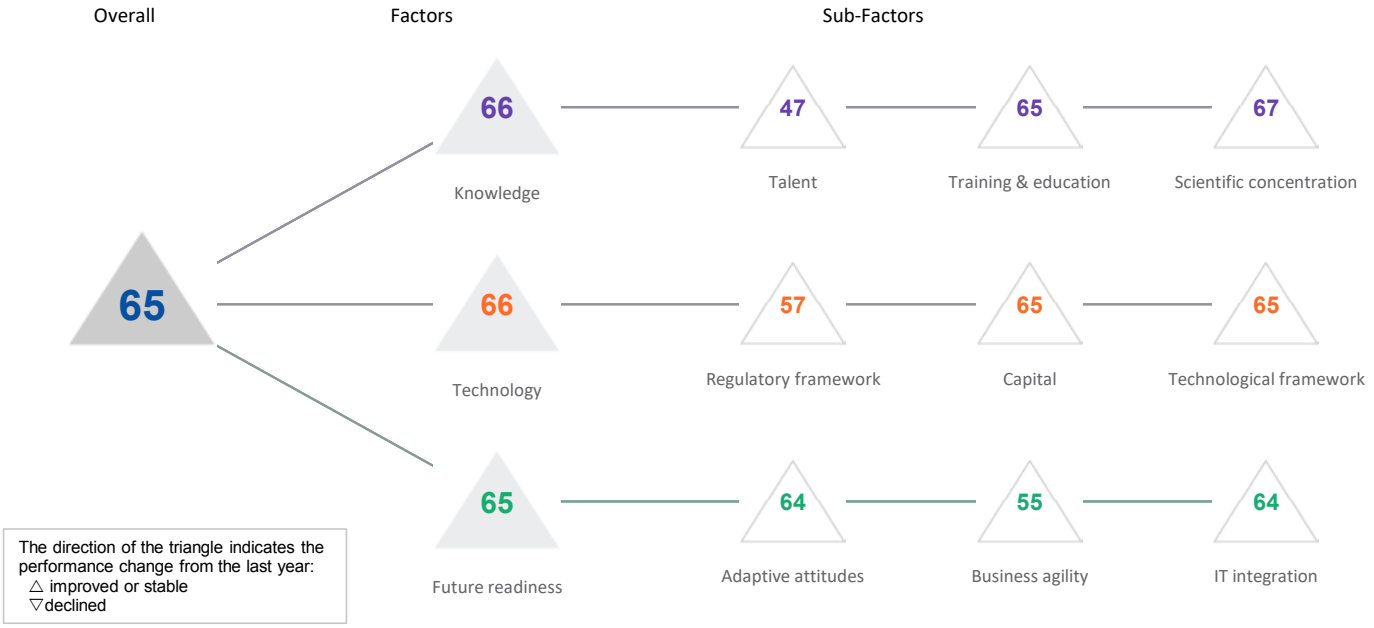
Business agility	Rank
▷ Opportunities and threats	56
World robots distribution	05
Agility of companies	42
Use of big data and analytics	39
Knowledge transfer	17
Entrepreneurial fear of failure	13

IT integration	Rank
E-Government	12
Public-private partnerships	44
Cyber security	33
Software piracy	08
Government cyber security capacity	35
Privacy protection by law exists	31

GHANA

DIGITAL TRENDS - OVERALL

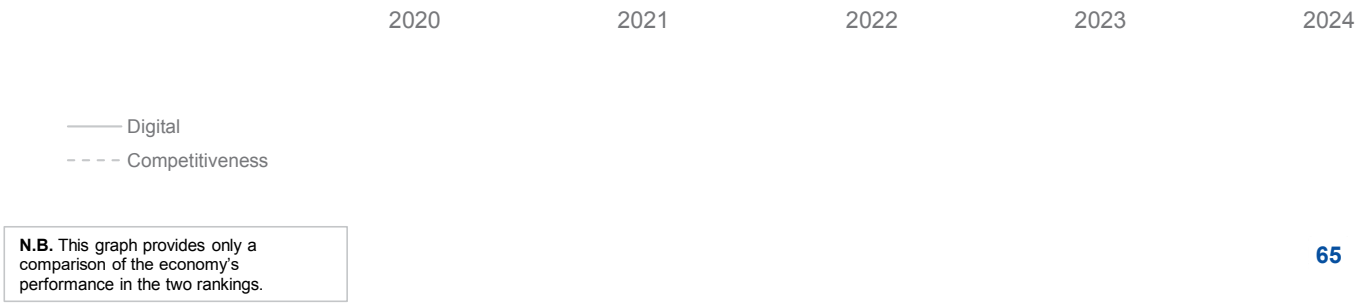
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	-	-	-	-	65
Knowledge	-	-	-	-	66
Technology	-	-	-	-	66
Future readiness	-	-	-	-	65

COMPETITIVENESS & DIGITAL RANKINGS



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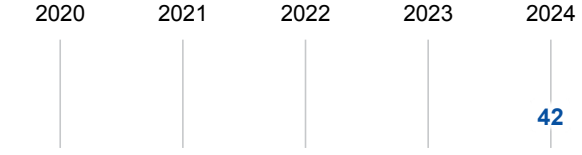
PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS > 20 MILLION (30 economies)

GHANA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	-	-	-	-	47
Training & education	-	-	-	-	65
Scientific concentration	-	-	-	-	67

Talent	Rank
Educational assessment PISA - Math	-
International experience	49
Foreign highly skilled personnel	37
Management of cities	53
Digital/Technological skills	56
Net flow of international students	51

Training & education	Rank
Employee training	52
Total public expenditure on education	47
Higher education achievement	63
Pupil-teacher ratio (tertiary education)	58
Graduates in Sciences	61
▷ Women with degrees	63
Computer science education index	61

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	60
High-tech patent grants	62
Robots in Education and R&D	-
▷ AI articles	64

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	-	-	-	-	57
Capital	-	-	-	-	65
Technological framework	-	-	-	-	65

Regulatory framework	Rank
Starting a business	50
Enforcing contracts	57
▶ Immigration laws	13
Development & application of tech.	53
Scientific research legislation	55
▷ Intellectual property rights	65
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	60
Banking and financial services	62
▷ Country credit rating	66
Venture capital	53
Investment in Telecommunications	47

Technological framework	Rank
Communications technology	62
Mobile broadband subscribers	-
Wireless broadband	36
Internet users	63
Internet bandwidth speed	63
High-tech exports (%)	62
▷ Secure internet servers	66

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	-	-	-	-	64
Business agility	-	-	-	-	55
IT integration	-	-	-	-	64

Adaptive attitudes	Rank
E-Participation	58
Internet retailing	61
Tablet possession	62
▶ Smartphone possession	43
Attitudes toward globalization	52
Flexibility and adaptability	52

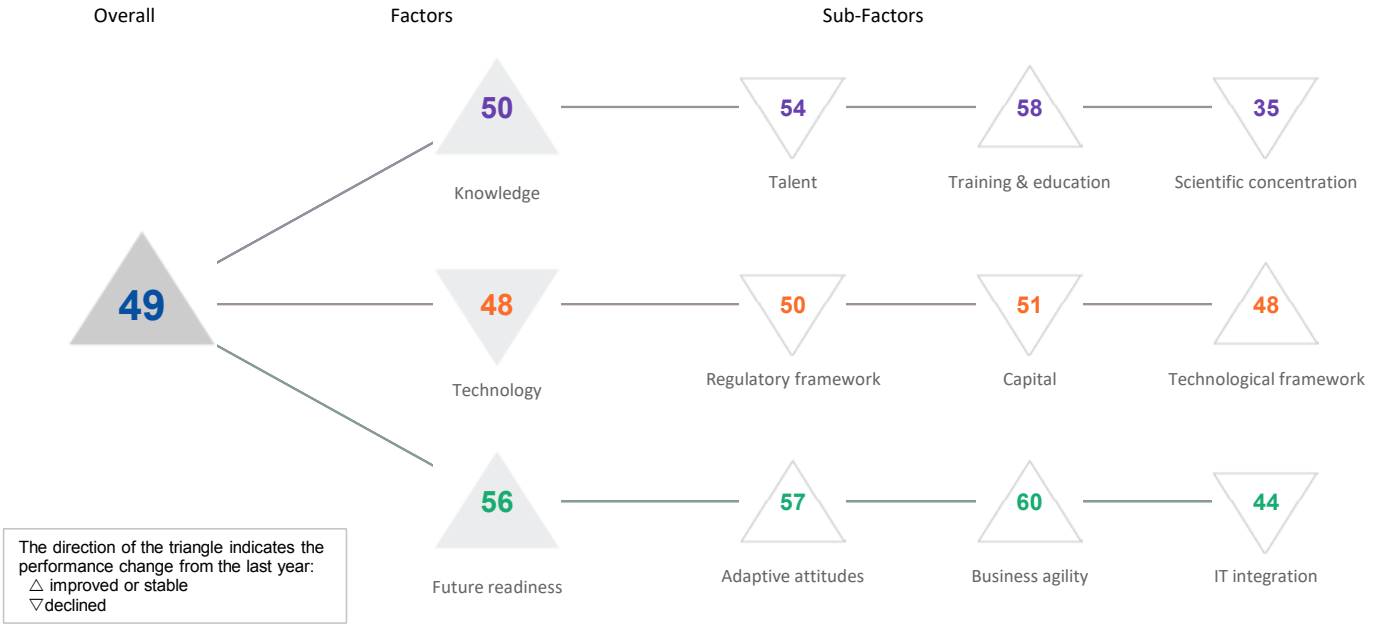
Business agility	Rank
Opportunities and threats	61
World robots distribution	-
Agility of companies	63
Use of big data and analytics	47
Knowledge transfer	55
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	61
Public-private partnerships	42
Cyber security	51
Software piracy	-
Government cyber security capacity	62
Privacy protection by law exists	51

GREECE

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

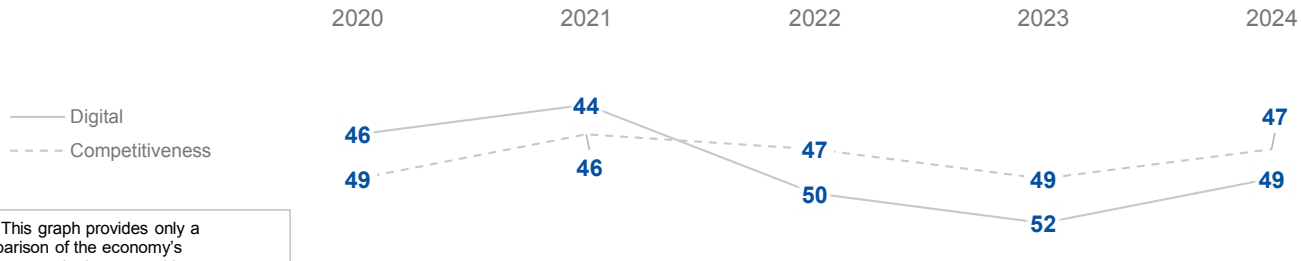


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	46	44	50	52	49
Knowledge	48	45	47	51	50
Technology	43	46	47	47	48
Future readiness	46	43	60	57	56

COMPETITIVENESS & DIGITAL RANKINGS



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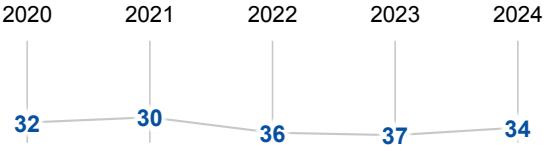
PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)

GREECE

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	50	42	49	53	54
Training & education	56	55	59	59	58
Scientific concentration	36	35	33	31	35

Talent	Rank
Educational assessment PISA - Math	40
International experience	39
Foreign highly skilled personnel	57
Management of cities	47
Digital/Technological skills	44
Net flow of international students	54

Training & education	Rank
▷ Employee training	64
Total public expenditure on education	49
Higher education achievement	30
▷ Pupil-teacher ratio (tertiary education)	62
▶ Graduates in Sciences	23
Women with degrees	36
Computer science education index	26

Scientific concentration	Rank
Total expenditure on R&D (%)	26
Total R&D personnel per capita	29
Female researchers	25
R&D productivity by publication	32
▶ Scientific and technical employment	19
High-tech patent grants	50
Robots in Education and R&D	40
AI articles	23

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	41	43	42	46	50
Capital	49	52	46	37	51
Technological framework	46	50	50	52	48

Regulatory framework	Rank
▶ Starting a business	06
▷ Enforcing contracts	62
Immigration laws	47
Development & application of tech.	44
Scientific research legislation	37
Intellectual property rights	46
AI policies passed into law	28

Capital	Rank
▶ IT & media stock market capitalization	22
Funding for technological development	36
▷ Banking and financial services	61
Country credit rating	55
Venture capital	49
Investment in Telecommunications	27

Technological framework	Rank
Communications technology	56
Mobile broadband subscribers	24
▶ Wireless broadband	22
Internet users	52
Internet bandwidth speed	57
High-tech exports (%)	33
Secure internet servers	40

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	44	43	60	61	57
Business agility	55	51	61	60	60
IT integration	45	41	41	43	44

Adaptive attitudes	Rank
E-Participation	48
Internet retailing	34
Tablet possession	31
▷ Smartphone possession	62
Attitudes toward globalization	38
Flexibility and adaptability	38

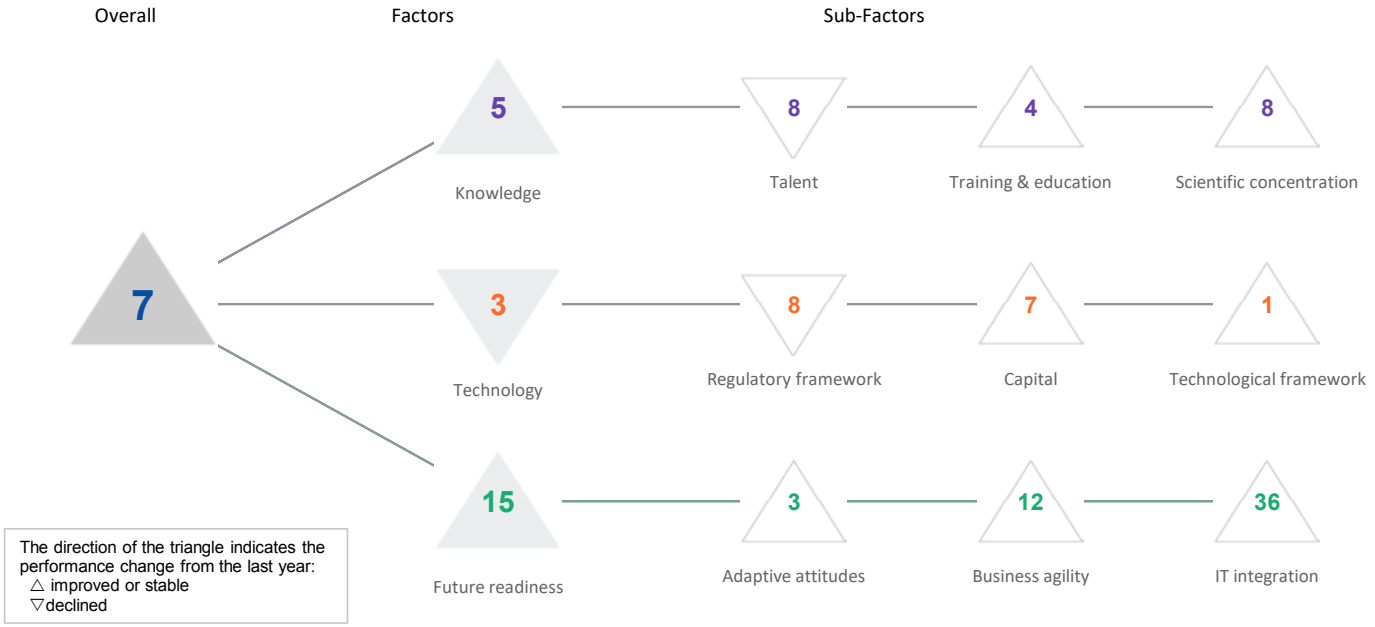
Business agility	Rank
Opportunities and threats	48
World robots distribution	44
Agility of companies	36
Use of big data and analytics	58
Knowledge transfer	58
Entrepreneurial fear of failure	45

IT integration	Rank
E-Government	33
Public-private partnerships	45
Cyber security	46
Software piracy	54
Government cyber security capacity	28
Privacy protection by law exists	38

HONG KONG SAR

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

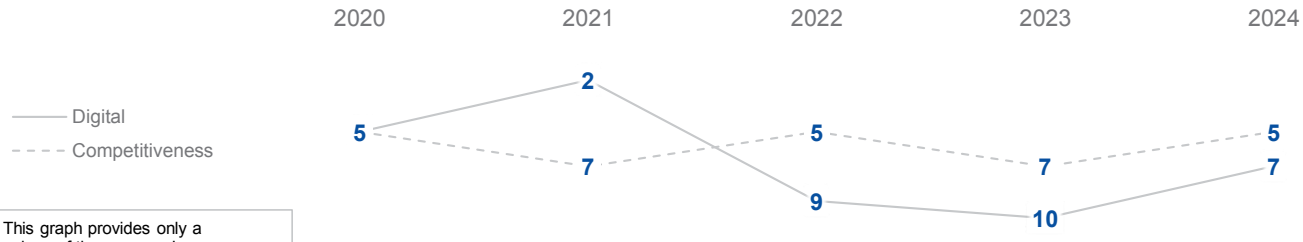


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	05	02	09	10	07
Knowledge	07	05	07	06	05
Technology	02	01	02	02	03
Future readiness	10	10	18	17	15

COMPETITIVENESS & DIGITAL RANKINGS

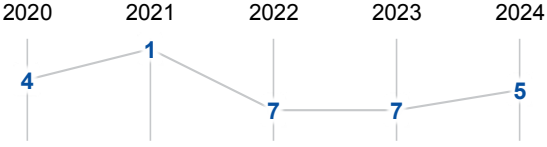


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)

POPULATIONS < 20 MILLION (37 economies)



HONG KONG SAR

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	07	06	10	06	08
Training & education	05	01	02	05	04
Scientific concentration	17	14	18	08	08

Talent	Rank
Educational assessment PISA - Math	04
International experience	13
Foreign highly skilled personnel	26
Management of cities	06
Digital/Technological skills	17
Net flow of international students	22

Training & education	Rank
Employee training	23
▷ Total public expenditure on education	50
Higher education achievement	07
Pupil-teacher ratio (tertiary education)	28
▶ Graduates in Sciences	01
Women with degrees	-
Computer science education index	20

Scientific concentration	Rank
▷ Total expenditure on R&D (%)	38
Total R&D personnel per capita	33
Female researchers	-
R&D productivity by publication	25
Scientific and technical employment	08
▶ High-tech patent grants	02
Robots in Education and R&D	34
AI articles	09

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	07	06	09	06	08
Capital	12	07	08	14	07
Technological framework	02	01	01	01	01

Regulatory framework	Rank
Starting a business	04
Enforcing contracts	24
Immigration laws	05
Development & application of tech.	09
Scientific research legislation	08
Intellectual property rights	08
AI policies passed into law	28

Capital	Rank
▶ IT & media stock market capitalization	04
Funding for technological development	12
Banking and financial services	05
Country credit rating	18
Venture capital	18
▷ Investment in Telecommunications	51

Technological framework	Rank
Communications technology	08
Mobile broadband subscribers	16
▶ Wireless broadband	03
Internet users	16
Internet bandwidth speed	23
High-tech exports (%)	05
Secure internet servers	11

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	04	03	09	05	03
Business agility	14	09	11	16	12
IT integration	19	17	45	47	36

Adaptive attitudes	Rank
E-Participation	-
Internet retailing	10
Tablet possession	15
▶ Smartphone possession	02
Attitudes toward globalization	07
Flexibility and adaptability	07

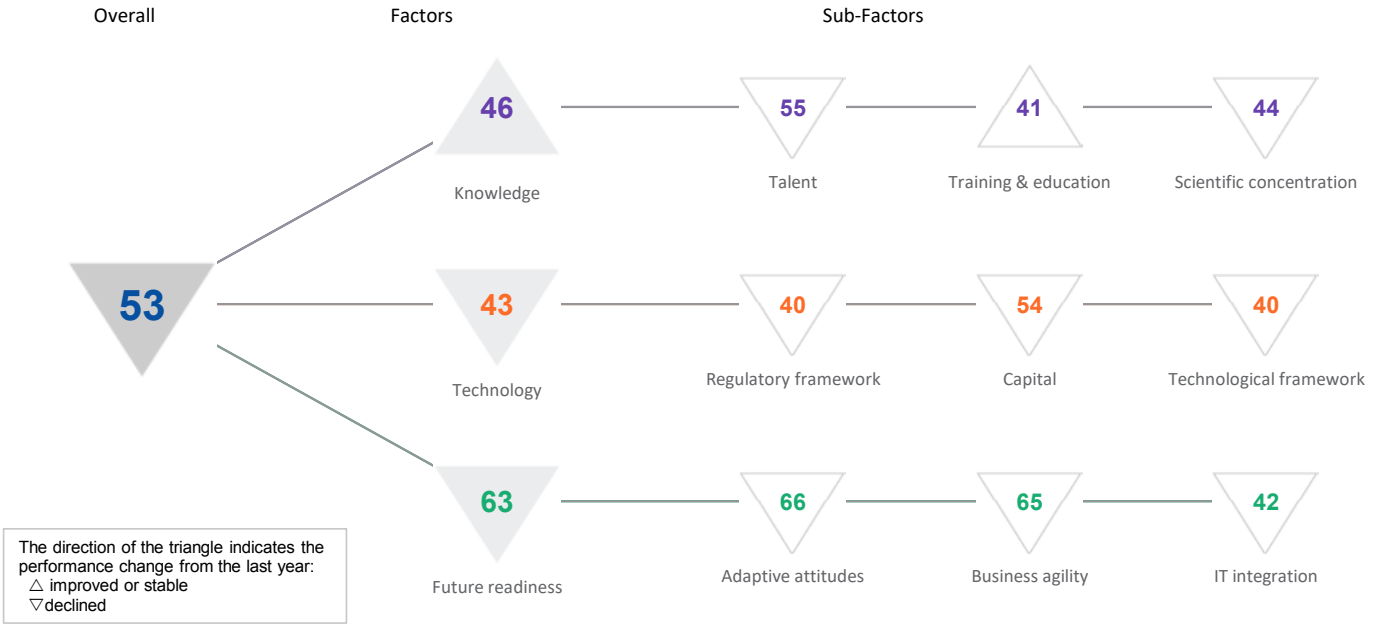
Business agility	Rank
Opportunities and threats	07
World robots distribution	37
Agility of companies	06
Use of big data and analytics	14
Knowledge transfer	07
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	-
Public-private partnerships	09
Cyber security	14
Software piracy	28
▷ Government cyber security capacity	45
▷ Privacy protection by law exists	57

HUNGARY

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

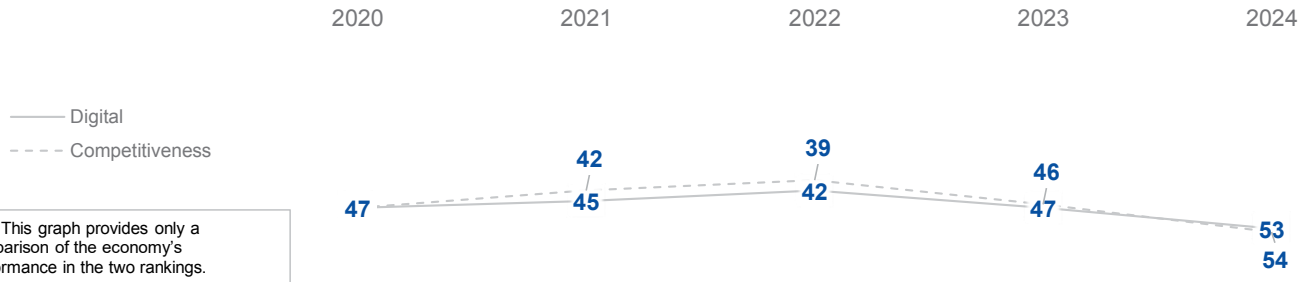


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	47	45	42	47	53
Knowledge	44	43	43	46	46
Technology	39	36	31	36	43
Future readiness	60	61	57	61	63

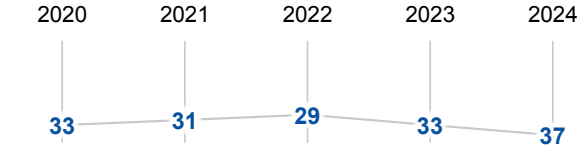
COMPETITIVENESS & DIGITAL RANKINGS



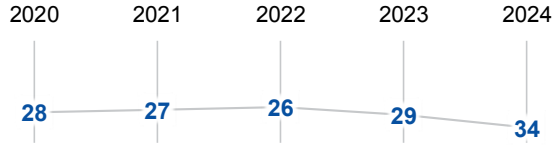
N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



HUNGARY

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	44	43	40	45	55
Training & education	45	47	44	47	41
Scientific concentration	44	42	38	42	44

Talent	Rank
Educational assessment PISA - Math	28
International experience	58
Foreign highly skilled personnel	58
Management of cities	54
▷ Digital/Technological skills	65
▶ Net flow of international students	18

Training & education	Rank
Employee training	54
Total public expenditure on education	24
Higher education achievement	49
▶ Pupil-teacher ratio (tertiary education)	15
Graduates in Sciences	28
Women with degrees	40
Computer science education index	46

Scientific concentration	Rank
Total expenditure on R&D (%)	31
Total R&D personnel per capita	28
Female researchers	51
R&D productivity by publication	41
Scientific and technical employment	33
High-tech patent grants	41
Robots in Education and R&D	31
AI articles	39

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	39	36	26	35	40
Capital	46	45	42	46	54
Technological framework	24	21	19	29	40

Regulatory framework	Rank
Starting a business	38
Enforcing contracts	21
Immigration laws	32
Development & application of tech.	59
Scientific research legislation	51
Intellectual property rights	37
AI policies passed into law	28

Capital	Rank
IT & media stock market capitalization	29
Funding for technological development	54
Banking and financial services	45
Country credit rating	52
Venture capital	60
Investment in Telecommunications	29

Technological framework	Rank
Communications technology	49
Mobile broadband subscribers	43
Wireless broadband	45
Internet users	36
▶ Internet bandwidth speed	17
High-tech exports (%)	24
Secure internet servers	23

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	62	62	62	62	66
Business agility	59	62	48	55	65
IT integration	41	42	35	37	42

Adaptive attitudes	Rank
E-Participation	57
Internet retailing	42
Tablet possession	52
Smartphone possession	63
▷ Attitudes toward globalization	67
▷ Flexibility and adaptability	67

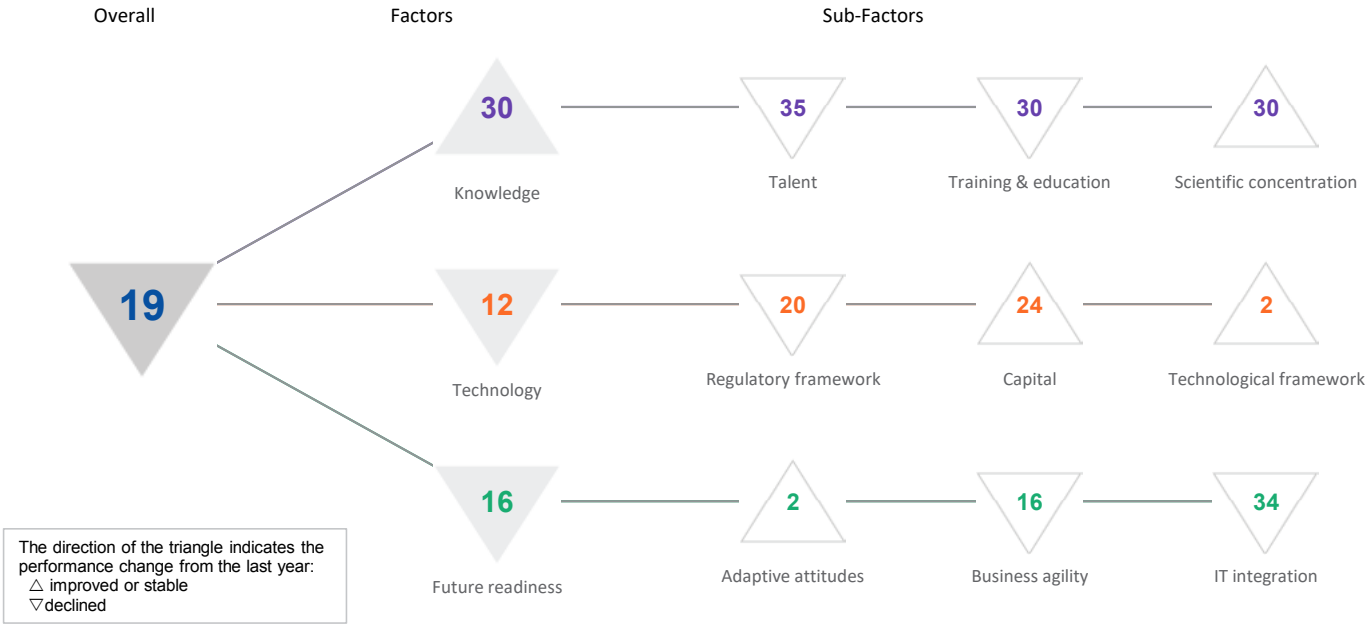
Business agility	Rank
▷ Opportunities and threats	66
World robots distribution	25
▷ Agility of companies	66
Use of big data and analytics	65
Knowledge transfer	47
▶ Entrepreneurial fear of failure	07

IT integration	Rank
E-Government	51
Public-private partnerships	60
Cyber security	60
Software piracy	27
Government cyber security capacity	32
▶ Privacy protection by law exists	12

ICELAND

DIGITAL TRENDS - OVERALL

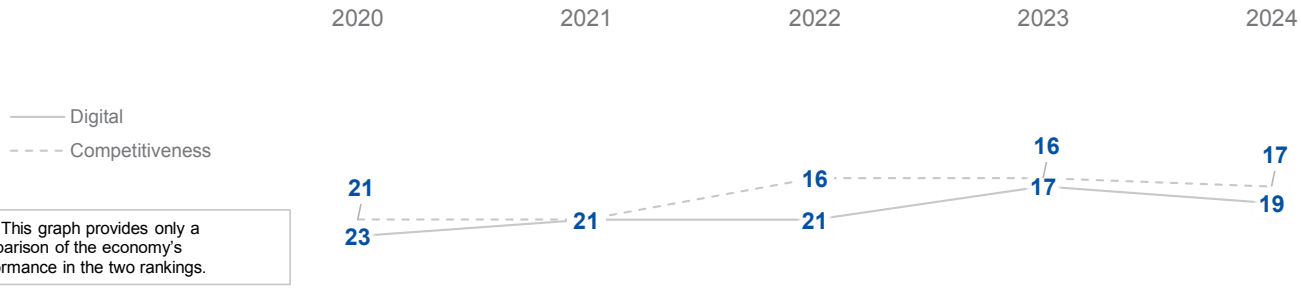
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	23	21	21	17	19
Knowledge	27	33	31	32	30
Technology	21	10	11	08	12
Future readiness	22	25	21	14	16

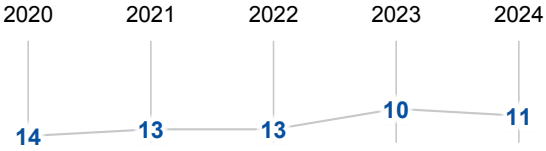
COMPETITIVENESS & DIGITAL RANKINGS



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

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)

ICELAND

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	33	35	24	32	35
Training & education	15	22	26	26	30
Scientific concentration	46	39	45	37	30

Talent	Rank
Educational assessment PISA - Math	36
International experience	54
Foreign highly skilled personnel	43
Management of cities	40
Digital/Technological skills	07
▷ Net flow of international students	57

Training & education	Rank
Employee training	33
▶ Total public expenditure on education	04
Higher education achievement	37
Pupil-teacher ratio (tertiary education)	36
▷ Graduates in Sciences	57
Women with degrees	13
Computer science education index	23

Scientific concentration	Rank
Total expenditure on R&D (%)	14
▶ Total R&D personnel per capita	03
Female researchers	15
▷ R&D productivity by publication	61
Scientific and technical employment	23
High-tech patent grants	48
Robots in Education and R&D	54
AI articles	06

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	15	14	11	11	20
Capital	35	26	17	27	24
Technological framework	16	03	05	04	02

Regulatory framework	Rank
Starting a business	32
Enforcing contracts	25
Immigration laws	07
Development & application of tech.	12
Scientific research legislation	12
Intellectual property rights	11
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	11
Banking and financial services	15
Country credit rating	31
Venture capital	22
▷ Investment in Telecommunications	56

Technological framework	Rank
Communications technology	12
Mobile broadband subscribers	49
Wireless broadband	13
Internet users	05
▶ Internet bandwidth speed	01
High-tech exports (%)	06
Secure internet servers	10

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	25	31	21	11	02
Business agility	19	16	12	13	16
IT integration	27	27	30	31	34

Adaptive attitudes	Rank
E-Participation	06
Internet retailing	26
Tablet possession	-
▶ Smartphone possession	01
Attitudes toward globalization	15
▶ Flexibility and adaptability	03

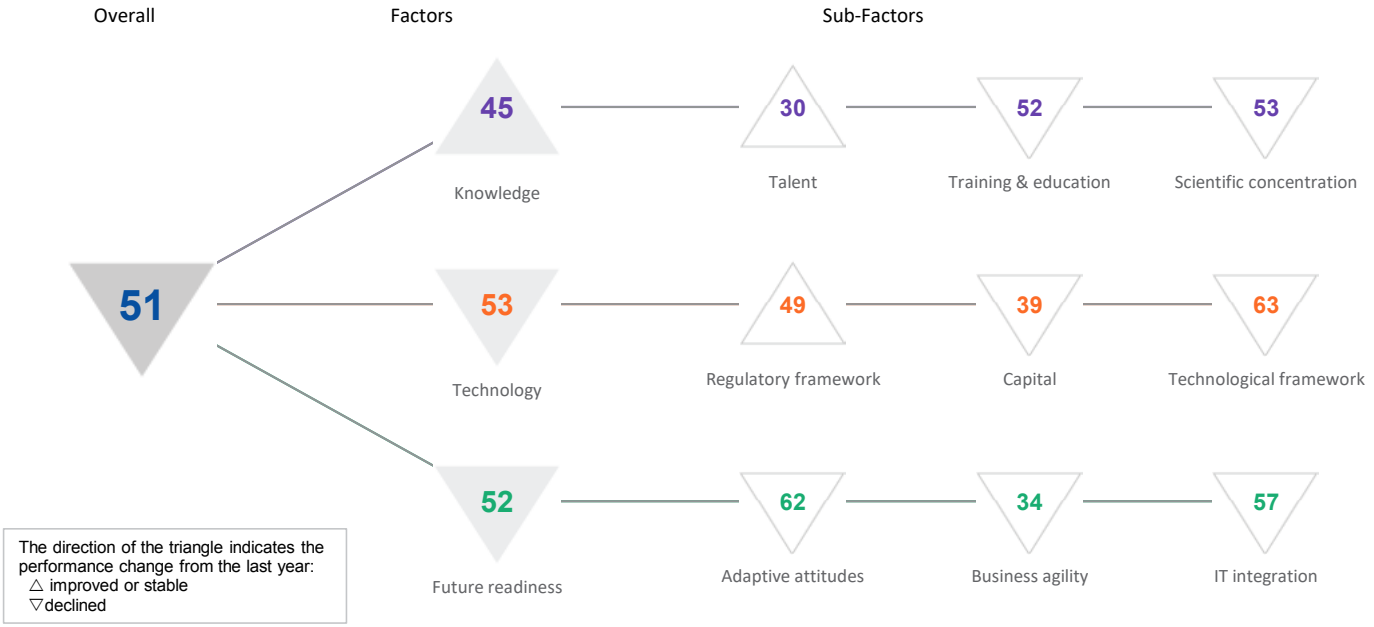
Business agility	Rank
Opportunities and threats	06
World robots distribution	54
Agility of companies	05
Use of big data and analytics	22
Knowledge transfer	20
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	05
▷ Public-private partnerships	59
Cyber security	21
Software piracy	35
Government cyber security capacity	55
Privacy protection by law exists	36

INDIA

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

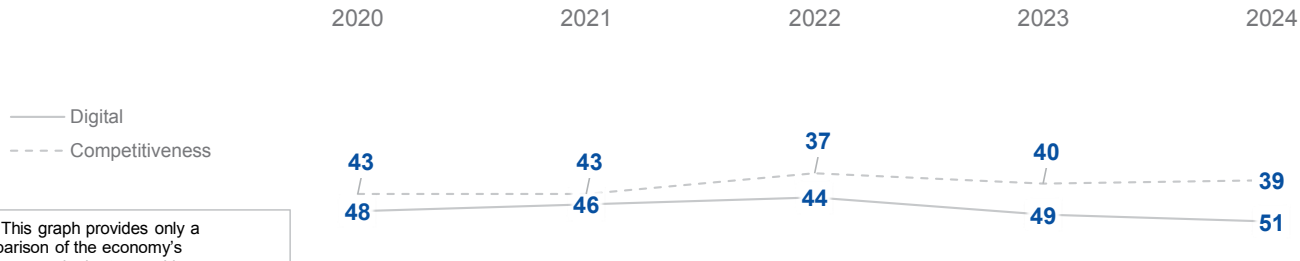


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	48	46	44	49	51
Knowledge	39	41	46	45	45
Technology	50	44	43	50	53
Future readiness	56	50	42	51	52

COMPETITIVENESS & DIGITAL RANKINGS



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

PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)

POPULATIONS > 20 MILLION (30 economies)

INDIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	41	38	34	34	30
Training & education	51	43	56	48	52
Scientific concentration	29	47	50	52	53

Talent	Rank
Educational assessment PISA - Math	-
International experience	27
Foreign highly skilled personnel	36
Management of cities	50
▶ Digital/Technological skills	12
Net flow of international students	49

Training & education	Rank
Employee training	42
Total public expenditure on education	60
Higher education achievement	57
Pupil-teacher ratio (tertiary education)	54
▶ Graduates in Sciences	12
▷ Women with degrees	61
▶ Computer science education index	05

Scientific concentration	Rank
Total expenditure on R&D (%)	48
Total R&D personnel per capita	57
Female researchers	-
▶ R&D productivity by publication	02
Scientific and technical employment	58
High-tech patent grants	44
Robots in Education and R&D	22
AI articles	61

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	53	52	48	52	49
Capital	07	04	01	23	39
Technological framework	62	62	58	60	63

Regulatory framework	Rank
Starting a business	59
▷ Enforcing contracts	65
Immigration laws	41
Development & application of tech.	20
Scientific research legislation	29
Intellectual property rights	41
AI policies passed into law	17

Capital	Rank
IT & media stock market capitalization	13
Funding for technological development	23
Banking and financial services	20
Country credit rating	53
Venture capital	19
▷ Investment in Telecommunications	66

Technological framework	Rank
Communications technology	32
Mobile broadband subscribers	55
▷ Wireless broadband	64
▷ Internet users	65
Internet bandwidth speed	53
High-tech exports (%)	37
Secure internet servers	52

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	55	55	56	60	62
Business agility	52	36	25	30	34
IT integration	55	51	48	52	57

Adaptive attitudes	Rank
E-Participation	50
Internet retailing	58
Tablet possession	56
Smartphone possession	61
Attitudes toward globalization	22
▶ Flexibility and adaptability	12

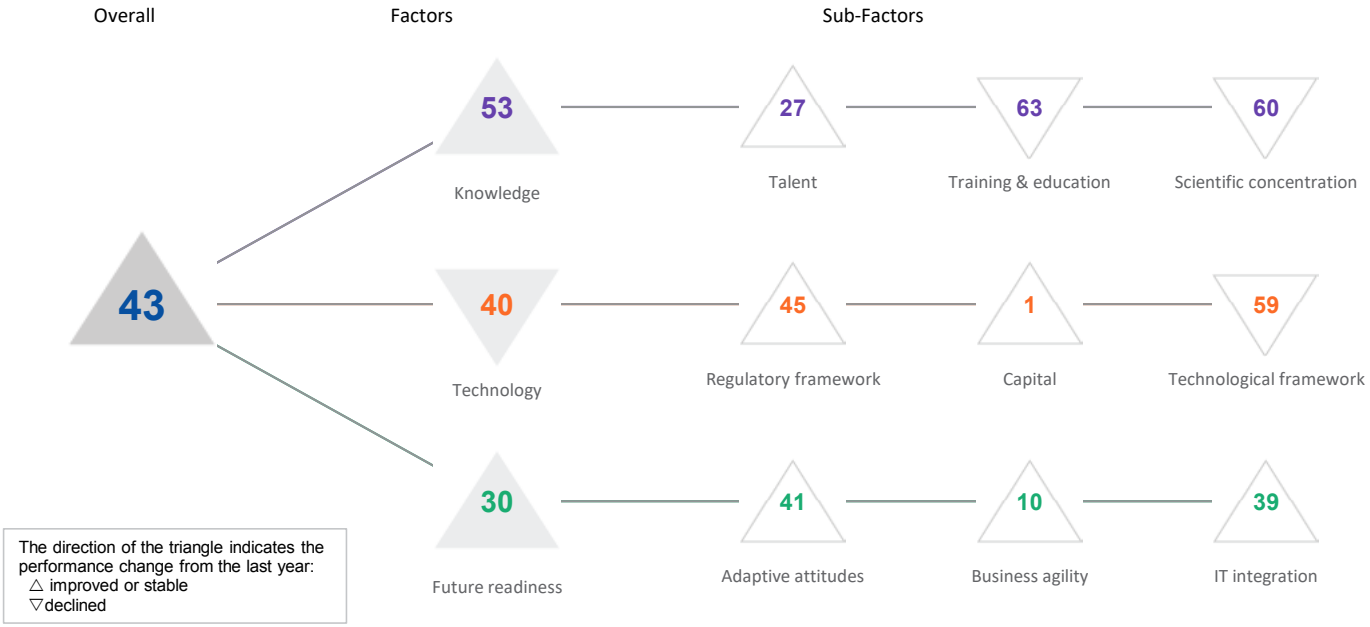
Business agility	Rank
Opportunities and threats	20
World robots distribution	12
Agility of companies	21
Use of big data and analytics	27
Knowledge transfer	36
Entrepreneurial fear of failure	52

IT integration	Rank
E-Government	60
Public-private partnerships	19
Cyber security	32
Software piracy	50
Government cyber security capacity	30
Privacy protection by law exists	55

INDONESIA

DIGITAL TRENDS - OVERALL

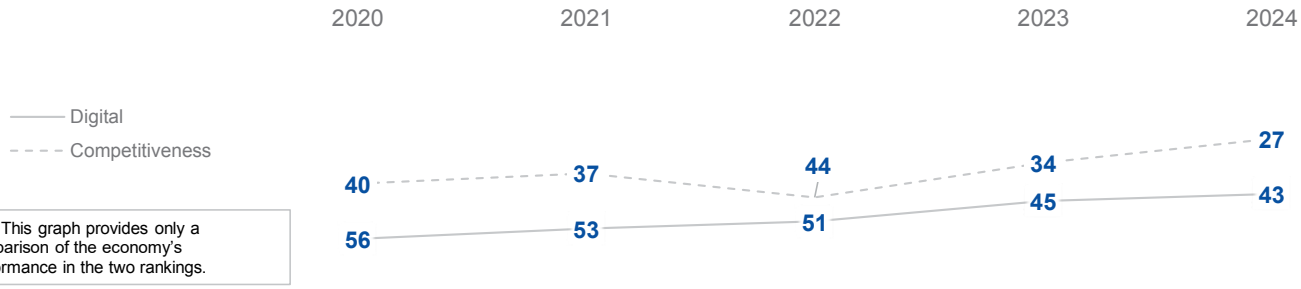
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	56	53	51	45	43
Knowledge	63	60	60	60	53
Technology	54	49	45	39	40
Future readiness	48	48	52	43	30

COMPETITIVENESS & DIGITAL RANKINGS



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PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)

POPULATIONS > 20 MILLION (30 economies)

INDONESIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	43	48	45	42	27
Training & education	63	64	62	61	63
Scientific concentration	51	44	54	59	60

Talent	Rank
Educational assessment PISA - Math	56
International experience	11
Foreign highly skilled personnel	09
Management of cities	18
Digital/Technological skills	20
Net flow of international students	46

Training & education	Rank
Employee training	17
Total public expenditure on education	61
Higher education achievement	60
Pupil-teacher ratio (tertiary education)	59
Graduates in Sciences	48
Women with degrees	59
Computer science education index	52

Scientific concentration	Rank
Total expenditure on R&D (%)	58
Total R&D personnel per capita	58
Female researchers	17
▶ R&D productivity by publication	04
Scientific and technical employment	59
High-tech patent grants	61
Robots in Education and R&D	44
▷ AI articles	63

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	51	50	49	45	45
Capital	41	25	18	03	01
Technological framework	55	55	56	57	59

Regulatory framework	Rank
▷ Starting a business	62
Enforcing contracts	60
Immigration laws	50
Development & application of tech.	18
Scientific research legislation	18
Intellectual property rights	30
AI policies passed into law	21

Capital	Rank
IT & media stock market capitalization	15
Funding for technological development	16
▶ Banking and financial services	02
Country credit rating	48
▶ Venture capital	05
▶ Investment in Telecommunications	03

Technological framework	Rank
Communications technology	34
Mobile broadband subscribers	59
Wireless broadband	51
▷ Internet users	64
▷ Internet bandwidth speed	66
High-tech exports (%)	51
Secure internet servers	47

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	58	57	55	54	41
Business agility	24	26	22	10	10
IT integration	60	60	60	59	39

Adaptive attitudes	Rank
E-Participation	30
Internet retailing	49
Tablet possession	59
Smartphone possession	57
Attitudes toward globalization	14
Flexibility and adaptability	16

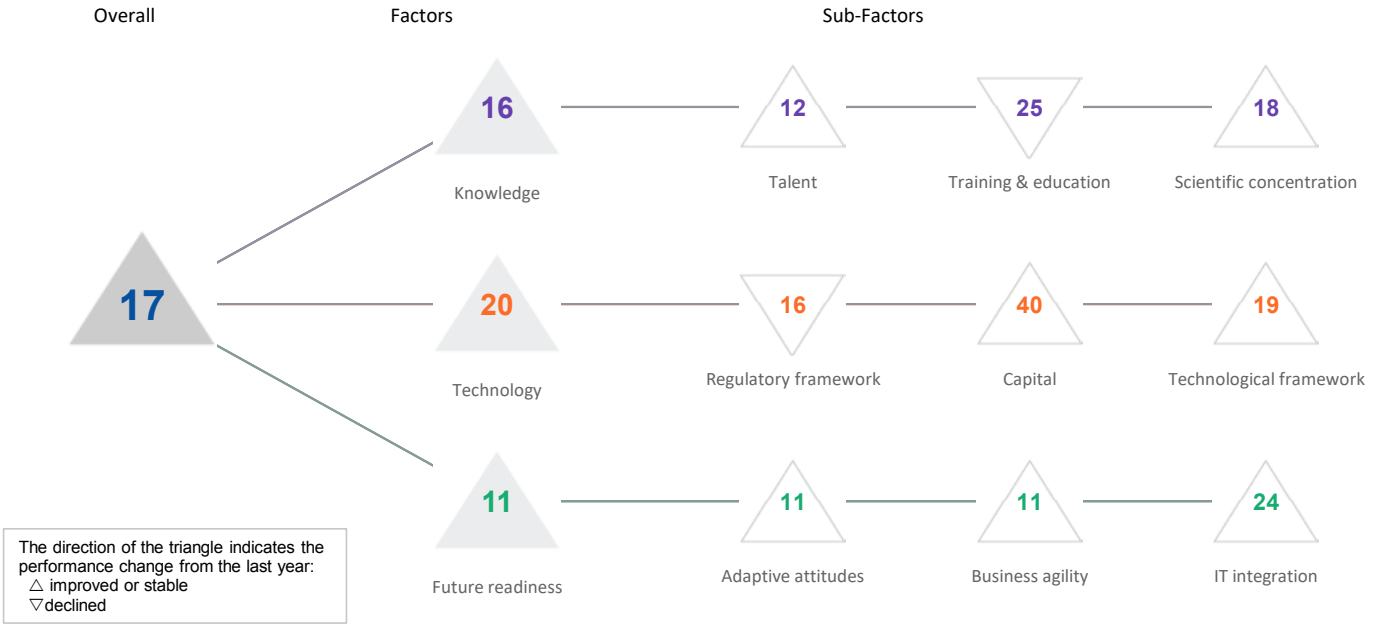
Business agility	Rank
Opportunities and threats	09
World robots distribution	27
Agility of companies	11
▶ Use of big data and analytics	02
Knowledge transfer	26
Entrepreneurial fear of failure	11

IT integration	Rank
E-Government	53
Public-private partnerships	06
Cyber security	15
▷ Software piracy	63
Government cyber security capacity	14
Privacy protection by law exists	52

IRELAND

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

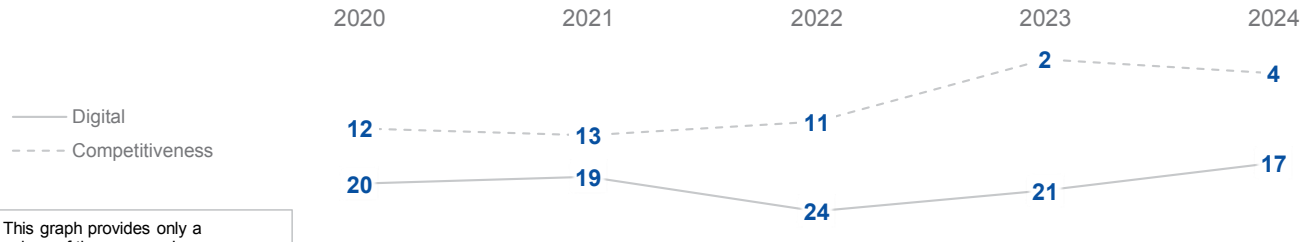


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	20	19	24	21	17
Knowledge	24	23	22	19	16
Technology	30	28	37	28	20
Future readiness	14	14	22	22	11

COMPETITIVENESS & DIGITAL RANKINGS



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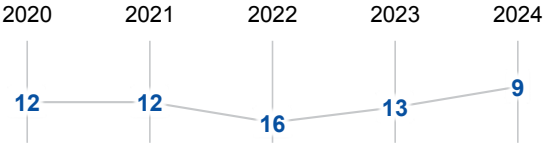
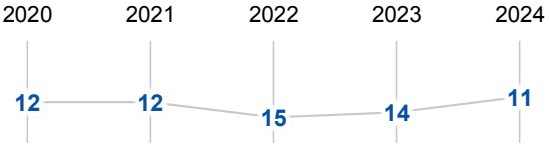
PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



IRELAND

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	19	18	19	16	12
Training & education	35	32	31	24	25
Scientific concentration	25	26	24	24	18

Talent	Rank
Educational assessment PISA - Math	11
International experience	06
Foreign highly skilled personnel	06
Management of cities	43
Digital/Technological skills	22
Net flow of international students	26

Training & education	Rank
Employee training	06
▷ Total public expenditure on education	62
Higher education achievement	08
Pupil-teacher ratio (tertiary education)	47
Graduates in Sciences	25
Women with degrees	05
Computer science education index	16

Scientific concentration	Rank
Total expenditure on R&D (%)	42
Total R&D personnel per capita	21
Female researchers	30
R&D productivity by publication	33
Scientific and technical employment	14
High-tech patent grants	07
Robots in Education and R&D	27
AI articles	10

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	14	19	22	09	16
Capital	45	35	44	42	40
Technological framework	30	34	38	35	19

Regulatory framework	Rank
Starting a business	12
Enforcing contracts	49
Immigration laws	08
Development & application of tech.	11
▶ Scientific research legislation	04
Intellectual property rights	05
AI policies passed into law	39

Capital	Rank
▷ IT & media stock market capitalization	60
Funding for technological development	07
Banking and financial services	16
Country credit rating	21
Venture capital	08
▷ Investment in Telecommunications	63

Technological framework	Rank
Communications technology	25
Mobile broadband subscribers	37
Wireless broadband	48
Internet users	17
Internet bandwidth speed	26
High-tech exports (%)	04
Secure internet servers	06

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	12	12	11	19	11
Business agility	09	14	18	15	11
IT integration	25	19	38	35	24

Adaptive attitudes	Rank
E-Participation	14
Internet retailing	06
Tablet possession	40
▷ Smartphone possession	59
▶ Attitudes toward globalization	02
▶ Flexibility and adaptability	01

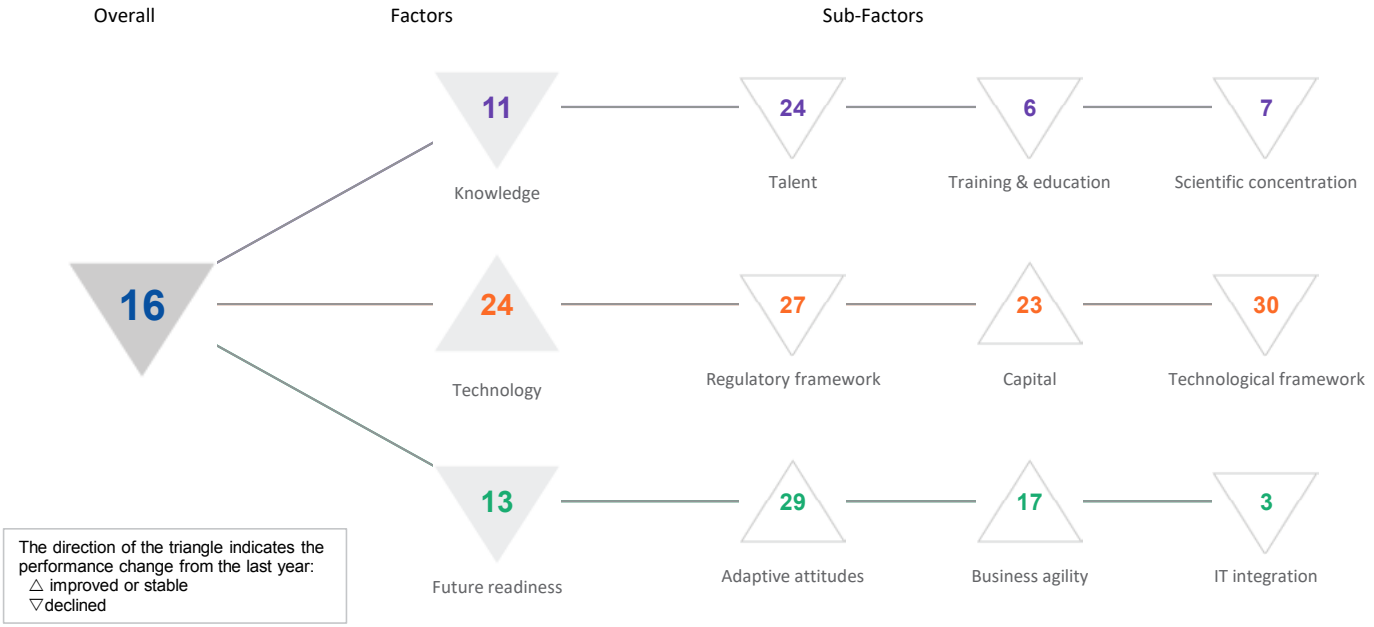
Business agility	Rank
▶ Opportunities and threats	01
World robots distribution	41
▶ Agility of companies	03
Use of big data and analytics	15
Knowledge transfer	06
Entrepreneurial fear of failure	40

IT integration	Rank
E-Government	20
Public-private partnerships	18
Cyber security	22
Software piracy	19
▷ Government cyber security capacity	58
Privacy protection by law exists	25

ISRAEL

DIGITAL TRENDS - OVERALL

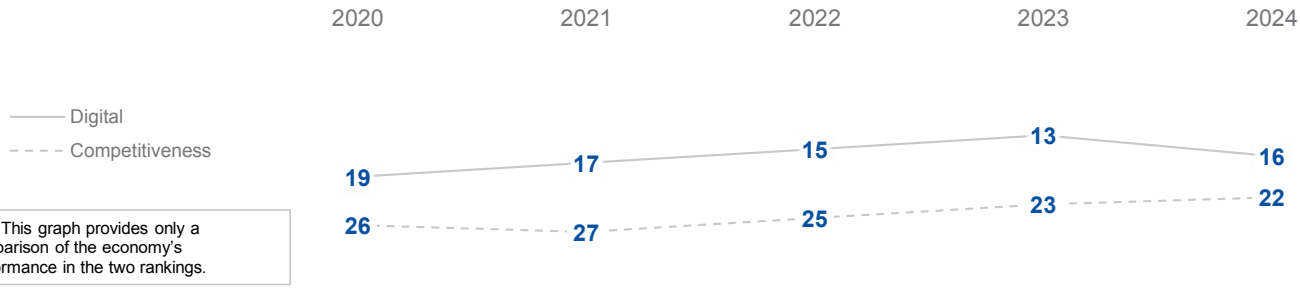
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

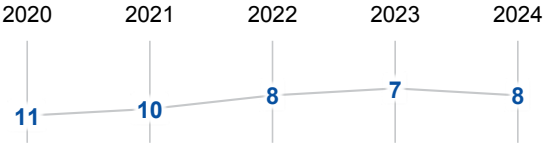
	2020	2021	2022	2023	2024
OVERALL	19	17	15	13	16
Knowledge	09	12	10	08	11
Technology	32	27	22	24	24
Future readiness	23	21	14	12	13

COMPETITIVENESS & DIGITAL RANKINGS

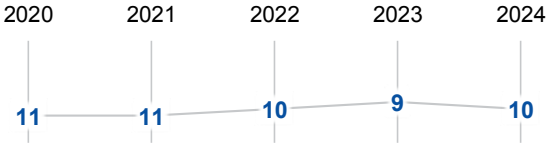


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



ISRAEL

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	28	27	26	23	24
Training & education	01	03	06	03	06
Scientific concentration	03	09	05	03	07

Talent	Rank
Educational assessment PISA - Math	37
International experience	15
Foreign highly skilled personnel	31
Management of cities	22
Digital/Technological skills	13
▷ Net flow of international students	53

Training & education	Rank
Employee training	35
▶ Total public expenditure on education	03
Higher education achievement	28
Pupil-teacher ratio (tertiary education)	07
Graduates in Sciences	20
Women with degrees	10
Computer science education index	32

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	01
Total R&D personnel per capita	-
Female researchers	-
▷ R&D productivity by publication	53
▶ Scientific and technical employment	07
High-tech patent grants	20
Robots in Education and R&D	36
AI articles	30

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	32	31	31	25	27
Capital	26	28	25	25	23
Technological framework	36	26	23	23	30

Regulatory framework	Rank
Starting a business	17
▷ Enforcing contracts	48
Immigration laws	48
Development & application of tech.	08
Scientific research legislation	09
Intellectual property rights	20
AI policies passed into law	28

Capital	Rank
IT & media stock market capitalization	14
Funding for technological development	13
Banking and financial services	32
Country credit rating	29
Venture capital	16
▷ Investment in Telecommunications	57

Technological framework	Rank
Communications technology	38
Mobile broadband subscribers	32
Wireless broadband	24
Internet users	28
Internet bandwidth speed	22
High-tech exports (%)	17
Secure internet servers	39

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	26	25	24	30	29
Business agility	29	31	23	19	17
IT integration	14	13	05	01	03

Adaptive attitudes	Rank
E-Participation	43
Internet retailing	32
▷ Tablet possession	50
Smartphone possession	22
Attitudes toward globalization	19
Flexibility and adaptability	15

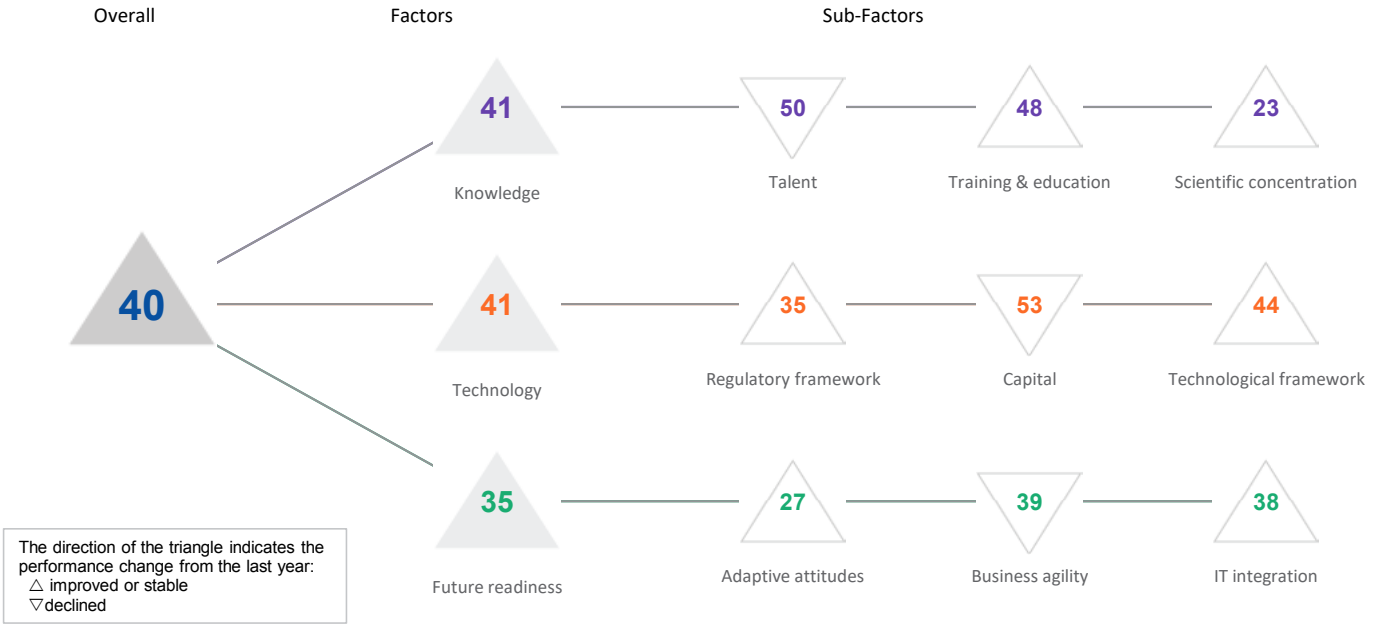
Business agility	Rank
Opportunities and threats	13
World robots distribution	38
Agility of companies	17
Use of big data and analytics	07
Knowledge transfer	14
Entrepreneurial fear of failure	18

IT integration	Rank
E-Government	23
Public-private partnerships	11
▶ Cyber security	06
Software piracy	17
▶ Government cyber security capacity	02
Privacy protection by law exists	41

ITALY

DIGITAL TRENDS - OVERALL

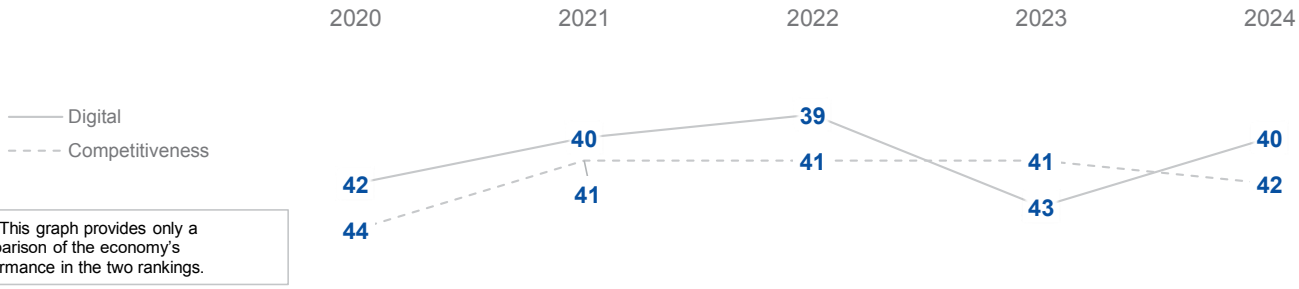
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	42	40	39	43	40
Knowledge	42	40	41	43	41
Technology	46	42	44	46	41
Future readiness	38	30	38	37	35

COMPETITIVENESS & DIGITAL RANKINGS

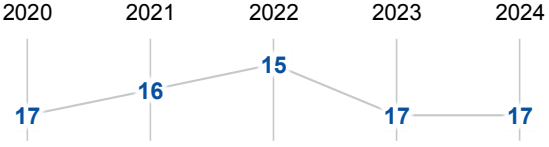


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS > 20 MILLION (30 economies)



ITALY

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	42	40	43	46	50
Training & education	58	60	58	58	48
Scientific concentration	22	25	23	23	23

Talent	Rank
Educational assessment PISA - Math	31
▷ International experience	61
▷ Foreign highly skilled personnel	55
Management of cities	29
Digital/Technological skills	54
Net flow of international students	41

Training & education	Rank
▷ Employee training	58
Total public expenditure on education	42
Higher education achievement	50
Pupil-teacher ratio (tertiary education)	50
Graduates in Sciences	34
Women with degrees	52
▶ Computer science education index	09

Scientific concentration	Rank
Total expenditure on R&D (%)	33
Total R&D personnel per capita	32
Female researchers	33
▶ R&D productivity by publication	05
Scientific and technical employment	13
High-tech patent grants	49
Robots in Education and R&D	12
AI articles	26

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	48	42	38	41	35
Capital	54	48	41	48	53
Technological framework	43	44	44	45	44

Regulatory framework	Rank
Starting a business	42
▷ Enforcing contracts	58
Immigration laws	14
Development & application of tech.	48
Scientific research legislation	49
Intellectual property rights	22
AI policies passed into law	15

Capital	Rank
IT & media stock market capitalization	39
Funding for technological development	35
Banking and financial services	51
Country credit rating	50
Venture capital	52
Investment in Telecommunications	26

Technological framework	Rank
Communications technology	36
Mobile broadband subscribers	30
Wireless broadband	21
Internet users	46
Internet bandwidth speed	45
High-tech exports (%)	45
Secure internet servers	34

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	42	36	32	31	27
Business agility	23	19	30	33	39
IT integration	39	38	40	41	38

Adaptive attitudes	Rank
E-Participation	50
Internet retailing	30
Tablet possession	35
Smartphone possession	41
Attitudes toward globalization	45
▶ Flexibility and adaptability	04

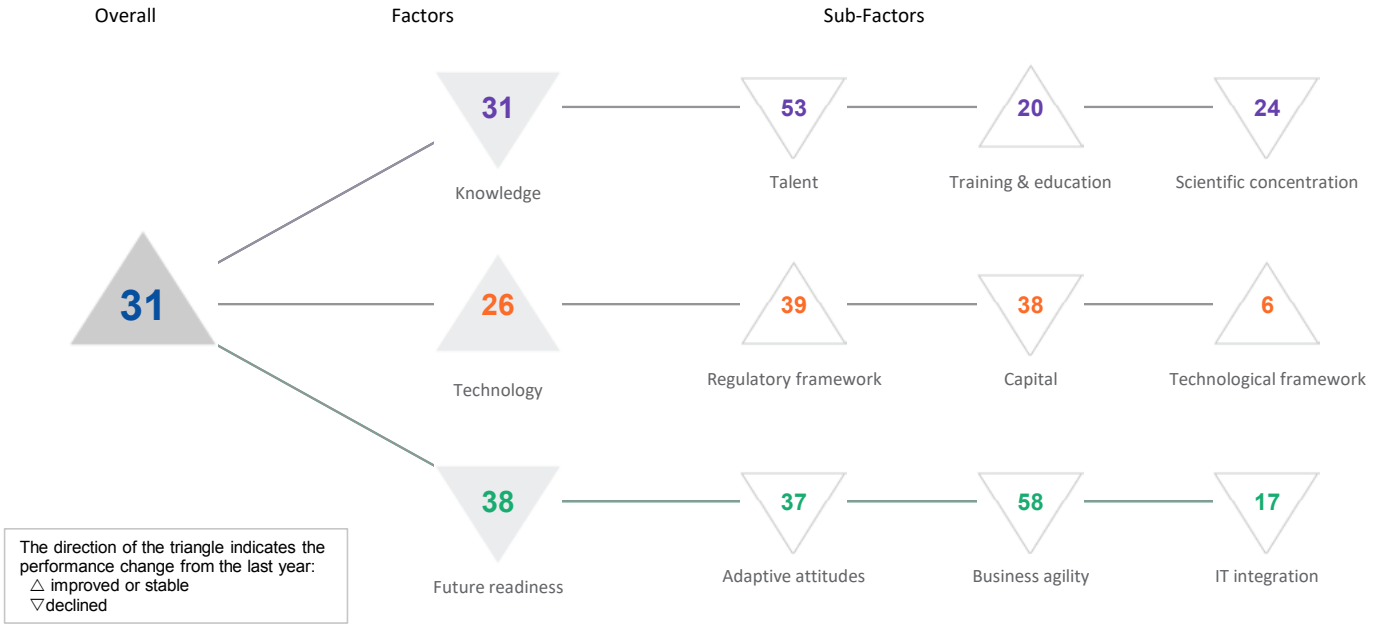
Business agility	Rank
Opportunities and threats	28
▶ World robots distribution	06
Agility of companies	41
▷ Use of big data and analytics	62
Knowledge transfer	44
Entrepreneurial fear of failure	39

IT integration	Rank
E-Government	43
Public-private partnerships	46
Cyber security	43
Software piracy	34
Government cyber security capacity	44
▶ Privacy protection by law exists	02

JAPAN

DIGITAL TRENDS - OVERALL

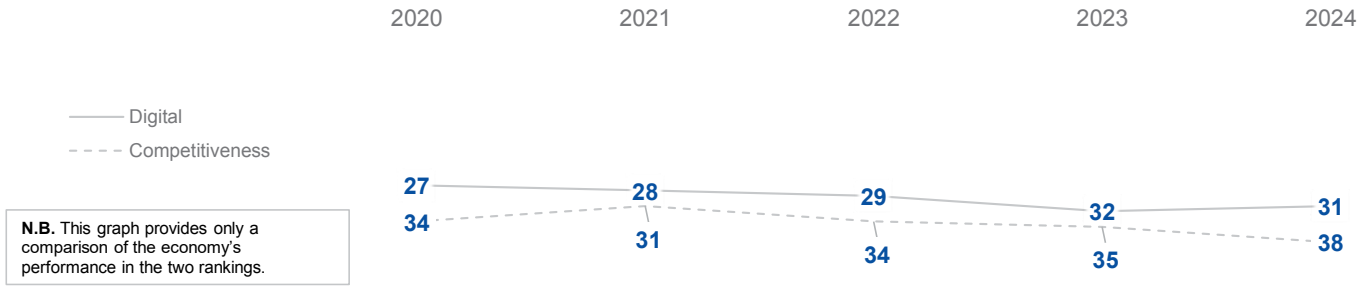
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

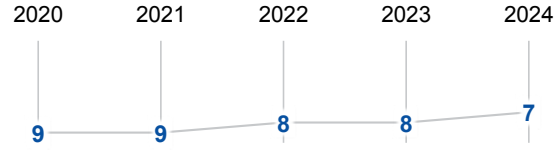
	2020	2021	2022	2023	2024
OVERALL	27	28	29	32	31
Knowledge	22	25	28	28	31
Technology	26	30	30	32	26
Future readiness	26	27	28	32	38

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)



POPULATIONS > 20 MILLION (30 economies)

JAPAN

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	46	47	50	49	53
Training & education	18	21	21	21	20
Scientific concentration	11	13	14	15	24

Talent	Rank
Educational assessment PISA - Math	05
▷ International experience	67
Foreign highly skilled personnel	56
Management of cities	14
▷ Digital/Technological skills	67
Net flow of international students	30

Training & education	Rank
Employee training	32
Total public expenditure on education	56
Higher education achievement	06
▶ Pupil-teacher ratio (tertiary education)	03
Graduates in Sciences	38
Women with degrees	06
Computer science education index	11

Scientific concentration	Rank
Total expenditure on R&D (%)	07
Total R&D personnel per capita	25
Female researchers	57
R&D productivity by publication	17
Scientific and technical employment	40
High-tech patent grants	06
Robots in Education and R&D	06
AI articles	47

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	44	48	47	50	39
Capital	33	37	32	36	38
Technological framework	05	08	08	07	06

Regulatory framework	Rank
Starting a business	45
Enforcing contracts	35
Immigration laws	58
Development & application of tech.	49
Scientific research legislation	48
Intellectual property rights	43
AI policies passed into law	09

Capital	Rank
IT & media stock market capitalization	12
Funding for technological development	45
Banking and financial services	49
Country credit rating	30
Venture capital	37
Investment in Telecommunications	43

Technological framework	Rank
Communications technology	40
Mobile broadband subscribers	05
▶ Wireless broadband	02
Internet users	47
Internet bandwidth speed	12
High-tech exports (%)	35
Secure internet servers	29

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	19	18	20	22	37
Business agility	56	53	62	56	58
IT integration	23	23	18	16	17

Adaptive attitudes	Rank
▶ E-Participation	01
Internet retailing	18
Tablet possession	43
Smartphone possession	48
Attitudes toward globalization	53
Flexibility and adaptability	63

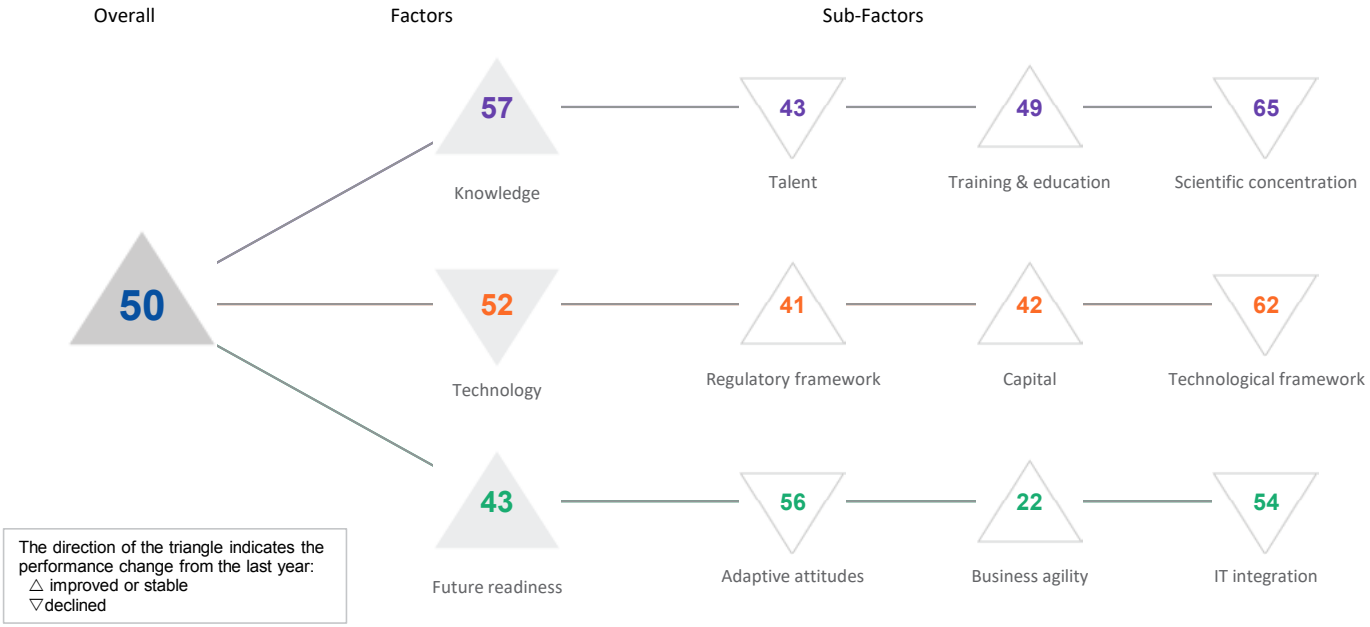
Business agility	Rank
▷ Opportunities and threats	67
▶ World robots distribution	02
▷ Agility of companies	67
▷ Use of big data and analytics	64
Knowledge transfer	56
Entrepreneurial fear of failure	41

IT integration	Rank
E-Government	13
Public-private partnerships	40
Cyber security	45
▶ Software piracy	02
Government cyber security capacity	26
Privacy protection by law exists	10

JORDAN

DIGITAL TRENDS - OVERALL

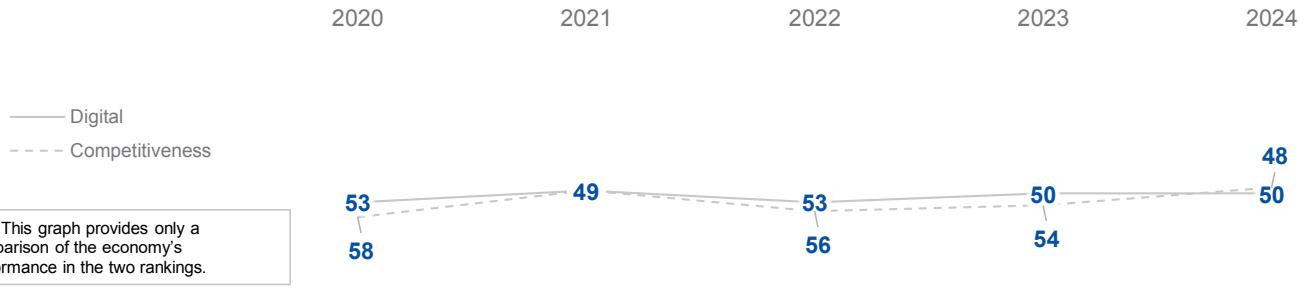
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

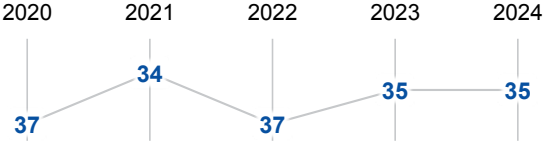
	2020	2021	2022	2023	2024
OVERALL	53	49	53	50	50
Knowledge	54	48	53	59	57
Technology	44	43	50	48	52
Future readiness	58	56	55	45	43

COMPETITIVENESS & DIGITAL RANKINGS

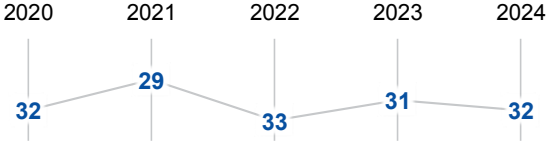


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



JORDAN

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	40	34	41	38	43
Training & education	33	33	41	50	49
Scientific concentration	63	62	62	63	65

Talent	Rank
Educational assessment PISA - Math	58
International experience	16
Foreign highly skilled personnel	22
Management of cities	30
Digital/Technological skills	29
Net flow of international students	36

Training & education	Rank
Employee training	21
Total public expenditure on education	58
Higher education achievement	-
▷ Pupil-teacher ratio (tertiary education)	60
Graduates in Sciences	21
Women with degrees	48
Computer science education index	42

Scientific concentration	Rank
Total expenditure on R&D (%)	-
Total R&D personnel per capita	-
Female researchers	56
R&D productivity by publication	-
Scientific and technical employment	43
High-tech patent grants	53
Robots in Education and R&D	-
AI articles	37

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	42	38	45	42	41
Capital	38	41	45	44	42
Technological framework	53	53	53	54	62

Regulatory framework	Rank
Starting a business	52
Enforcing contracts	54
Immigration laws	16
Development & application of tech.	29
Scientific research legislation	22
Intellectual property rights	34
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	52
Funding for technological development	22
Banking and financial services	23
Country credit rating	59
▶ Venture capital	14
Investment in Telecommunications	20

Technological framework	Rank
Communications technology	53
▷ Mobile broadband subscribers	62
▷ Wireless broadband	63
Internet users	34
Internet bandwidth speed	48
▷ High-tech exports (%)	61
▷ Secure internet servers	63

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	61	61	61	53	56
Business agility	37	28	34	29	22
IT integration	57	54	52	46	54

Adaptive attitudes	Rank
E-Participation	55
Internet retailing	59
Tablet possession	48
▶ Smartphone possession	12
Attitudes toward globalization	31
Flexibility and adaptability	33

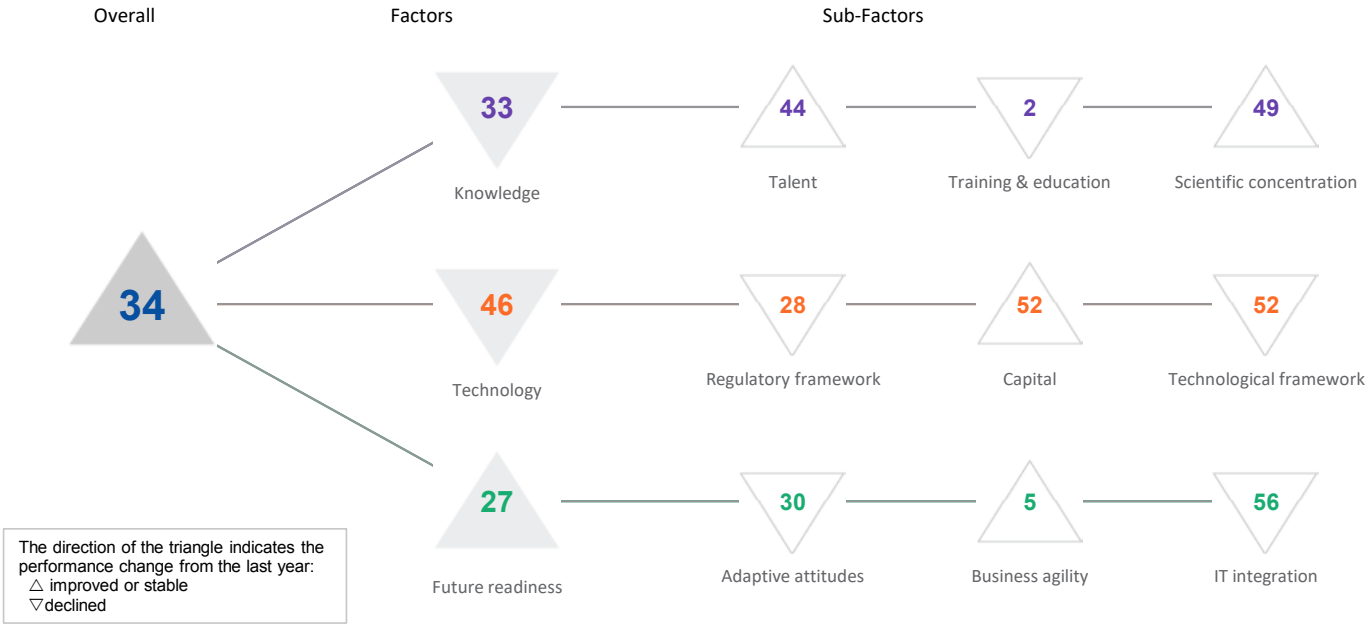
Business agility	Rank
Opportunities and threats	22
World robots distribution	-
▶ Use of big data and analytics	09
▶ Knowledge transfer	16
Entrepreneurial fear of failure	42

IT integration	Rank
E-Government	59
▶ Public-private partnerships	15
Cyber security	17
Software piracy	48
Government cyber security capacity	33
Privacy protection by law exists	59

KAZAKHSTAN

DIGITAL TRENDS - OVERALL

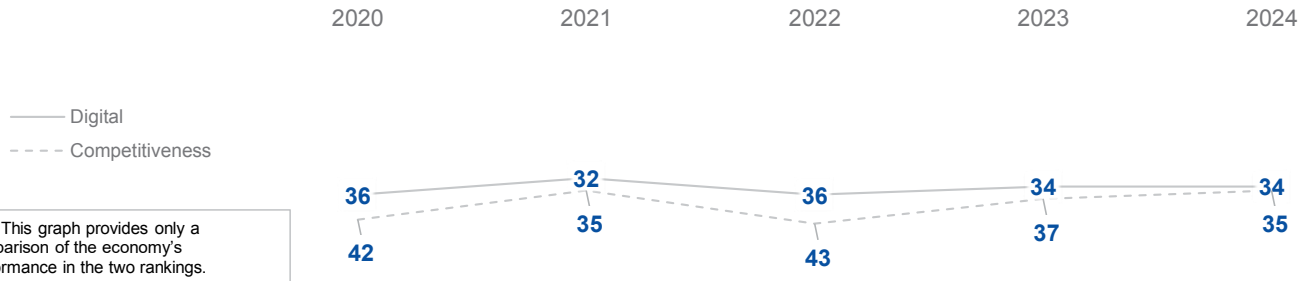
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

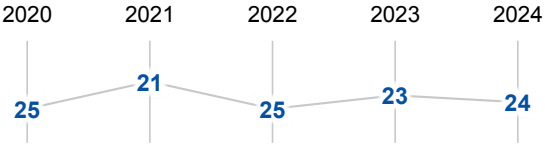
	2020	2021	2022	2023	2024
OVERALL	36	32	36	34	34
Knowledge	34	36	30	30	33
Technology	41	40	40	41	46
Future readiness	33	28	30	31	27

COMPETITIVENESS & DIGITAL RANKINGS

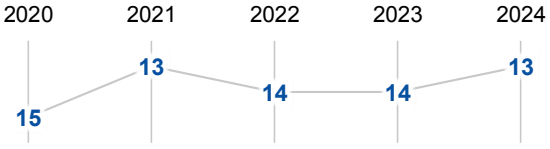


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS > 20 MILLION (30 economies)



KAZAKHSTAN

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	49	45	46	47	44
Training & education	04	14	01	01	02
Scientific concentration	54	54	51	49	49

Talent	Rank
Educational assessment PISA - Math	42
International experience	40
Foreign highly skilled personnel	27
Management of cities	39
Digital/Technological skills	46
Net flow of international students	58

Training & education	Rank
Employee training	13
Total public expenditure on education	20
▶ Higher education achievement	01
Pupil-teacher ratio (tertiary education)	40
Graduates in Sciences	29
▶ Women with degrees	01
Computer science education index	56

Scientific concentration	Rank
▷ Total expenditure on R&D (%)	59
Total R&D personnel per capita	52
▶ Female researchers	04
R&D productivity by publication	18
Scientific and technical employment	47
High-tech patent grants	51
Robots in Education and R&D	-
AI articles	58

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	23	22	21	22	28
Capital	55	51	50	53	52
Technological framework	48	47	47	48	52

Regulatory framework	Rank
Starting a business	11
▶ Enforcing contracts	04
Immigration laws	29
Development & application of tech.	32
Scientific research legislation	30
Intellectual property rights	44
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	24
Banking and financial services	34
Country credit rating	49
Venture capital	36
▷ Investment in Telecommunications	59

Technological framework	Rank
Communications technology	57
▷ Mobile broadband subscribers	60
Wireless broadband	59
Internet users	27
▷ Internet bandwidth speed	60
High-tech exports (%)	07
Secure internet servers	45

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	33	32	34	29	30
Business agility	13	06	06	05	05
IT integration	46	44	56	54	56

Adaptive attitudes	Rank
E-Participation	23
Internet retailing	47
Tablet possession	30
Smartphone possession	35
Attitudes toward globalization	35
Flexibility and adaptability	36

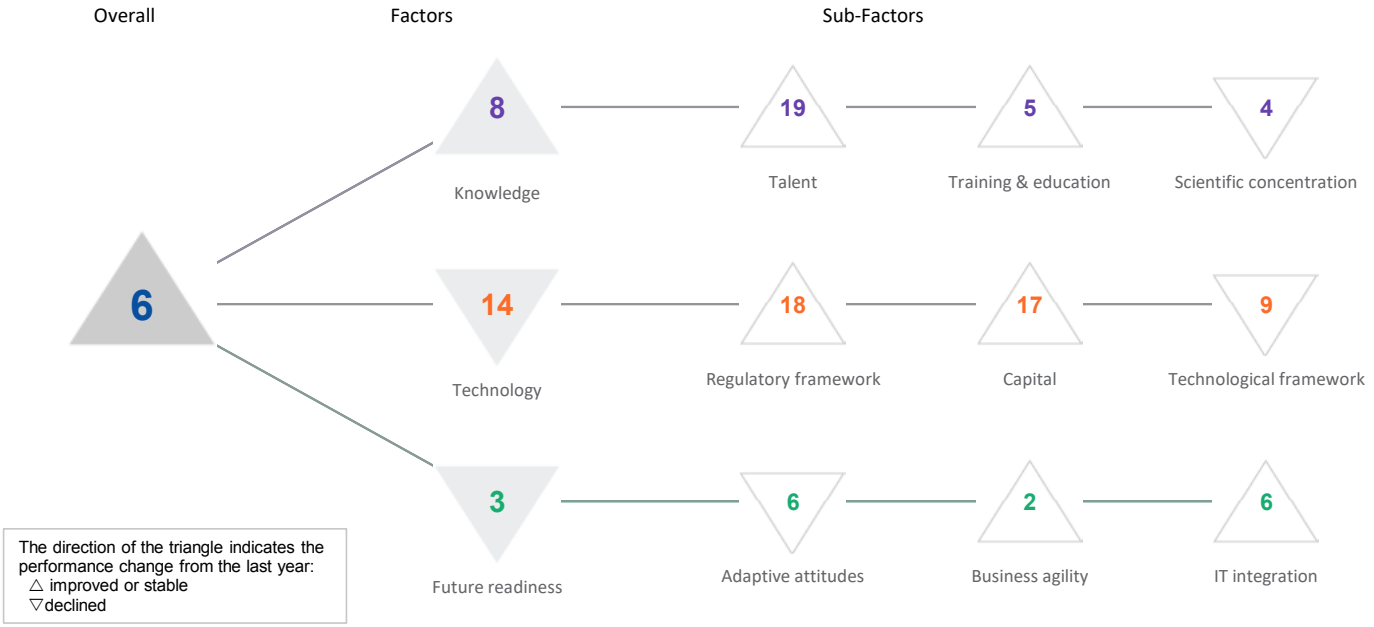
Business agility	Rank
Opportunities and threats	33
World robots distribution	-
Agility of companies	27
Use of big data and analytics	13
Knowledge transfer	28
▶ Entrepreneurial fear of failure	01

IT integration	Rank
E-Government	24
Public-private partnerships	31
Cyber security	48
▷ Software piracy	60
Government cyber security capacity	36
Privacy protection by law exists	56

KOREA REP.

DIGITAL TRENDS - OVERALL

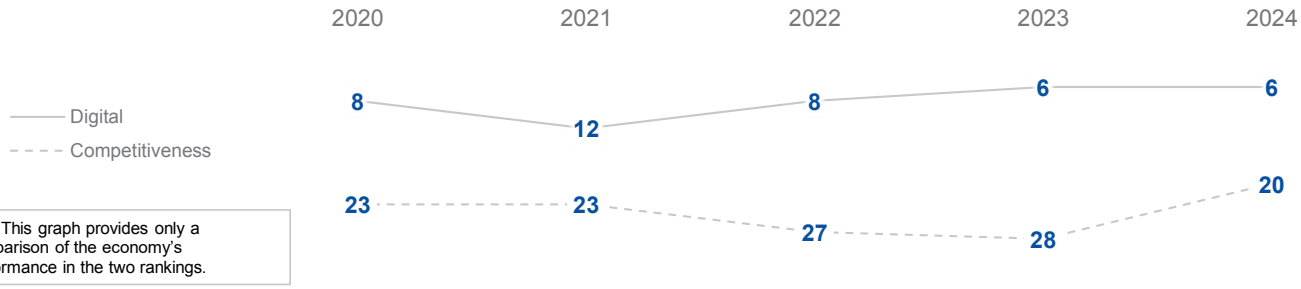
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

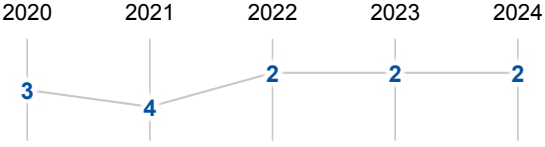
	2020	2021	2022	2023	2024
OVERALL	08	12	08	06	06
Knowledge	10	15	16	10	08
Technology	12	13	13	12	14
Future readiness	03	05	02	01	03

COMPETITIVENESS & DIGITAL RANKINGS

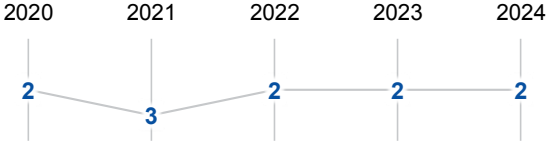


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)



POPULATIONS > 20 MILLION (30 economies)



KOREA REP.

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	21	26	33	31	19
Training & education	11	16	16	06	05
Scientific concentration	04	03	03	02	04

Talent	Rank
Educational assessment PISA - Math	06
▷ International experience	45
Foreign highly skilled personnel	38
Management of cities	04
Digital/Technological skills	28
Net flow of international students	33

Training & education	Rank
Employee training	19
Total public expenditure on education	30
Higher education achievement	04
Pupil-teacher ratio (tertiary education)	26
Graduates in Sciences	09
Women with degrees	22
Computer science education index	06

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	02
Total R&D personnel per capita	05
▷ Female researchers	55
R&D productivity by publication	30
Scientific and technical employment	32
▶ High-tech patent grants	03
Robots in Education and R&D	04
AI articles	25

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	26	23	23	26	18
Capital	25	16	15	24	17
Technological framework	03	07	07	08	09

Regulatory framework	Rank
Starting a business	19
▶ Enforcing contracts	02
▷ Immigration laws	54
Development & application of tech.	43
Scientific research legislation	35
Intellectual property rights	31
AI policies passed into law	05

Capital	Rank
IT & media stock market capitalization	03
Funding for technological development	33
▷ Banking and financial services	53
Country credit rating	17
Venture capital	38
Investment in Telecommunications	22

Technological framework	Rank
Communications technology	09
Mobile broadband subscribers	06
Wireless broadband	30
Internet users	11
Internet bandwidth speed	20
High-tech exports (%)	27
Secure internet servers	43

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	01	02	01	01	06
Business agility	03	05	02	03	02
IT integration	15	16	14	12	06

Adaptive attitudes	Rank
E-Participation	03
Internet retailing	03
▷ Tablet possession	44
Smartphone possession	08
Attitudes toward globalization	09
Flexibility and adaptability	14

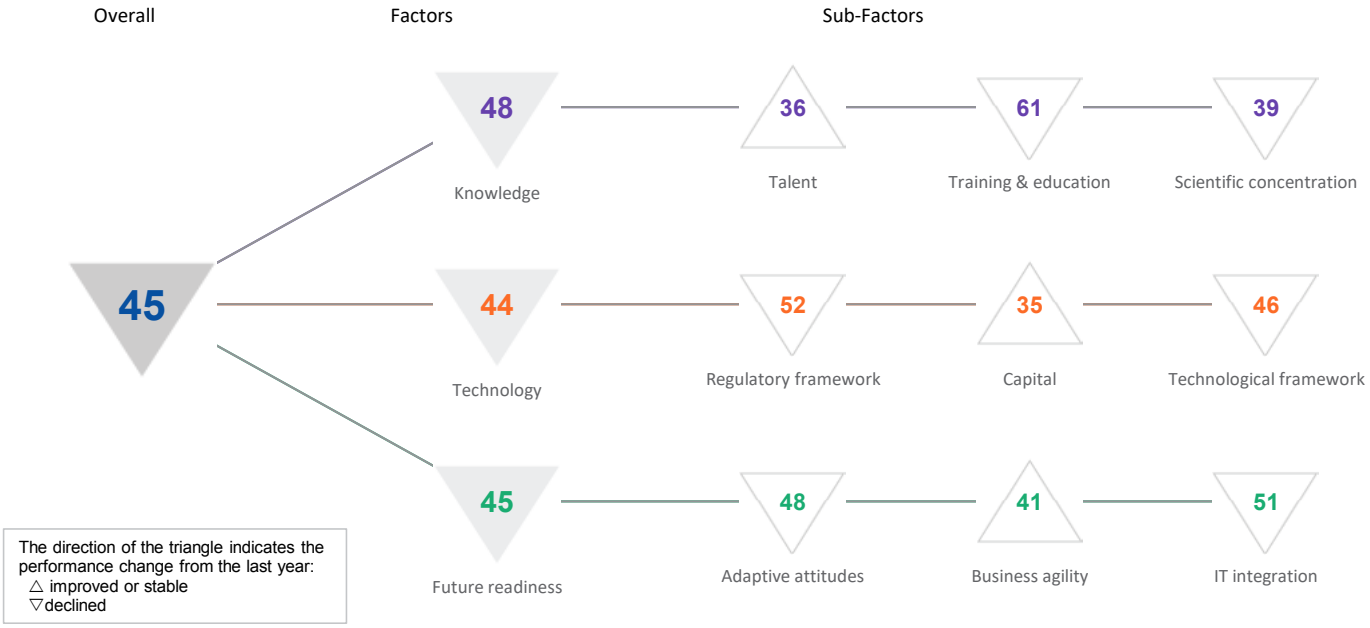
Business agility	Rank
Opportunities and threats	17
▶ World robots distribution	03
Agility of companies	09
Use of big data and analytics	21
Knowledge transfer	25
▶ Entrepreneurial fear of failure	02

IT integration	Rank
E-Government	04
Public-private partnerships	33
Cyber security	20
Software piracy	20
Government cyber security capacity	06
Privacy protection by law exists	09

KUWAIT

DIGITAL TRENDS - OVERALL

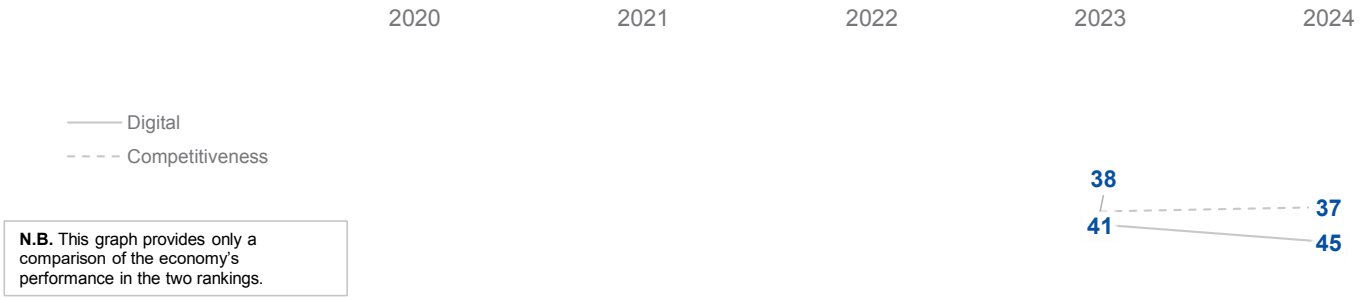
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

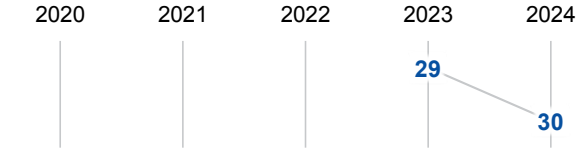
	2020	2021	2022	2023	2024
OVERALL	-	-	-	41	45
Knowledge	-	-	-	44	48
Technology	-	-	-	37	44
Future readiness	-	-	-	41	45

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)

KUWAIT

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	-	-	-	43	36
Training & education	-	-	-	53	61
Scientific concentration	-	-	-	35	39

Talent	Rank
Educational assessment PISA - Math	-
International experience	26
Foreign highly skilled personnel	50
Management of cities	44
Digital/Technological skills	24
Net flow of international students	-

Training & education	Rank
Employee training	34
Total public expenditure on education	23
▷ Higher education achievement	62
Pupil-teacher ratio (tertiary education)	-
Graduates in Sciences	-
Women with degrees	58
Computer science education index	58

Scientific concentration	Rank
Total expenditure on R&D (%)	61
▶ Total R&D personnel per capita	08
Female researchers	11
R&D productivity by publication	24
Scientific and technical employment	-
High-tech patent grants	-
Robots in Education and R&D	54
AI articles	44

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	-	-	-	44	52
Capital	-	-	-	40	35
Technological framework	-	-	-	25	46

Regulatory framework	Rank
Starting a business	37
Enforcing contracts	44
Immigration laws	61
Development & application of tech.	39
Scientific research legislation	46
Intellectual property rights	45
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	28
Funding for technological development	32
▶ Banking and financial services	06
Country credit rating	25
Venture capital	27
▷ Investment in Telecommunications	65

Technological framework	Rank
Communications technology	26
▶ Mobile broadband subscribers	10
Wireless broadband	35
▶ Internet users	06
Internet bandwidth speed	29
▷ High-tech exports (%)	63
Secure internet servers	57

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	-	-	-	36	48
Business agility	-	-	-	47	41
IT integration	-	-	-	40	51

Adaptive attitudes	Rank
▷ E-Participation	62
Internet retailing	43
Tablet possession	10
Smartphone possession	28
Attitudes toward globalization	27
Flexibility and adaptability	37

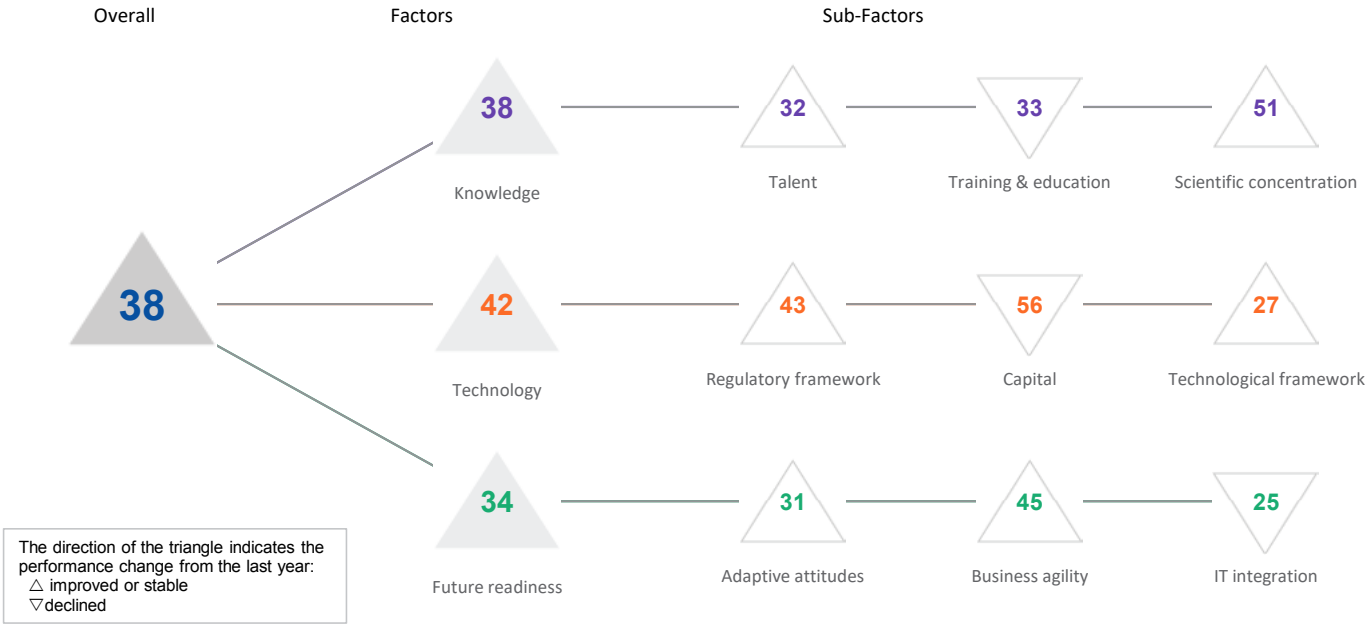
Business agility	Rank
Opportunities and threats	31
World robots distribution	58
Agility of companies	46
Use of big data and analytics	26
Knowledge transfer	39
Entrepreneurial fear of failure	36

IT integration	Rank
E-Government	55
Public-private partnerships	41
Cyber security	27
Software piracy	-
▶ Government cyber security capacity	09
▷ Privacy protection by law exists	65

LATVIA

DIGITAL TRENDS - OVERALL

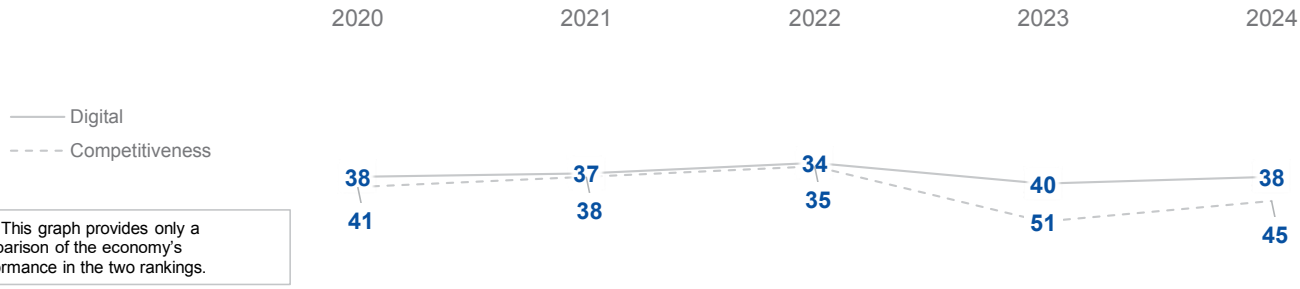
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	38	37	34	40	38
Knowledge	36	34	36	39	38
Technology	34	34	34	43	42
Future readiness	42	42	32	34	34

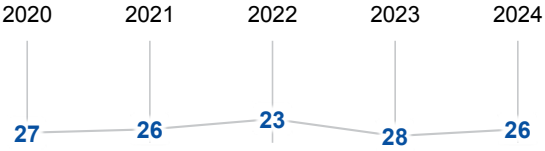
COMPETITIVENESS & DIGITAL RANKINGS



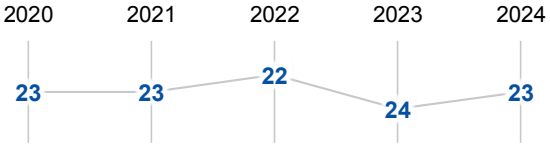
N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



LATVIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	27	24	25	44	32
Training & education	27	30	28	31	33
Scientific concentration	49	51	52	54	51

Talent	Rank
Educational assessment PISA - Math	21
International experience	46
▷ Foreign highly skilled personnel	54
Management of cities	34
Digital/Technological skills	31
Net flow of international students	20

Training & education	Rank
Employee training	38
Total public expenditure on education	16
Higher education achievement	29
▶ Pupil-teacher ratio (tertiary education)	16
Graduates in Sciences	45
Women with degrees	26
Computer science education index	44

Scientific concentration	Rank
Total expenditure on R&D (%)	46
Total R&D personnel per capita	40
▶ Female researchers	06
▷ R&D productivity by publication	55
Scientific and technical employment	37
High-tech patent grants	46
Robots in Education and R&D	48
AI articles	36

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	37	34	36	43	43
Capital	50	46	39	52	56
Technological framework	13	18	22	27	27

Regulatory framework	Rank
▶ Starting a business	15
▶ Enforcing contracts	14
▷ Immigration laws	55
Development & application of tech.	33
Scientific research legislation	53
Intellectual property rights	47
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	41
Funding for technological development	41
▷ Banking and financial services	64
Country credit rating	35
Venture capital	44
▷ Investment in Telecommunications	55

Technological framework	Rank
Communications technology	31
Mobile broadband subscribers	17
Wireless broadband	23
Internet users	32
Internet bandwidth speed	40
High-tech exports (%)	30
Secure internet servers	36

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	51	51	44	35	31
Business agility	45	48	31	49	45
IT integration	37	37	23	21	25

Adaptive attitudes	Rank
E-Participation	32
Internet retailing	37
Tablet possession	20
Smartphone possession	20
Attitudes toward globalization	47
Flexibility and adaptability	47

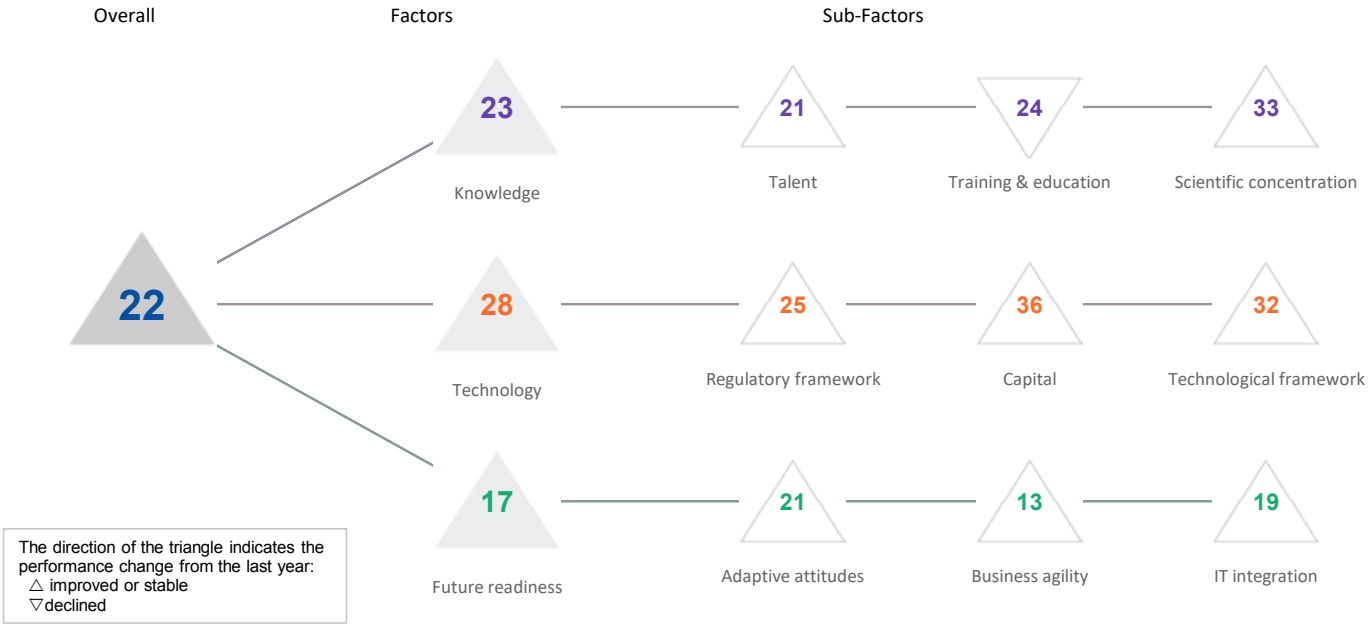
Business agility	Rank
Opportunities and threats	35
World robots distribution	52
Agility of companies	45
Use of big data and analytics	36
Knowledge transfer	40
Entrepreneurial fear of failure	33

IT integration	Rank
E-Government	27
Public-private partnerships	47
Cyber security	26
Software piracy	41
▶ Government cyber security capacity	12
Privacy protection by law exists	23

LITHUANIA

DIGITAL TRENDS - OVERALL

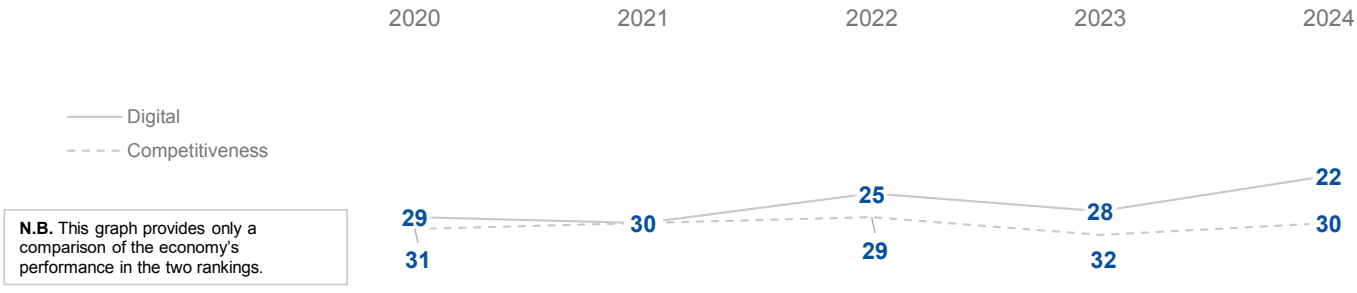
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

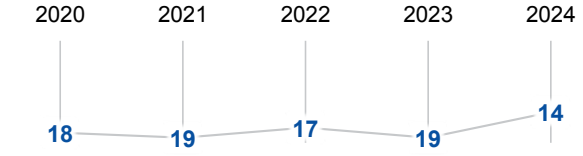
	2020	2021	2022	2023	2024
OVERALL	29	30	25	28	22
Knowledge	25	26	24	23	23
Technology	29	29	32	33	28
Future readiness	30	33	24	28	17

COMPETITIVENESS & DIGITAL RANKINGS

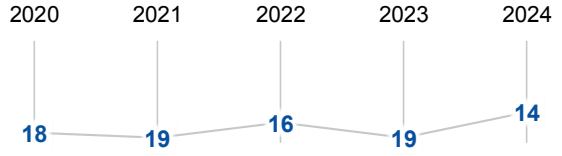


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



LITHUANIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	23	25	27	25	21
Training & education	16	15	13	15	24
Scientific concentration	40	37	37	33	33

Talent	Rank
Educational assessment PISA - Math	25
International experience	18
Foreign highly skilled personnel	41
Management of cities	26
▶ Digital/Technological skills	01
Net flow of international students	37

Training & education	Rank
Employee training	27
Total public expenditure on education	28
Higher education achievement	13
Pupil-teacher ratio (tertiary education)	11
Graduates in Sciences	32
Women with degrees	12
Computer science education index	40

Scientific concentration	Rank
Total expenditure on R&D (%)	39
Total R&D personnel per capita	34
Female researchers	10
▷ R&D productivity by publication	52
Scientific and technical employment	27
High-tech patent grants	12
▷ Robots in Education and R&D	47
AI articles	32

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	27	32	28	28	25
Capital	42	30	37	39	36
Technological framework	18	30	32	33	32

Regulatory framework	Rank
Starting a business	20
▶ Enforcing contracts	07
Immigration laws	40
Development & application of tech.	21
Scientific research legislation	28
Intellectual property rights	23
AI policies passed into law	39

Capital	Rank
▶ IT & media stock market capitalization	06
Funding for technological development	31
Banking and financial services	41
Country credit rating	33
Venture capital	33
▷ Investment in Telecommunications	58

Technological framework	Rank
▶ Communications technology	06
▷ Mobile broadband subscribers	57
Wireless broadband	11
Internet users	41
Internet bandwidth speed	30
High-tech exports (%)	36
Secure internet servers	15

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	47	47	38	37	21
Business agility	18	24	17	18	13
IT integration	32	34	26	28	19

Adaptive attitudes	Rank
E-Participation	24
Internet retailing	31
Tablet possession	26
Smartphone possession	27
Attitudes toward globalization	32
Flexibility and adaptability	18

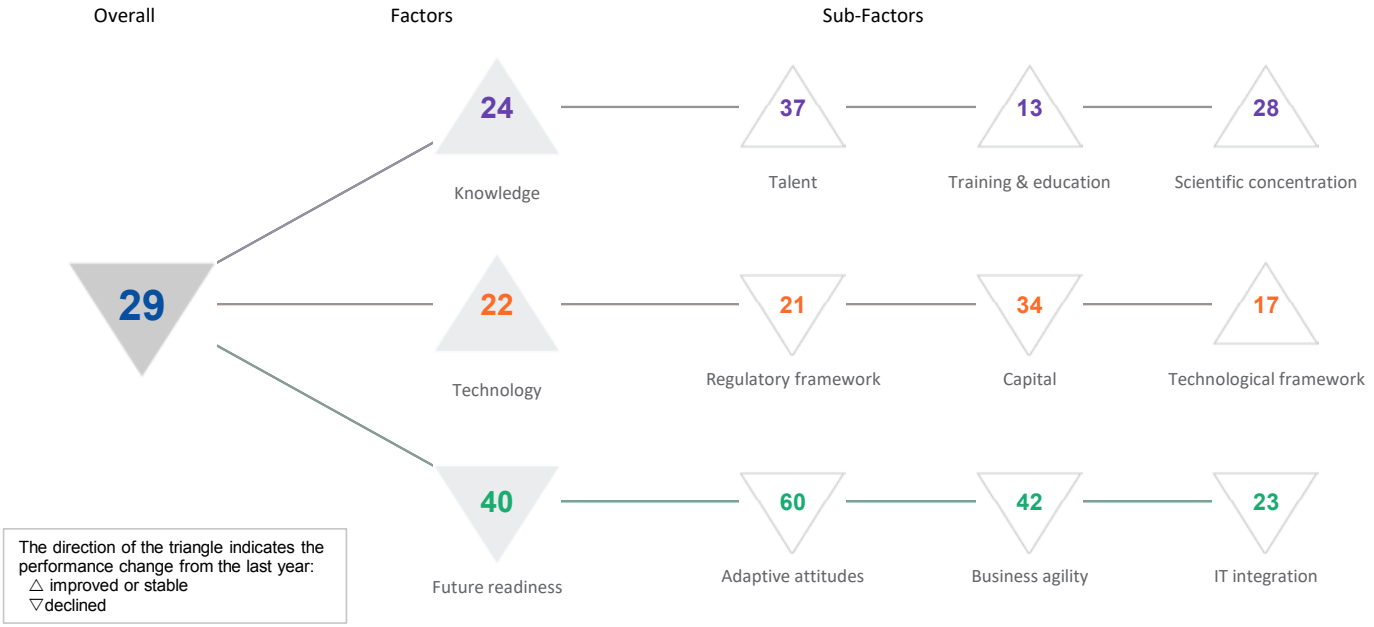
Business agility	Rank
▶ Opportunities and threats	03
▷ World robots distribution	45
Agility of companies	07
Use of big data and analytics	22
Knowledge transfer	33
Entrepreneurial fear of failure	08

IT integration	Rank
E-Government	21
Public-private partnerships	35
Cyber security	18
Software piracy	44
Government cyber security capacity	10
Privacy protection by law exists	14

LUXEMBOURG

DIGITAL TRENDS - OVERALL

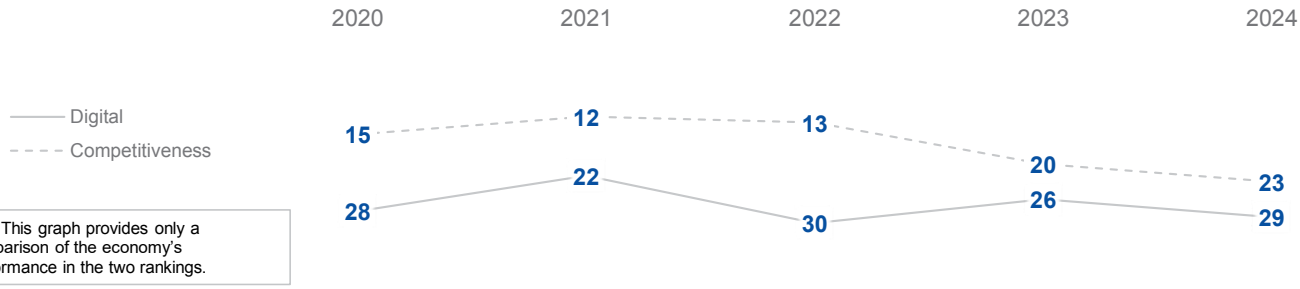
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

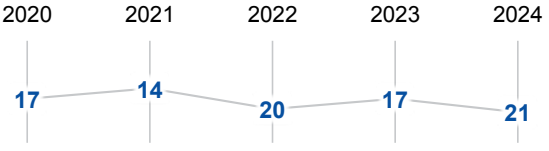
	2020	2021	2022	2023	2024
OVERALL	28	22	30	26	29
Knowledge	35	29	35	33	24
Technology	17	14	19	25	22
Future readiness	27	24	35	21	40

COMPETITIVENESS & DIGITAL RANKINGS

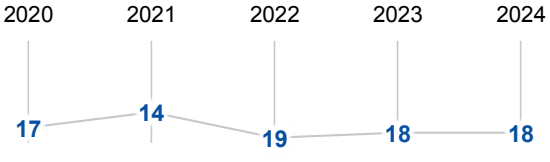


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



LUXEMBOURG

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	39	33	35	40	37
Training & education	23	20	20	18	13
Scientific concentration	41	38	42	48	28

Talent	Rank
Educational assessment PISA - Math	21
International experience	09
Foreign highly skilled personnel	13
Management of cities	15
Digital/Technological skills	37
▷ Net flow of international students	61

Training & education	Rank
Employee training	30
Total public expenditure on education	34
Higher education achievement	10
▶ Pupil-teacher ratio (tertiary education)	01
Graduates in Sciences	36
Women with degrees	16
Computer science education index	19

Scientific concentration	Rank
Total expenditure on R&D (%)	41
Total R&D personnel per capita	15
Female researchers	48
▷ R&D productivity by publication	58
Scientific and technical employment	24
High-tech patent grants	27
Robots in Education and R&D	-
▶ AI articles	02

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	08	08	18	17	21
Capital	15	08	24	29	34
Technological framework	35	25	27	34	17

Regulatory framework	Rank
Starting a business	34
Enforcing contracts	17
Immigration laws	10
Development & application of tech.	19
Scientific research legislation	19
Intellectual property rights	15
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	10
Funding for technological development	29
▷ Banking and financial services	56
▶ Country credit rating	01
Venture capital	39
▷ Investment in Telecommunications	62

Technological framework	Rank
Communications technology	16
Mobile broadband subscribers	18
Wireless broadband	31
▶ Internet users	08
Internet bandwidth speed	14
High-tech exports (%)	54
Secure internet servers	16

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	48	38	47	23	60
Business agility	34	22	36	27	42
IT integration	16	12	17	10	23

Adaptive attitudes	Rank
E-Participation	53
Internet retailing	-
Tablet possession	-
Smartphone possession	-
Attitudes toward globalization	41
▷ Flexibility and adaptability	55

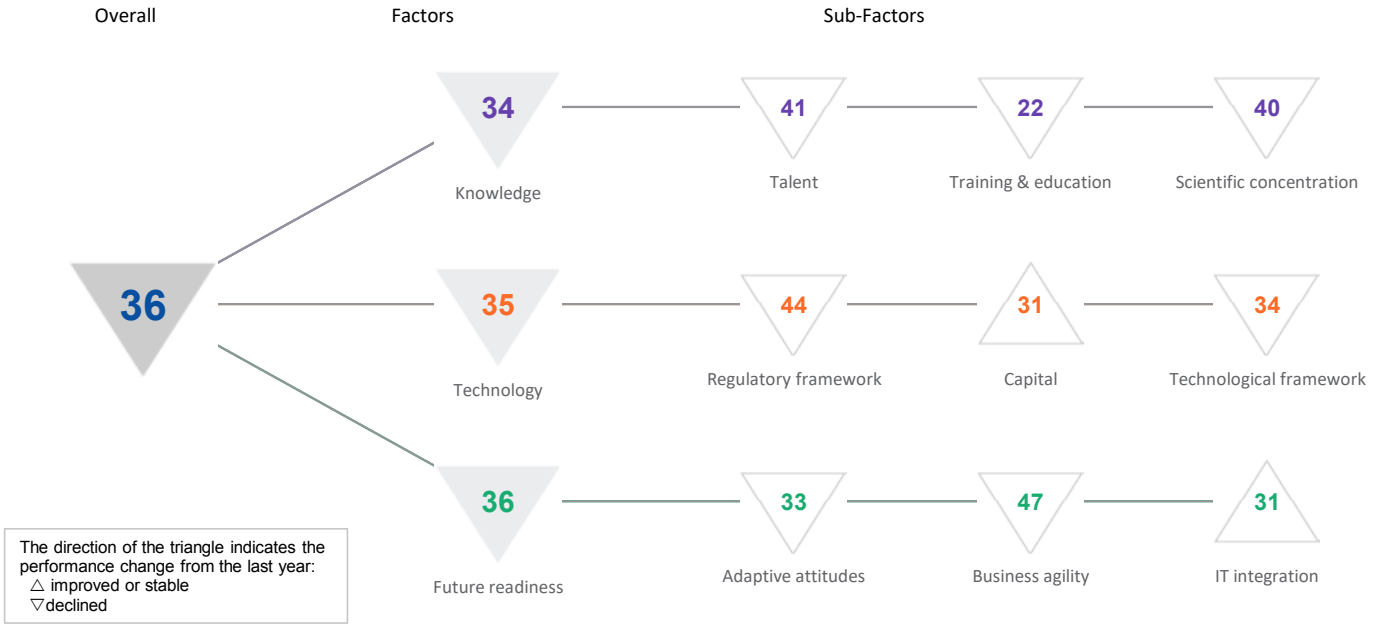
Business agility	Rank
Opportunities and threats	39
World robots distribution	-
Agility of companies	35
Use of big data and analytics	53
Knowledge transfer	31
Entrepreneurial fear of failure	34

IT integration	Rank
E-Government	38
Public-private partnerships	30
Cyber security	23
▶ Software piracy	04
Government cyber security capacity	41
Privacy protection by law exists	37

MALAYSIA

DIGITAL TRENDS - OVERALL

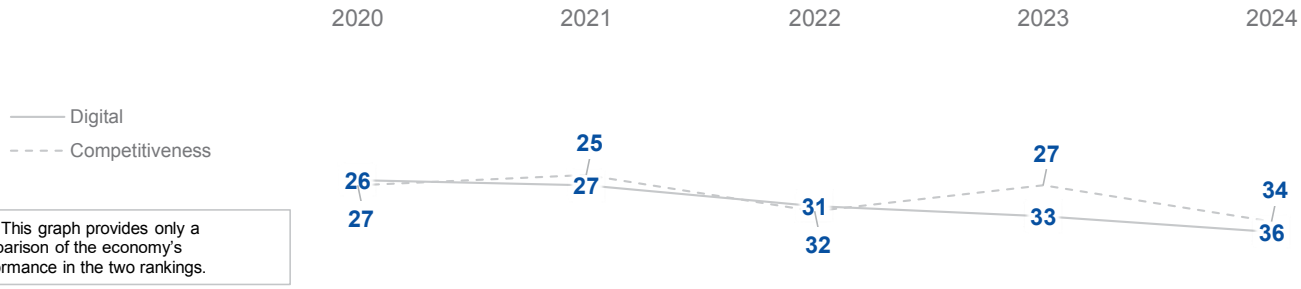
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

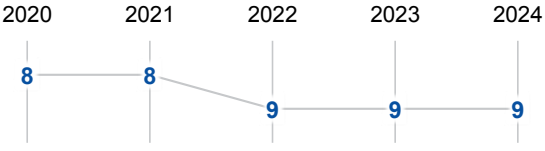
	2020	2021	2022	2023	2024
OVERALL	26	27	31	33	36
Knowledge	19	22	25	29	34
Technology	20	26	29	27	35
Future readiness	32	29	31	33	36

COMPETITIVENESS & DIGITAL RANKINGS

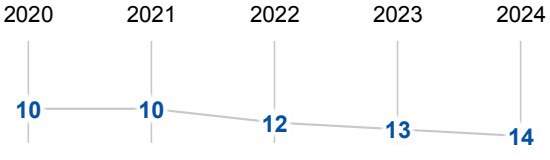


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)



POPULATIONS > 20 MILLION (30 economies)



MALAYSIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	30	30	36	30	41
Training & education	08	09	10	17	22
Scientific concentration	26	32	35	36	40

Talent	Rank
Educational assessment PISA - Math	48
International experience	34
Foreign highly skilled personnel	42
Management of cities	28
Digital/Technological skills	36
Net flow of international students	29

Training & education	Rank
Employee training	43
Total public expenditure on education	43
Higher education achievement	41
Pupil-teacher ratio (tertiary education)	34
▶ Graduates in Sciences	02
Women with degrees	23
Computer science education index	22

Scientific concentration	Rank
Total expenditure on R&D (%)	43
Total R&D personnel per capita	43
▶ Female researchers	07
R&D productivity by publication	16
▷ Scientific and technical employment	51
High-tech patent grants	45
Robots in Education and R&D	29
AI articles	41

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	35	35	40	36	44
Capital	18	31	33	32	31
Technological framework	15	15	16	16	34

Regulatory framework	Rank
▷ Starting a business	54
Enforcing contracts	27
Immigration laws	42
Development & application of tech.	28
Scientific research legislation	33
▷ Intellectual property rights	50
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	18
Funding for technological development	38
Banking and financial services	26
Country credit rating	40
Venture capital	32
Investment in Telecommunications	36

Technological framework	Rank
Communications technology	43
Mobile broadband subscribers	34
Wireless broadband	25
▶ Internet users	10
Internet bandwidth speed	42
▶ High-tech exports (%)	10
Secure internet servers	41

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	30	29	30	27	33
Business agility	30	27	35	37	47
IT integration	33	31	31	33	31

Adaptive attitudes	Rank
E-Participation	43
▷ Internet retailing	51
Tablet possession	19
▶ Smartphone possession	09
Attitudes toward globalization	34
Flexibility and adaptability	48

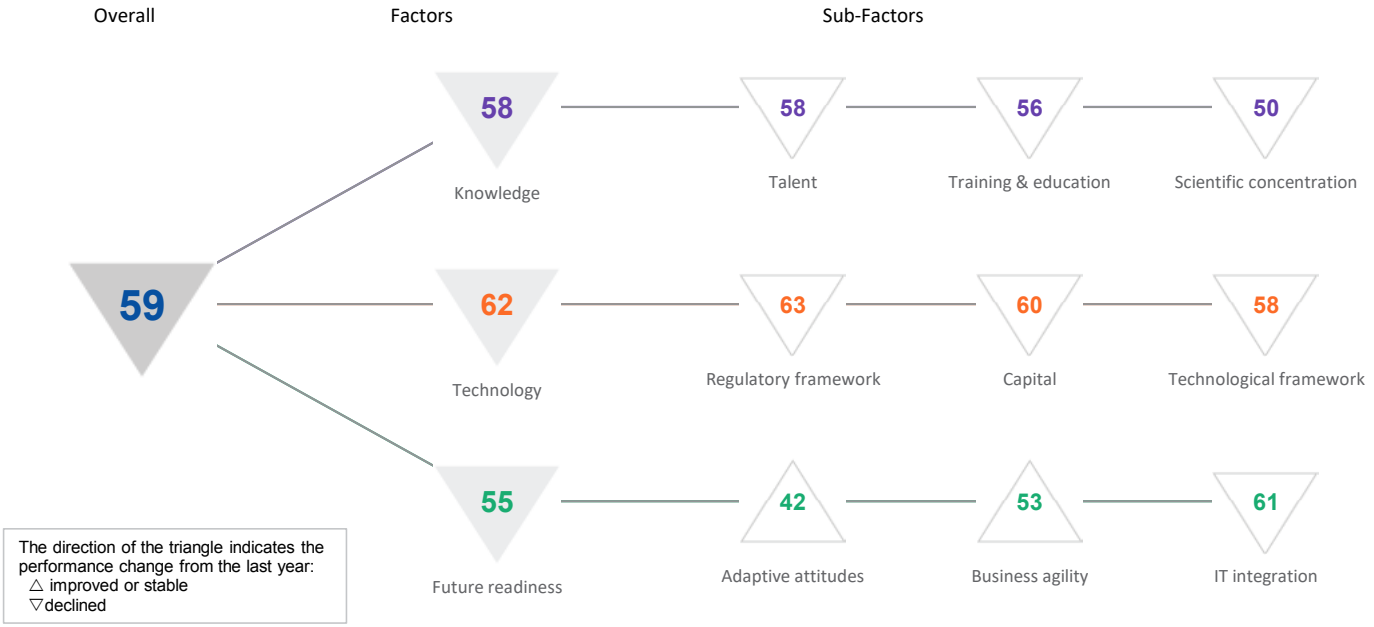
Business agility	Rank
Opportunities and threats	47
World robots distribution	22
▷ Agility of companies	51
Use of big data and analytics	40
Knowledge transfer	41
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	49
Public-private partnerships	27
Cyber security	38
Software piracy	46
Government cyber security capacity	19
Privacy protection by law exists	14

MEXICO

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

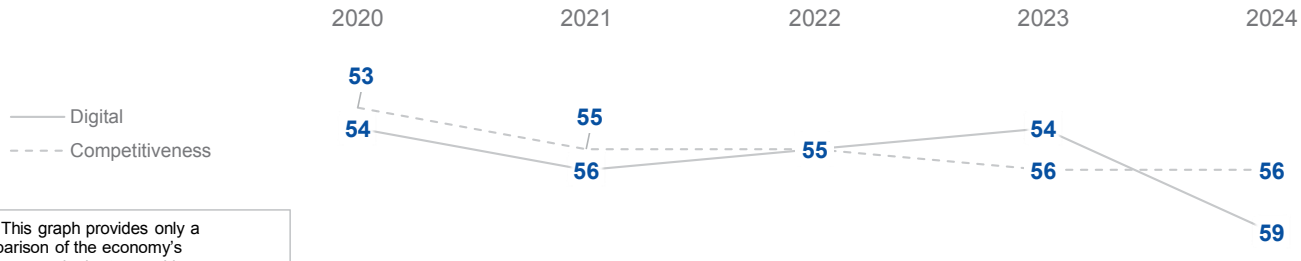


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	54	56	55	54	59
Knowledge	52	54	52	50	58
Technology	56	57	56	58	62
Future readiness	52	51	53	54	55

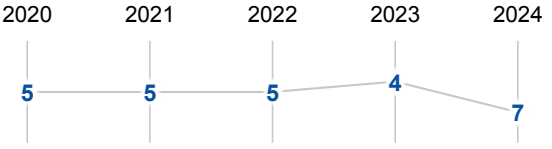
COMPETITIVENESS & DIGITAL RANKINGS



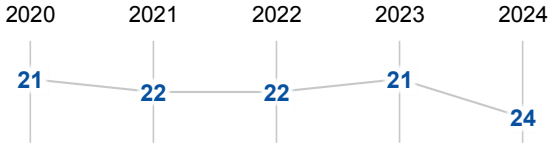
N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

THE AMERICAS (10 economies)



POPULATIONS > 20 MILLION (30 economies)



MEXICO

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	45	51	54	52	58
Training & education	57	57	53	54	56
Scientific concentration	43	50	49	46	50

Talent	Rank
Educational assessment PISA - Math	49
International experience	32
Foreign highly skilled personnel	28
Management of cities	62
Digital/Technological skills	61
Net flow of international students	40

Training & education	Rank
Employee training	55
Total public expenditure on education	59
Higher education achievement	53
Pupil-teacher ratio (tertiary education)	23
Graduates in Sciences	33
Women with degrees	55
Computer science education index	53

Scientific concentration	Rank
Total expenditure on R&D (%)	56
Total R&D personnel per capita	55
Female researchers	42
▶ R&D productivity by publication	06
Scientific and technical employment	35
High-tech patent grants	58
▶ Robots in Education and R&D	10
AI articles	62

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	50	54	56	59	63
Capital	53	57	55	55	60
Technological framework	54	54	54	55	58

Regulatory framework	Rank
Starting a business	46
Enforcing contracts	32
Immigration laws	52
▷ Development & application of tech.	64
▷ Scientific research legislation	66
Intellectual property rights	63
AI policies passed into law	21

Capital	Rank
IT & media stock market capitalization	19
▷ Funding for technological development	66
Banking and financial services	60
Country credit rating	50
Venture capital	61
Investment in Telecommunications	39

Technological framework	Rank
Communications technology	61
Mobile broadband subscribers	51
Wireless broadband	56
Internet users	56
Internet bandwidth speed	56
High-tech exports (%)	22
Secure internet servers	59

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	52	52	54	56	42
Business agility	50	41	46	53	53
IT integration	53	52	47	51	61

Adaptive attitudes	Rank
E-Participation	40
Internet retailing	40
Tablet possession	49
Smartphone possession	47
▶ Attitudes toward globalization	18
Flexibility and adaptability	46

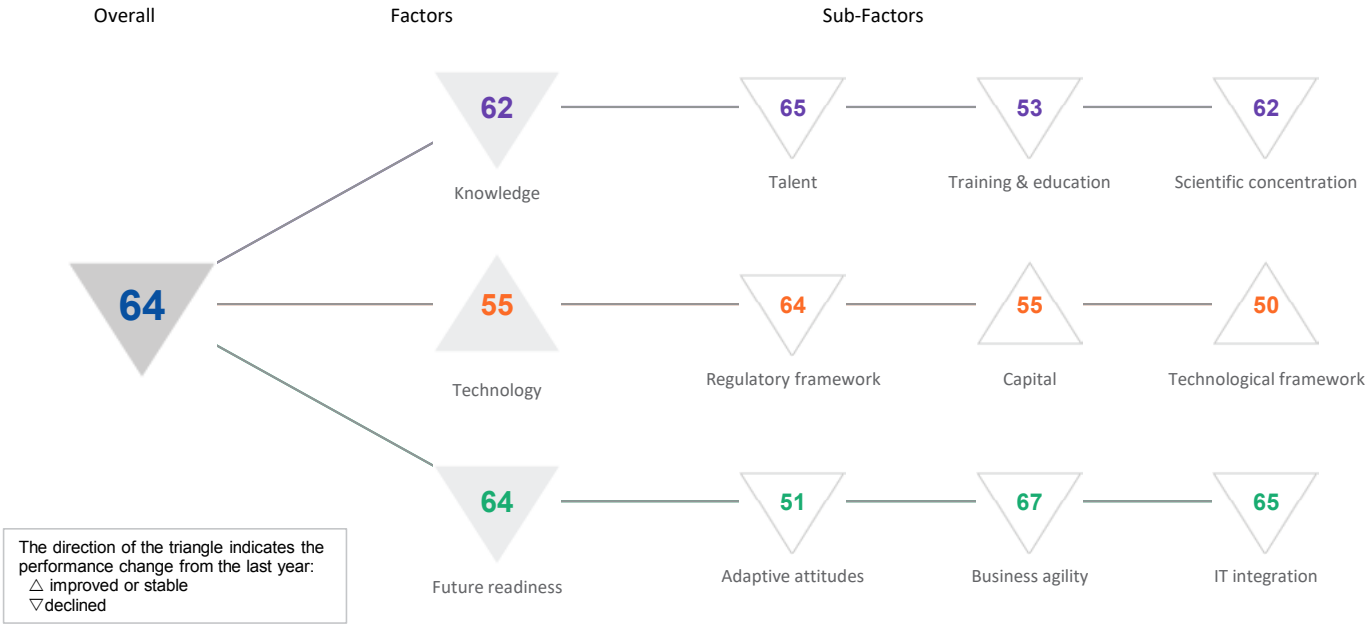
Business agility	Rank
Opportunities and threats	54
▶ World robots distribution	09
Agility of companies	47
Use of big data and analytics	56
Knowledge transfer	61
Entrepreneurial fear of failure	30

IT integration	Rank
E-Government	54
▷ Public-private partnerships	63
▷ Cyber security	66
Software piracy	43
Government cyber security capacity	51
▶ Privacy protection by law exists	17

MONGOLIA

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

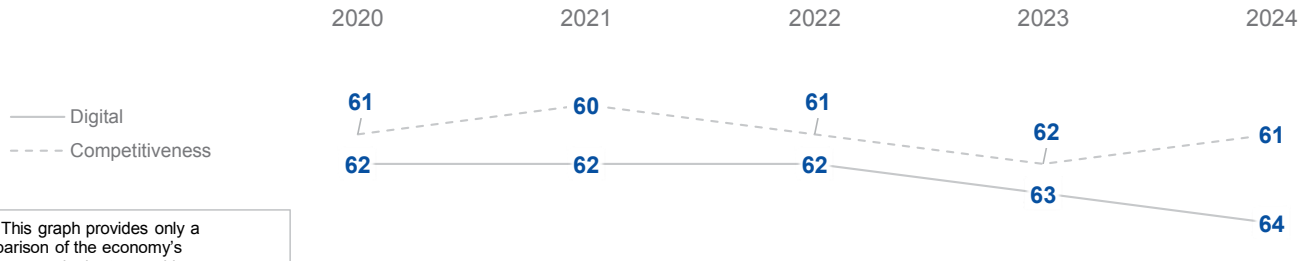


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	62	62	62	63	64
Knowledge	58	58	61	56	62
Technology	60	61	60	61	55
Future readiness	59	62	62	62	64

COMPETITIVENESS & DIGITAL RANKINGS

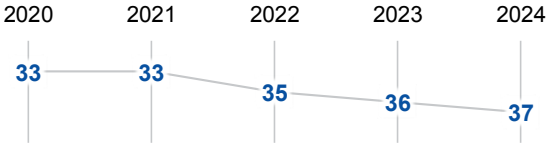


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)

POPULATIONS < 20 MILLION (37 economies)



MONGOLIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	60	60	60	63	65
Training & education	41	39	47	37	53
Scientific concentration	61	61	61	61	62

Talent	Rank
Educational assessment PISA - Math	43
▷ International experience	66
Foreign highly skilled personnel	61
Management of cities	65
Digital/Technological skills	57
Net flow of international students	60

Training & education	Rank
Employee training	31
Total public expenditure on education	52
Higher education achievement	26
Pupil-teacher ratio (tertiary education)	53
Graduates in Sciences	52
▶ Women with degrees	24
Computer science education index	61

Scientific concentration	Rank
Total expenditure on R&D (%)	60
Total R&D personnel per capita	46
▶ Female researchers	01
R&D productivity by publication	57
Scientific and technical employment	54
High-tech patent grants	59
Robots in Education and R&D	-
AI articles	59

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	58	58	60	61	64
Capital	60	62	59	61	55
Technological framework	60	60	57	58	50

Regulatory framework	Rank
Starting a business	43
Enforcing contracts	45
Immigration laws	60
Development & application of tech.	50
Scientific research legislation	65
▷ Intellectual property rights	66
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	63
Banking and financial services	48
Country credit rating	62
Venture capital	62
▶ Investment in Telecommunications	06

Technological framework	Rank
Communications technology	47
Mobile broadband subscribers	-
Wireless broadband	50
Internet users	50
Internet bandwidth speed	62
▶ High-tech exports (%)	08
Secure internet servers	49

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	40	37	51	44	51
Business agility	61	63	63	64	67
IT integration	61	62	62	62	65

Adaptive attitudes	Rank
E-Participation	32
Internet retailing	60
Tablet possession	-
▶ Smartphone possession	07
Attitudes toward globalization	43
Flexibility and adaptability	28

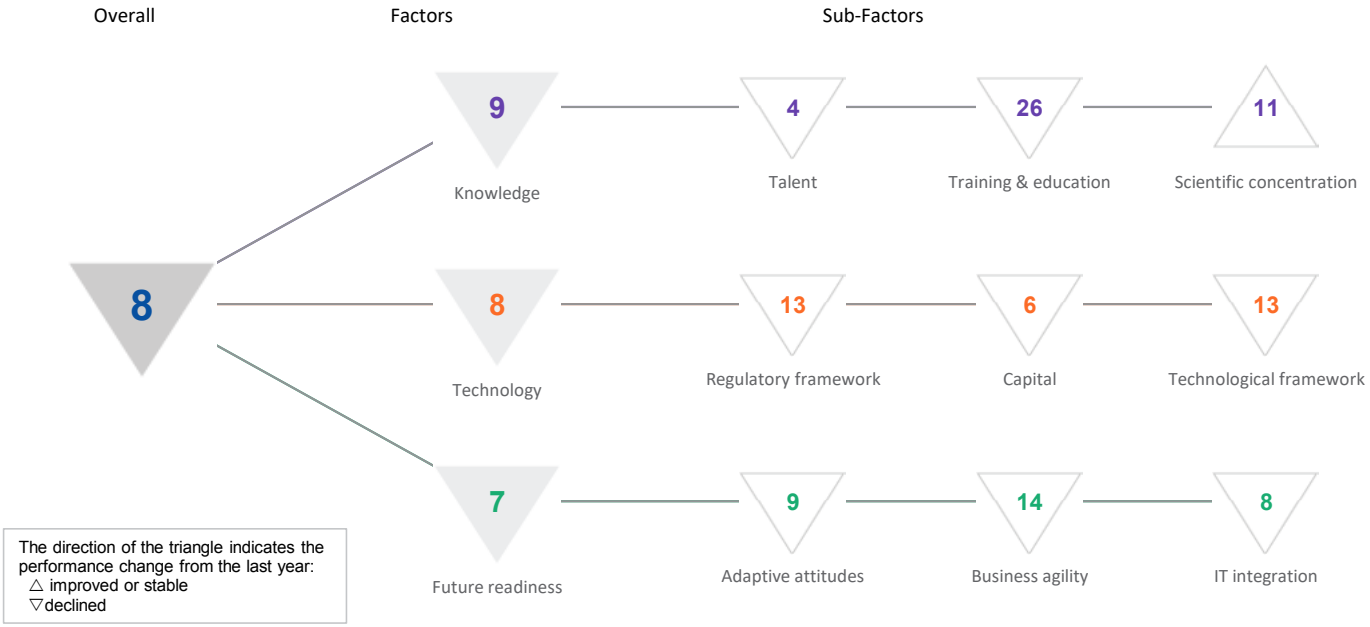
Business agility	Rank
Opportunities and threats	65
World robots distribution	-
▷ Use of big data and analytics	67
▷ Knowledge transfer	67
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	39
▷ Public-private partnerships	66
Cyber security	65
Software piracy	-
Government cyber security capacity	57
Privacy protection by law exists	62

NETHERLANDS

DIGITAL TRENDS - OVERALL

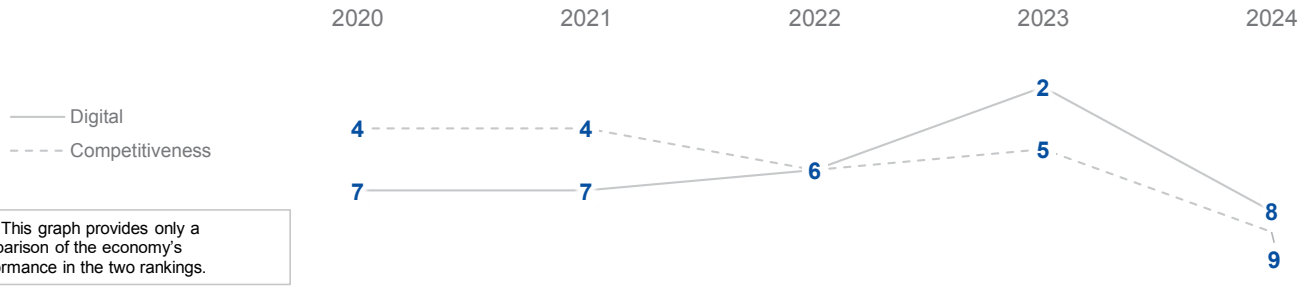
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	07	07	06	02	08
Knowledge	14	11	08	07	09
Technology	08	07	04	05	08
Future readiness	04	04	05	04	07

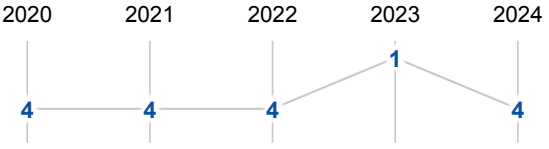
COMPETITIVENESS & DIGITAL RANKINGS



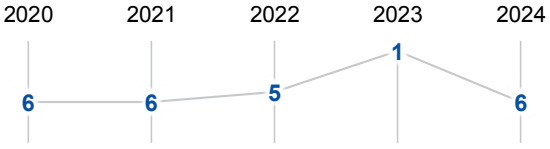
N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



NETHERLANDS

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	03	04	04	03	04
Training & education	29	28	25	23	26
Scientific concentration	16	16	12	12	11

Talent	Rank
Educational assessment PISA - Math	10
International experience	07
Foreign highly skilled personnel	08
Management of cities	17
Digital/Technological skills	09
Net flow of international students	06

Training & education	Rank
Employee training	16
Total public expenditure on education	25
Higher education achievement	16
Pupil-teacher ratio (tertiary education)	24
▷ Graduates in Sciences	43
Women with degrees	28
Computer science education index	25

Scientific concentration	Rank
Total expenditure on R&D (%)	16
Total R&D personnel per capita	07
▷ Female researchers	47
R&D productivity by publication	29
▶ Scientific and technical employment	05
High-tech patent grants	13
Robots in Education and R&D	23
AI articles	11

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	11	07	07	02	13
Capital	02	03	03	02	06
Technological framework	12	10	10	10	13

Regulatory framework	Rank
Starting a business	13
▷ Enforcing contracts	46
Immigration laws	18
Development & application of tech.	17
Scientific research legislation	11
Intellectual property rights	06
AI policies passed into law	15

Capital	Rank
▶ IT & media stock market capitalization	02
Funding for technological development	21
Banking and financial services	24
▶ Country credit rating	01
Venture capital	20
▷ Investment in Telecommunications	52

Technological framework	Rank
Communications technology	10
Mobile broadband subscribers	29
Wireless broadband	38
Internet users	26
Internet bandwidth speed	11
High-tech exports (%)	21
▶ Secure internet servers	03

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	06	06	02	06	09
Business agility	07	08	08	08	14
IT integration	05	06	09	07	08

Adaptive attitudes	Rank
E-Participation	11
Internet retailing	07
Tablet possession	11
Smartphone possession	28
Attitudes toward globalization	24
Flexibility and adaptability	20

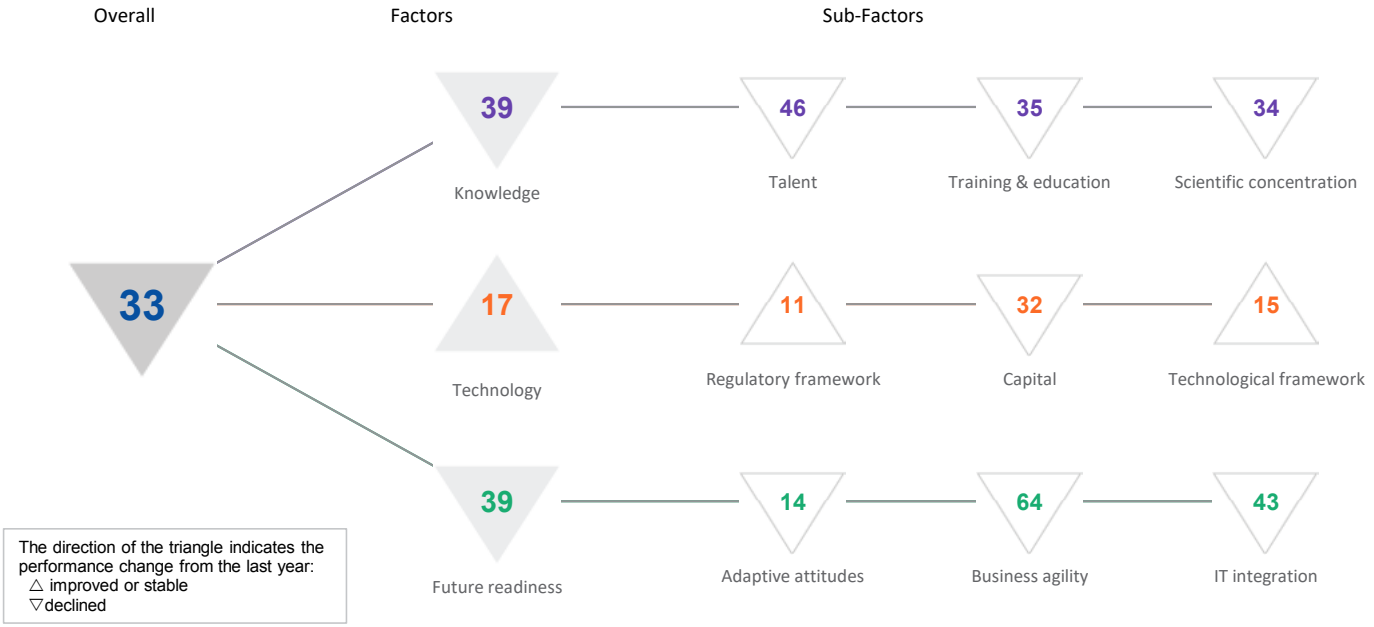
Business agility	Rank
Opportunities and threats	18
World robots distribution	20
Agility of companies	16
Use of big data and analytics	17
▶ Knowledge transfer	04
Entrepreneurial fear of failure	17

IT integration	Rank
E-Government	10
Public-private partnerships	17
Cyber security	13
Software piracy	13
▷ Government cyber security capacity	42
Privacy protection by law exists	06

NEW ZEALAND

DIGITAL TRENDS - OVERALL

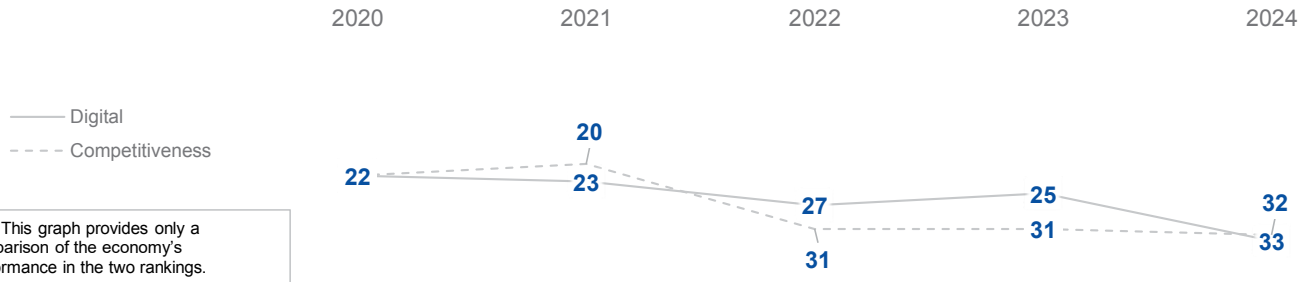
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	22	23	27	25	33
Knowledge	28	28	33	34	39
Technology	18	21	28	21	17
Future readiness	21	19	26	25	39

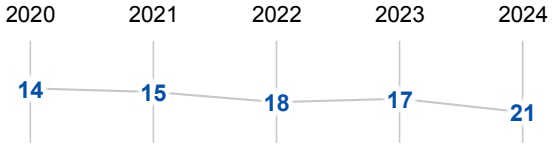
COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)

POPULATIONS < 20 MILLION (37 economies)



NEW ZEALAND

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	17	14	32	33	46
Training & education	37	36	32	32	35
Scientific concentration	34	33	32	30	34

Talent	Rank
Educational assessment PISA - Math	24
▷ International experience	65
Foreign highly skilled personnel	39
Management of cities	51
Digital/Technological skills	60
Net flow of international students	10

Training & education	Rank
▷ Employee training	66
Total public expenditure on education	14
Higher education achievement	33
Pupil-teacher ratio (tertiary education)	37
Graduates in Sciences	35
Women with degrees	31
Computer science education index	21

Scientific concentration	Rank
Total expenditure on R&D (%)	27
Total R&D personnel per capita	23
Female researchers	-
R&D productivity by publication	42
▶ Scientific and technical employment	10
High-tech patent grants	39
Robots in Education and R&D	45
AI articles	29

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	21	24	33	24	11
Capital	24	22	30	19	32
Technological framework	21	23	25	24	15

Regulatory framework	Rank
▶ Starting a business	01
Enforcing contracts	19
Immigration laws	17
Development & application of tech.	38
Scientific research legislation	32
Intellectual property rights	10
AI policies passed into law	12

Capital	Rank
IT & media stock market capitalization	33
Funding for technological development	50
Banking and financial services	36
Country credit rating	11
Venture capital	45
Investment in Telecommunications	24

Technological framework	Rank
Communications technology	39
Mobile broadband subscribers	14
▶ Wireless broadband	09
Internet users	15
Internet bandwidth speed	21
High-tech exports (%)	40
Secure internet servers	35

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	13	16	15	12	14
Business agility	46	30	49	40	64
IT integration	18	18	27	22	43

Adaptive attitudes	Rank
E-Participation	11
Internet retailing	17
▶ Tablet possession	07
Smartphone possession	39
Attitudes toward globalization	25
Flexibility and adaptability	24

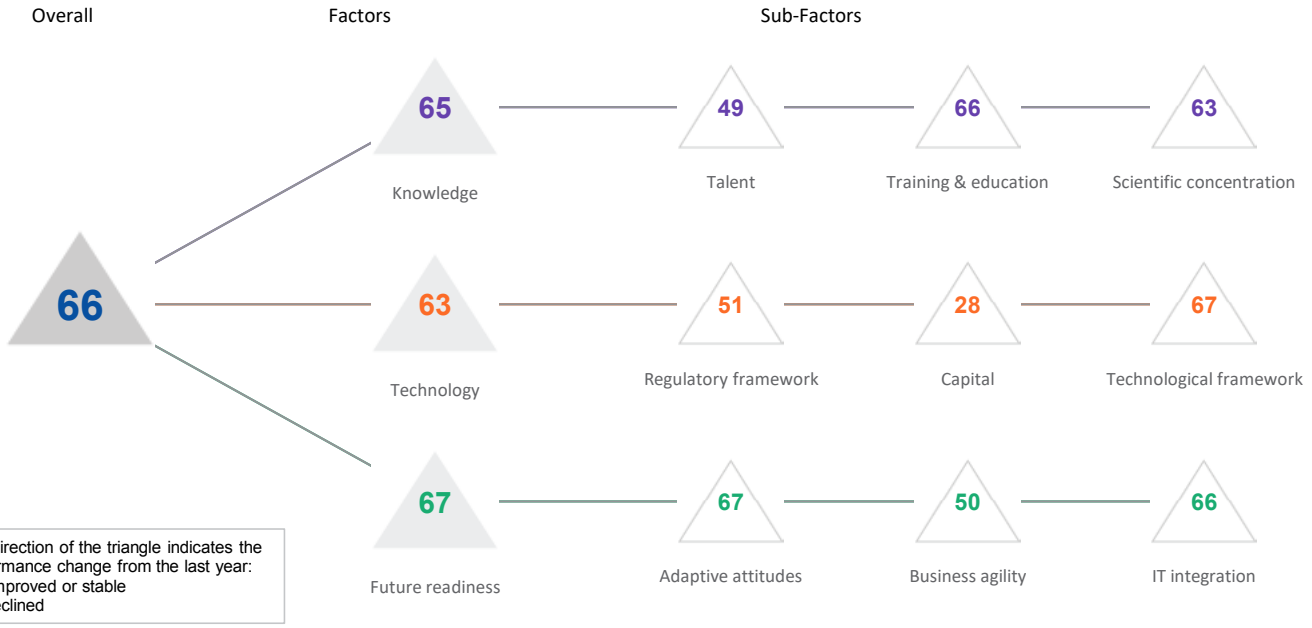
Business agility	Rank
▷ Opportunities and threats	62
World robots distribution	42
Agility of companies	55
▷ Use of big data and analytics	63
Knowledge transfer	43
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	16
▷ Public-private partnerships	64
Cyber security	54
▶ Software piracy	02
Government cyber security capacity	54
Privacy protection by law exists	50

NIGERIA

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

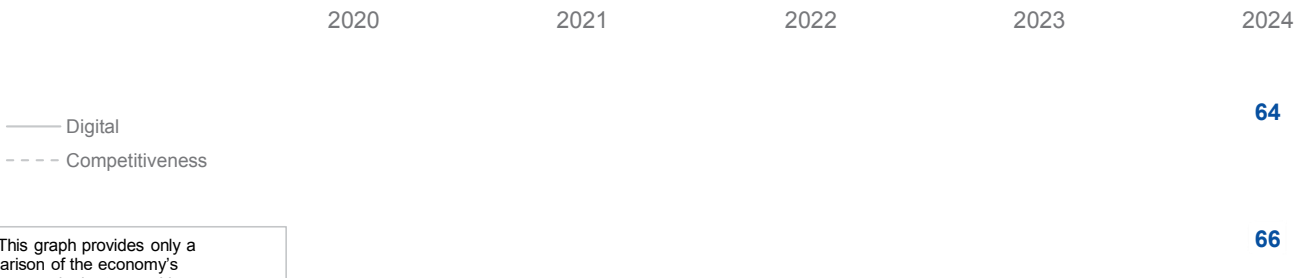


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	-	-	-	-	66
Knowledge	-	-	-	-	65
Technology	-	-	-	-	63
Future readiness	-	-	-	-	67

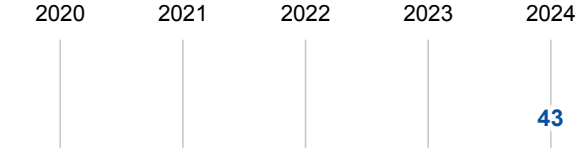
COMPETITIVENESS & DIGITAL RANKINGS



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

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS > 20 MILLION (30 economies)

NIGERIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	-	-	-	-	49
Training & education	-	-	-	-	66
Scientific concentration	-	-	-	-	63

Talent	Rank
Educational assessment PISA - Math	-
International experience	42
Foreign highly skilled personnel	32
Management of cities	56
Digital/Technological skills	62
Net flow of international students	-

Training & education	Rank
Employee training	39
▷ Total public expenditure on education	67
Higher education achievement	-
Pupil-teacher ratio (tertiary education)	-
Graduates in Sciences	-
Women with degrees	62
Computer science education index	60

Scientific concentration	Rank
Total expenditure on R&D (%)	50
Total R&D personnel per capita	-
Female researchers	45
▶ R&D productivity by publication	27
Scientific and technical employment	55
High-tech patent grants	60
Robots in Education and R&D	-
AI articles	65

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	-	-	-	-	51
Capital	-	-	-	-	28
Technological framework	-	-	-	-	67

Regulatory framework	Rank
Starting a business	44
Enforcing contracts	43
Immigration laws	51
Development & application of tech.	47
Scientific research legislation	42
Intellectual property rights	64
AI policies passed into law	28

Capital	Rank
▶ IT & media stock market capitalization	11
Funding for technological development	62
Banking and financial services	57
Country credit rating	63
Venture capital	59
▶ Investment in Telecommunications	01

Technological framework	Rank
Communications technology	65
Mobile broadband subscribers	61
▷ Wireless broadband	66
▷ Internet users	66
Internet bandwidth speed	65
High-tech exports (%)	60
Secure internet servers	65

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	-	-	-	-	67
Business agility	-	-	-	-	50
IT integration	-	-	-	-	66

Adaptive attitudes	Rank
E-Participation	61
Internet retailing	62
Tablet possession	60
▷ Smartphone possession	65
Attitudes toward globalization	47
Flexibility and adaptability	44

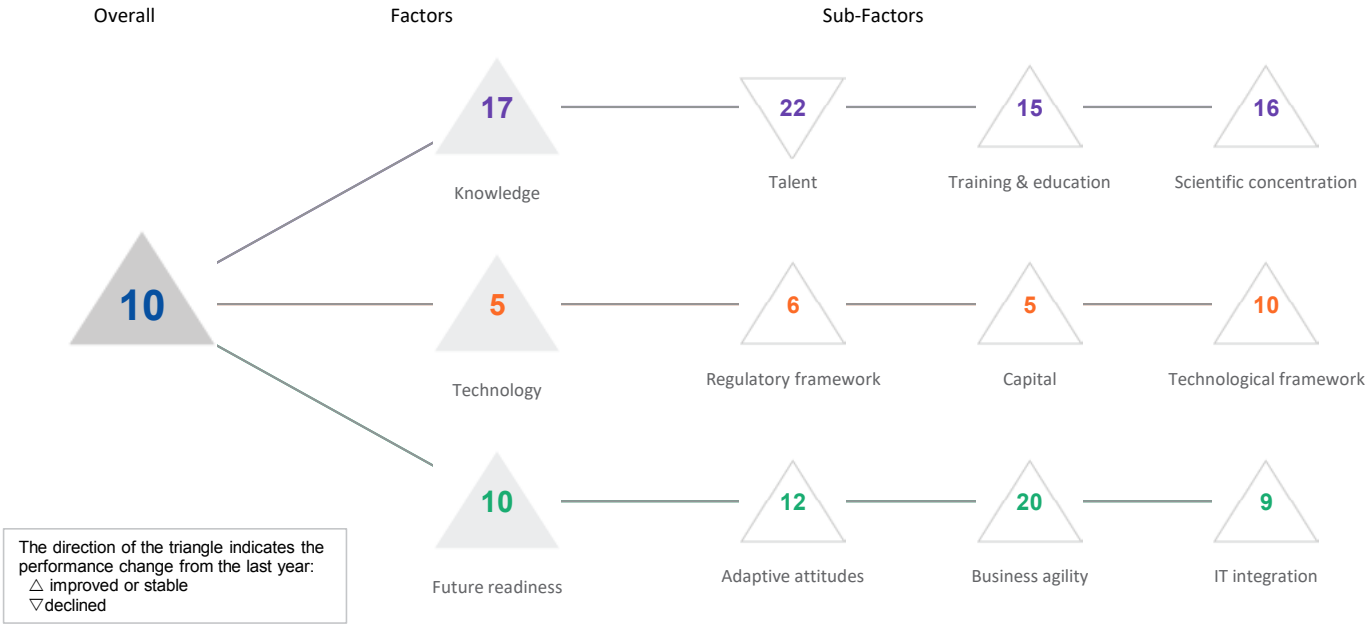
Business agility	Rank
Opportunities and threats	44
World robots distribution	-
Agility of companies	52
Use of big data and analytics	38
Knowledge transfer	60
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	64
Public-private partnerships	39
Cyber security	61
Software piracy	61
▷ Government cyber security capacity	65
Privacy protection by law exists	42

NORWAY

DIGITAL TRENDS - OVERALL

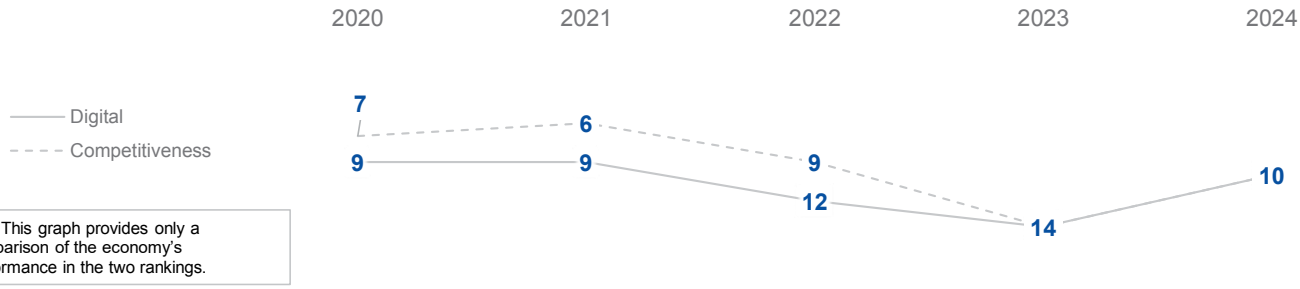
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

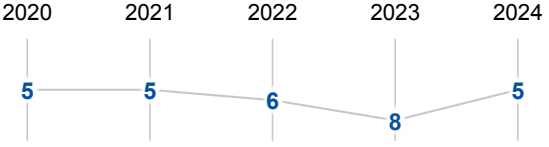
	2020	2021	2022	2023	2024
OVERALL	09	09	12	14	10
Knowledge	16	17	19	20	17
Technology	03	06	10	14	05
Future readiness	06	08	09	15	10

COMPETITIVENESS & DIGITAL RANKINGS

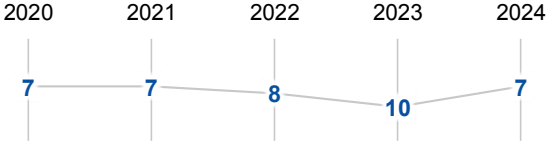


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



NORWAY

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	16	16	18	21	22
Training & education	10	11	14	16	15
Scientific concentration	23	22	22	22	16

Talent	Rank
Educational assessment PISA - Math	32
International experience	21
Foreign highly skilled personnel	19
Management of cities	13
Digital/Technological skills	18
▷ Net flow of international students	48

Training & education	Rank
Employee training	07
Total public expenditure on education	35
Higher education achievement	15
▶ Pupil-teacher ratio (tertiary education)	05
▷ Graduates in Sciences	39
Women with degrees	14
Computer science education index	36

Scientific concentration	Rank
Total expenditure on R&D (%)	21
Total R&D personnel per capita	13
Female researchers	27
▷ R&D productivity by publication	36
Scientific and technical employment	18
High-tech patent grants	26
Robots in Education and R&D	26
▶ AI articles	04

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	02	01	04	13	06
Capital	09	06	04	20	05
Technological framework	09	12	14	21	10

Regulatory framework	Rank
Starting a business	14
▶ Enforcing contracts	03
Immigration laws	26
Development & application of tech.	15
Scientific research legislation	10
Intellectual property rights	12
AI policies passed into law	21

Capital	Rank
IT & media stock market capitalization	31
Funding for technological development	18
Banking and financial services	11
▶ Country credit rating	01
Venture capital	10
Investment in Telecommunications	16

Technological framework	Rank
Communications technology	24
Mobile broadband subscribers	08
▷ Wireless broadband	41
Internet users	07
Internet bandwidth speed	24
High-tech exports (%)	14
Secure internet servers	19

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	07	08	06	15	12
Business agility	08	11	13	26	20
IT integration	06	08	12	17	09

Adaptive attitudes	Rank
E-Participation	19
Internet retailing	11
▶ Tablet possession	03
Smartphone possession	36
Attitudes toward globalization	23
Flexibility and adaptability	21

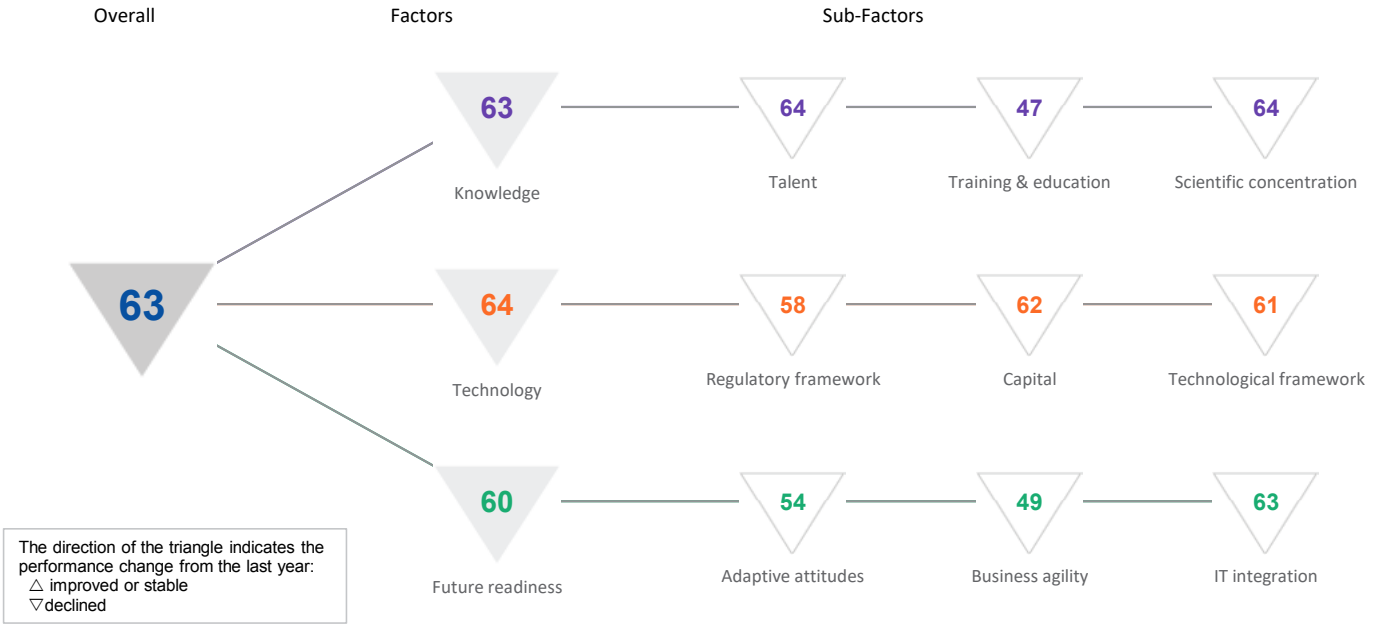
Business agility	Rank
Opportunities and threats	30
▷ World robots distribution	40
Agility of companies	24
Use of big data and analytics	12
Knowledge transfer	08
Entrepreneurial fear of failure	24

IT integration	Rank
E-Government	15
Public-private partnerships	21
Cyber security	24
Software piracy	10
Government cyber security capacity	20
Privacy protection by law exists	28

PERU

DIGITAL TRENDS - OVERALL

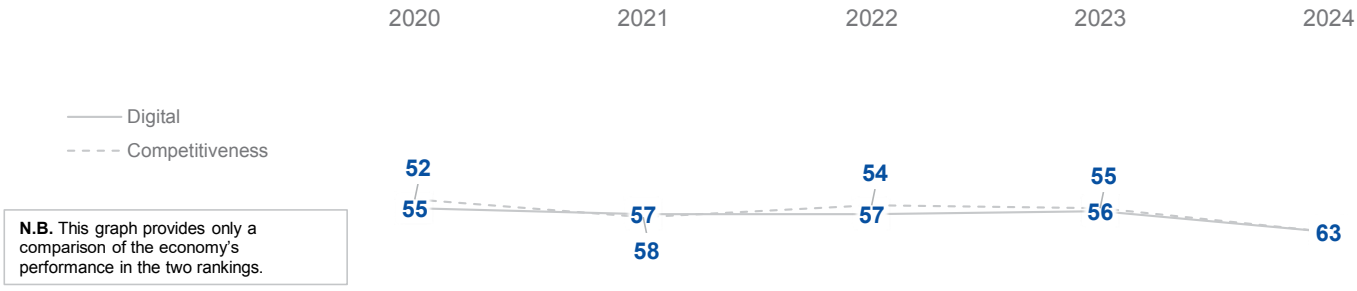
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

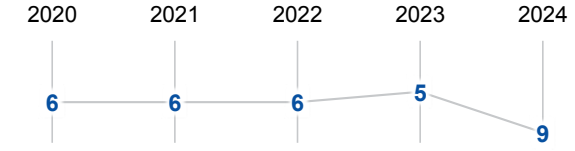
	2020	2021	2022	2023	2024
OVERALL	55	57	57	56	63
Knowledge	55	59	56	55	63
Technology	58	56	57	57	64
Future readiness	55	54	54	55	60

COMPETITIVENESS & DIGITAL RANKINGS

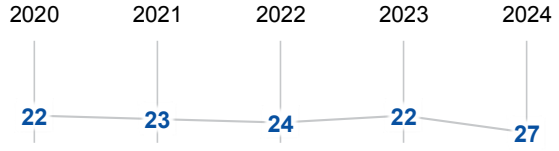


PEER GROUPS RANKINGS

THE AMERICAS (10 economies)



POPULATIONS > 20 MILLION (30 economies)



PERU

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	58	59	59	59	64
Training & education	39	41	37	38	47
Scientific concentration	59	60	60	62	64

Talent	Rank
Educational assessment PISA - Math	51
International experience	57
Foreign highly skilled personnel	46
▷ Management of cities	64
▷ Digital/Technological skills	64
Net flow of international students	-

Training & education	Rank
▷ Employee training	65
Total public expenditure on education	48
▶ Higher education achievement	09
Pupil-teacher ratio (tertiary education)	39
Graduates in Sciences	-
Women with degrees	42
Computer science education index	59

Scientific concentration	Rank
Total expenditure on R&D (%)	-
Total R&D personnel per capita	-
Female researchers	43
R&D productivity by publication	-
Scientific and technical employment	50
High-tech patent grants	62
Robots in Education and R&D	42
AI articles	56

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	49	49	51	51	58
Capital	37	43	53	51	62
Technological framework	59	58	59	59	61

Regulatory framework	Rank
Starting a business	57
Enforcing contracts	47
▶ Immigration laws	22
Development & application of tech.	62
▷ Scientific research legislation	64
Intellectual property rights	60
▶ AI policies passed into law	21

Capital	Rank
IT & media stock market capitalization	57
Funding for technological development	61
Banking and financial services	42
Country credit rating	47
Venture capital	46
Investment in Telecommunications	45

Technological framework	Rank
Communications technology	63
Mobile broadband subscribers	56
Wireless broadband	62
Internet users	61
Internet bandwidth speed	46
High-tech exports (%)	57
Secure internet servers	55

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	54	54	53	47	54
Business agility	47	39	39	48	49
IT integration	58	56	59	61	63

Adaptive attitudes	Rank
E-Participation	37
Internet retailing	55
Tablet possession	51
▶ Smartphone possession	39
Attitudes toward globalization	39
Flexibility and adaptability	39

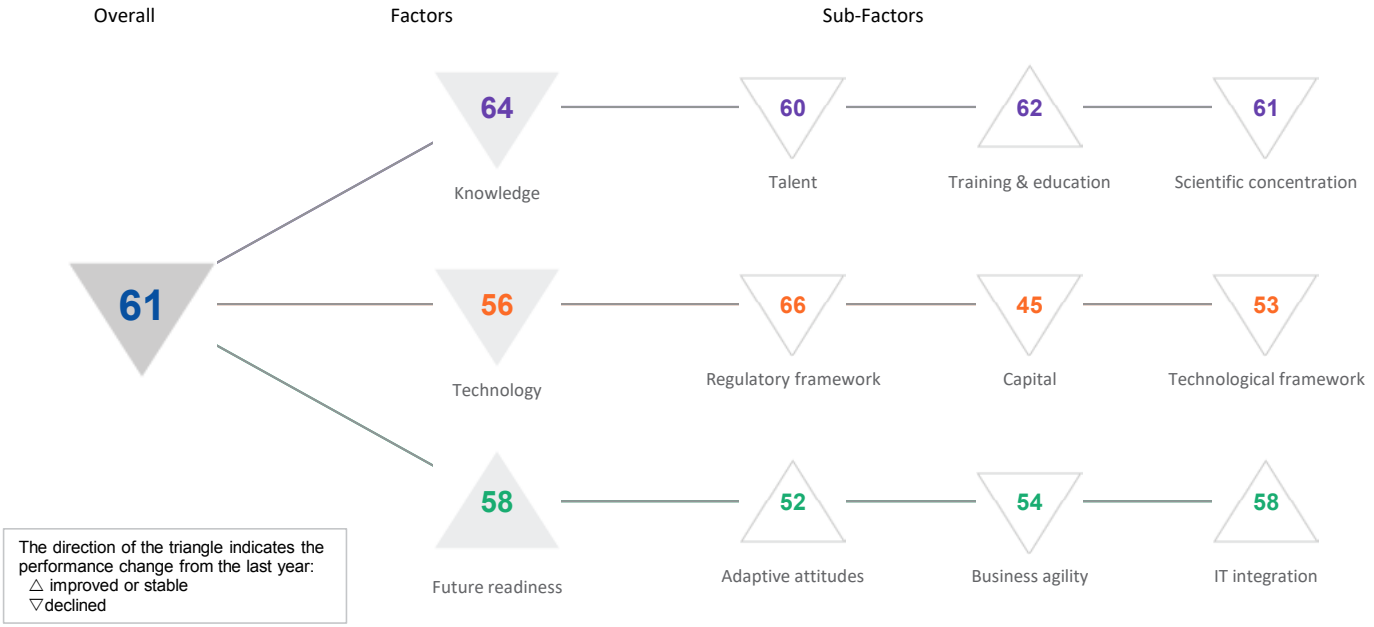
Business agility	Rank
Opportunities and threats	57
World robots distribution	53
Agility of companies	57
Use of big data and analytics	59
Knowledge transfer	59
▶ Entrepreneurial fear of failure	03

IT integration	Rank
E-Government	50
Public-private partnerships	50
Cyber security	64
Software piracy	55
▷ Government cyber security capacity	64
Privacy protection by law exists	47

PHILIPPINES

DIGITAL TRENDS - OVERALL

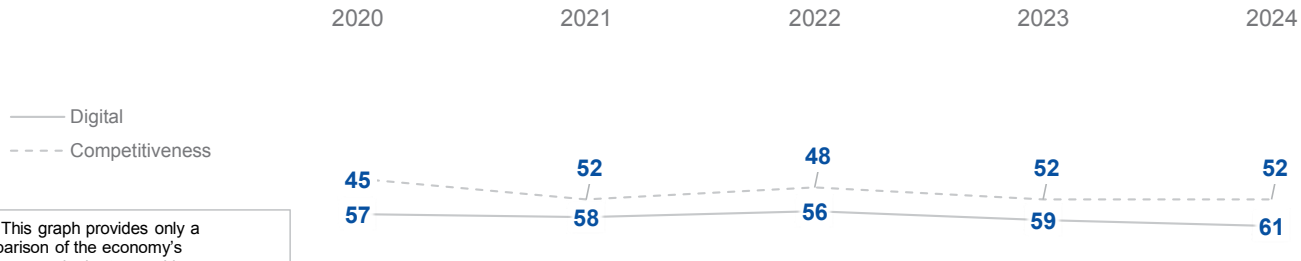
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	57	58	56	59	61
Knowledge	62	63	62	63	64
Technology	53	54	49	51	56
Future readiness	54	57	58	59	58

COMPETITIVENESS & DIGITAL RANKINGS

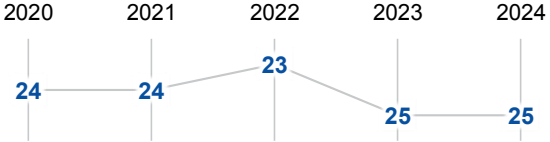


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)

POPULATIONS > 20 MILLION (30 economies)



PHILIPPINES

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	55	55	55	56	60
Training & education	59	61	61	62	62
Scientific concentration	56	56	57	58	61

Talent	Rank
Educational assessment PISA - Math	59
International experience	36
Foreign highly skilled personnel	53
Management of cities	58
Digital/Technological skills	50
Net flow of international students	43

Training & education	Rank
Employee training	48
Total public expenditure on education	55
Higher education achievement	58
Pupil-teacher ratio (tertiary education)	52
▶ Graduates in Sciences	22
Women with degrees	60
Computer science education index	57

Scientific concentration	Rank
Total expenditure on R&D (%)	55
Total R&D personnel per capita	56
▶ Female researchers	02
R&D productivity by publication	38
Scientific and technical employment	57
High-tech patent grants	43
Robots in Education and R&D	52
▷ AI articles	66

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	62	62	62	63	66
Capital	39	40	40	41	45
Technological framework	49	49	45	43	53

Regulatory framework	Rank
▷ Starting a business	65
▷ Enforcing contracts	64
Immigration laws	45
Development & application of tech.	56
Scientific research legislation	54
Intellectual property rights	59
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	40
Funding for technological development	58
Banking and financial services	30
Country credit rating	45
Venture capital	51
▶ Investment in Telecommunications	09

Technological framework	Rank
▷ Communications technology	66
Mobile broadband subscribers	26
Wireless broadband	32
Internet users	59
Internet bandwidth speed	54
▶ High-tech exports (%)	02
▷ Secure internet servers	64

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	57	60	58	59	52
Business agility	32	37	45	50	54
IT integration	56	57	57	60	58

Adaptive attitudes	Rank
E-Participation	42
Internet retailing	56
Tablet possession	54
Smartphone possession	55
Attitudes toward globalization	28
▶ Flexibility and adaptability	19

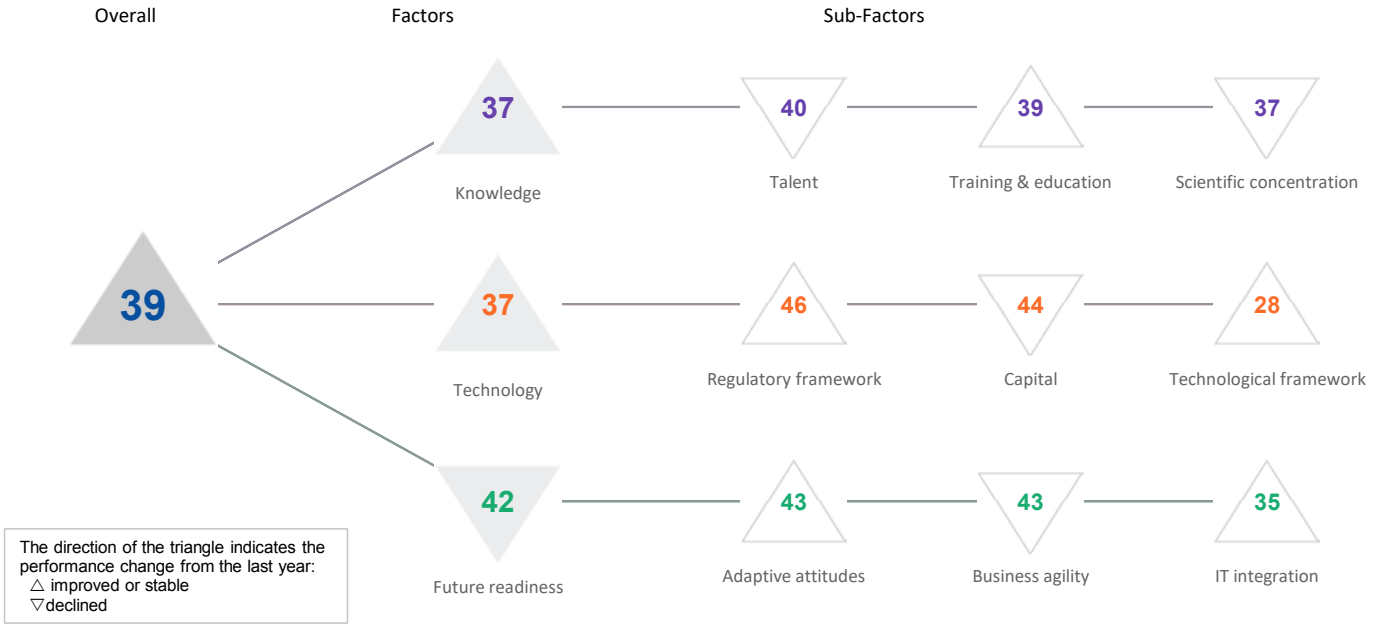
Business agility	Rank
Opportunities and threats	49
World robots distribution	39
Agility of companies	49
Use of big data and analytics	50
Knowledge transfer	46
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	58
Public-private partnerships	36
Cyber security	58
Software piracy	56
Government cyber security capacity	56
Privacy protection by law exists	35

POLAND

DIGITAL TRENDS - OVERALL

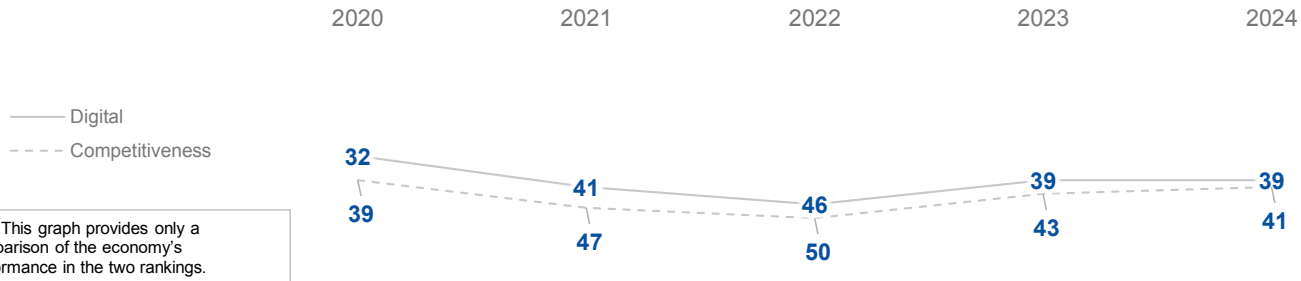
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

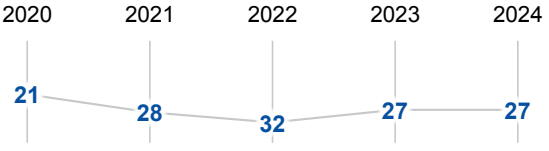
	2020	2021	2022	2023	2024
OVERALL	32	41	46	39	39
Knowledge	30	38	42	37	37
Technology	37	41	46	44	37
Future readiness	35	39	43	40	42

COMPETITIVENESS & DIGITAL RANKINGS

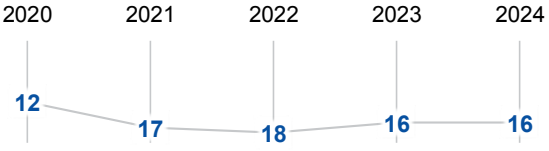


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS > 20 MILLION (30 economies)



POLAND

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	29	41	48	36	40
Training & education	32	44	42	39	39
Scientific concentration	28	28	30	28	37

Talent	Rank
▶ Educational assessment PISA - Math	12
International experience	43
Foreign highly skilled personnel	47
Management of cities	41
▷ Digital/Technological skills	58
Net flow of international students	28

Training & education	Rank
Employee training	45
Total public expenditure on education	36
Higher education achievement	40
Pupil-teacher ratio (tertiary education)	30
Graduates in Sciences	47
Women with degrees	33
Computer science education index	31

Scientific concentration	Rank
Total expenditure on R&D (%)	28
Total R&D personnel per capita	35
Female researchers	32
R&D productivity by publication	22
Scientific and technical employment	36
High-tech patent grants	42
▶ Robots in Education and R&D	14
AI articles	43

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	46	53	57	49	46
Capital	36	47	49	43	44
Technological framework	23	31	33	37	28

Regulatory framework	Rank
Starting a business	56
Enforcing contracts	38
Immigration laws	31
Development & application of tech.	45
Scientific research legislation	47
Intellectual property rights	51
AI policies passed into law	21

Capital	Rank
IT & media stock market capitalization	38
Funding for technological development	43
Banking and financial services	38
Country credit rating	37
Venture capital	31
Investment in Telecommunications	33

Technological framework	Rank
Communications technology	54
Mobile broadband subscribers	21
▶ Wireless broadband	05
Internet users	43
Internet bandwidth speed	27
High-tech exports (%)	42
Secure internet servers	26

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	29	28	37	45	43
Business agility	33	44	47	28	43
IT integration	38	45	51	44	35

Adaptive attitudes	Rank
E-Participation	37
Internet retailing	24
▶ Tablet possession	12
▷ Smartphone possession	60
▷ Attitudes toward globalization	60
▷ Flexibility and adaptability	58

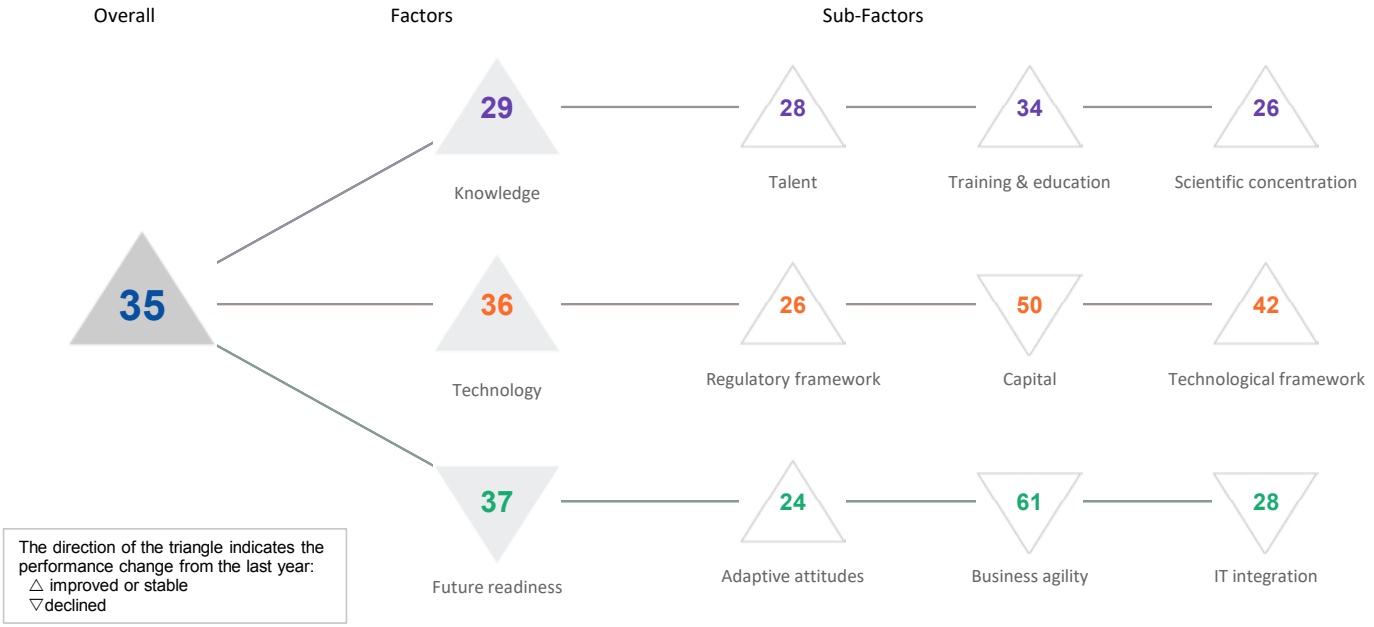
Business agility	Rank
Opportunities and threats	41
World robots distribution	17
Agility of companies	31
Use of big data and analytics	37
Knowledge transfer	37
Entrepreneurial fear of failure	43

IT integration	Rank
E-Government	34
▷ Public-private partnerships	56
Cyber security	40
Software piracy	37
Government cyber security capacity	30
▶ Privacy protection by law exists	18

PORTUGAL

DIGITAL TRENDS - OVERALL

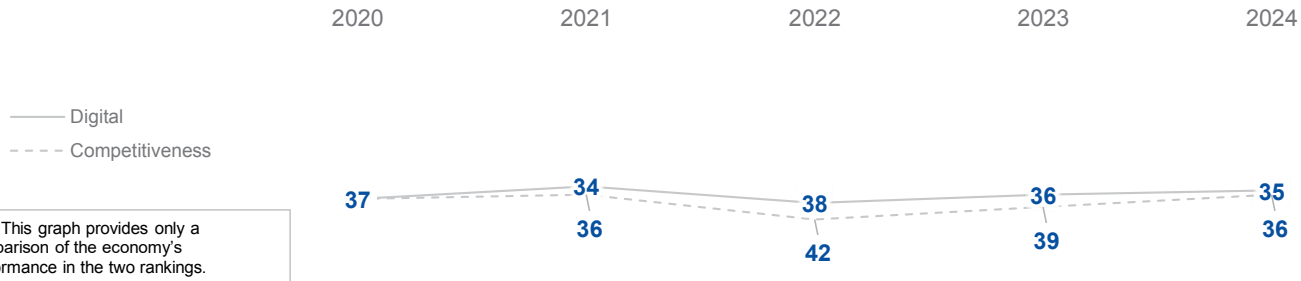
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

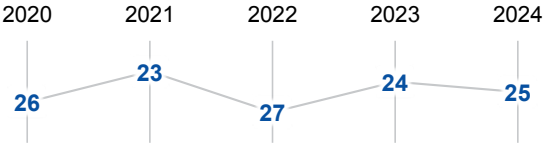
	2020	2021	2022	2023	2024
OVERALL	37	34	38	36	35
Knowledge	33	32	29	31	29
Technology	38	38	39	40	36
Future readiness	41	38	40	36	37

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)

PORTUGAL

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	24	22	29	29	28
Training & education	38	38	36	34	34
Scientific concentration	30	27	27	26	26

Talent	Rank
Educational assessment PISA - Math	30
▷ International experience	60
Foreign highly skilled personnel	30
Management of cities	21
Digital/Technological skills	21
Net flow of international students	17

Training & education	Rank
▷ Employee training	61
Total public expenditure on education	41
Higher education achievement	32
▶ Pupil-teacher ratio (tertiary education)	12
Graduates in Sciences	18
Women with degrees	37
Computer science education index	34

Scientific concentration	Rank
Total expenditure on R&D (%)	25
Total R&D personnel per capita	26
Female researchers	18
R&D productivity by publication	31
Scientific and technical employment	29
High-tech patent grants	33
Robots in Education and R&D	34
AI articles	18

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	20	21	19	27	26
Capital	44	44	48	49	50
Technological framework	42	46	48	46	42

Regulatory framework	Rank
Starting a business	31
Enforcing contracts	29
▶ Immigration laws	04
Development & application of tech.	34
Scientific research legislation	34
Intellectual property rights	32
AI policies passed into law	28

Capital	Rank
IT & media stock market capitalization	45
Funding for technological development	44
Banking and financial services	39
Country credit rating	38
▷ Venture capital	57
Investment in Telecommunications	25

Technological framework	Rank
▶ Communications technology	03
Mobile broadband subscribers	45
▷ Wireless broadband	55
Internet users	49
Internet bandwidth speed	16
High-tech exports (%)	53
Secure internet servers	31

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	31	30	35	26	24
Business agility	57	58	60	58	61
IT integration	34	30	25	25	28

Adaptive attitudes	Rank
E-Participation	52
Internet retailing	36
Tablet possession	27
Smartphone possession	30
Attitudes toward globalization	21
▶ Flexibility and adaptability	08

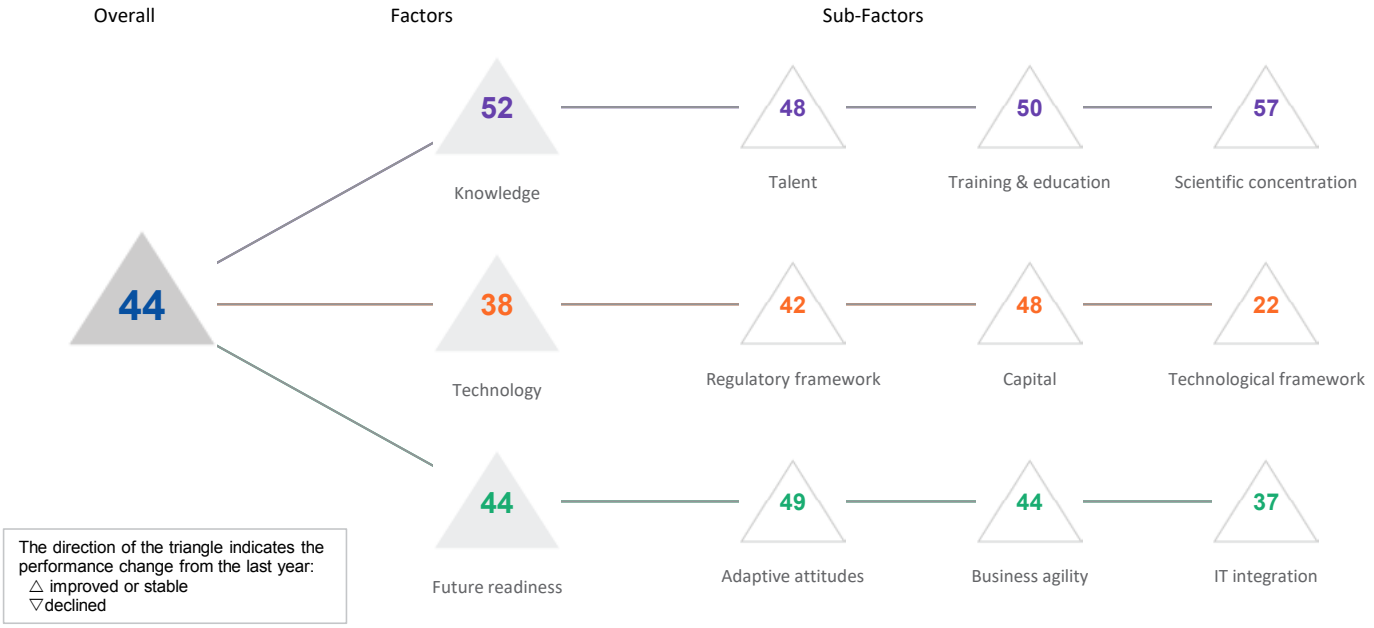
Business agility	Rank
Opportunities and threats	50
World robots distribution	31
Agility of companies	53
▷ Use of big data and analytics	61
Knowledge transfer	48
Entrepreneurial fear of failure	44

IT integration	Rank
E-Government	41
Public-private partnerships	32
Cyber security	42
Software piracy	28
Government cyber security capacity	22
▶ Privacy protection by law exists	05

PUERTO RICO

DIGITAL TRENDS - OVERALL

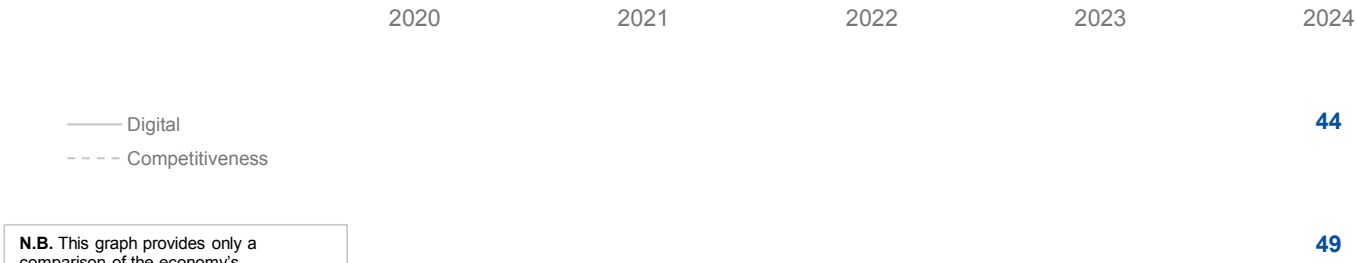
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

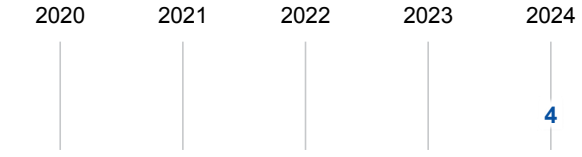
	2020	2021	2022	2023	2024
OVERALL	-	-	-	-	44
Knowledge	-	-	-	-	52
Technology	-	-	-	-	38
Future readiness	-	-	-	-	44

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (10 economies)



POPULATIONS < 20 MILLION (37 economies)

PUERTO RICO

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	-	-	-	-	48
Training & education	-	-	-	-	50
Scientific concentration	-	-	-	-	57

Talent	Rank
Educational assessment PISA - Math	-
International experience	53
Foreign highly skilled personnel	51
▷ Management of cities	61
Digital/Technological skills	45
Net flow of international students	-

Training & education	Rank
Employee training	49
Total public expenditure on education	51
Higher education achievement	52
Pupil-teacher ratio (tertiary education)	25
Graduates in Sciences	54
▶ Women with degrees	03
▷ Computer science education index	61

Scientific concentration	Rank
Total expenditure on R&D (%)	34
▶ Total R&D personnel per capita	01
Female researchers	-
▷ R&D productivity by publication	60
Scientific and technical employment	-
High-tech patent grants	-
Robots in Education and R&D	54
AI articles	52

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	-	-	-	-	42
Capital	-	-	-	-	48
Technological framework	-	-	-	-	22

Regulatory framework	Rank
Starting a business	-
Enforcing contracts	-
▷ Immigration laws	66
Development & application of tech.	36
Scientific research legislation	39
Intellectual property rights	21
AI policies passed into law	-

Capital	Rank
IT & media stock market capitalization	-
Funding for technological development	52
Banking and financial services	52
▷ Country credit rating	65
Venture capital	56
▶ Investment in Telecommunications	02

Technological framework	Rank
Communications technology	51
▶ Mobile broadband subscribers	04
Wireless broadband	34
Internet users	42
Internet bandwidth speed	32
▶ High-tech exports (%)	01
Secure internet servers	56

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	-	-	-	-	49
Business agility	-	-	-	-	44
IT integration	-	-	-	-	37

Adaptive attitudes	Rank
E-Participation	-
Internet retailing	-
Tablet possession	-
Smartphone possession	-
Attitudes toward globalization	50
Flexibility and adaptability	53

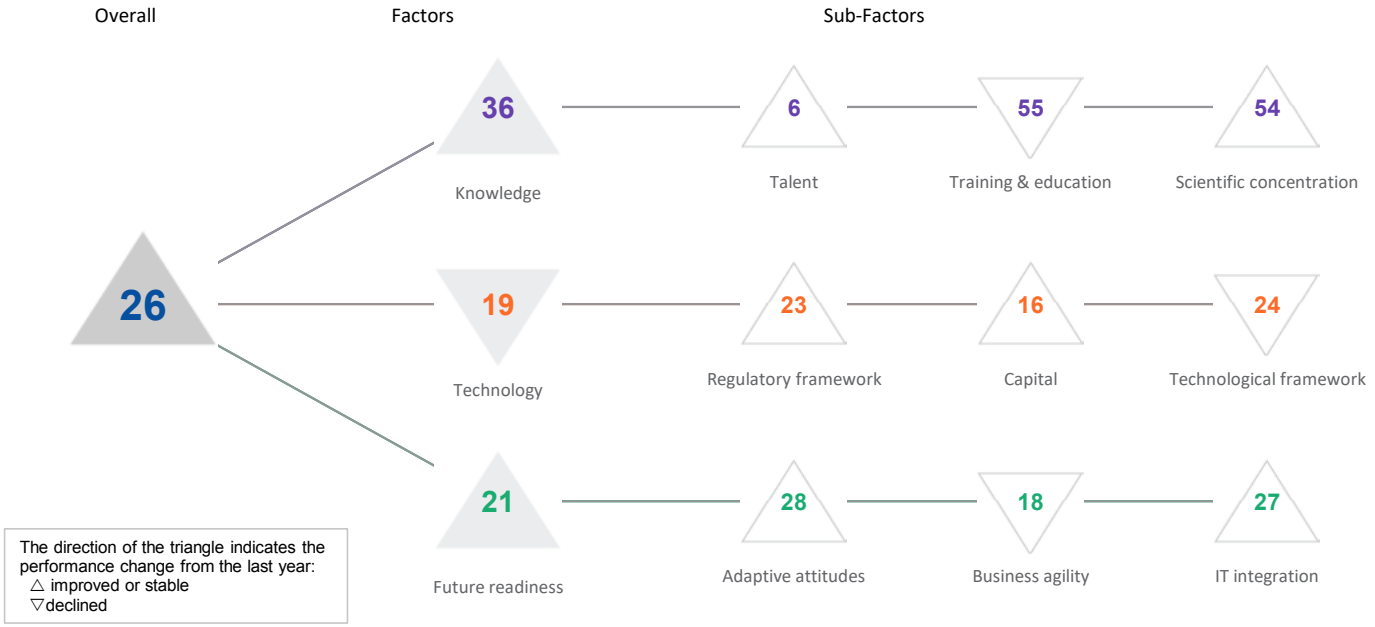
Business agility	Rank
Opportunities and threats	52
World robots distribution	55
Agility of companies	48
Use of big data and analytics	44
Knowledge transfer	53
Entrepreneurial fear of failure	22

IT integration	Rank
E-Government	-
Public-private partnerships	37
Cyber security	50
Software piracy	30
Government cyber security capacity	-
Privacy protection by law exists	-

QATAR

DIGITAL TRENDS - OVERALL

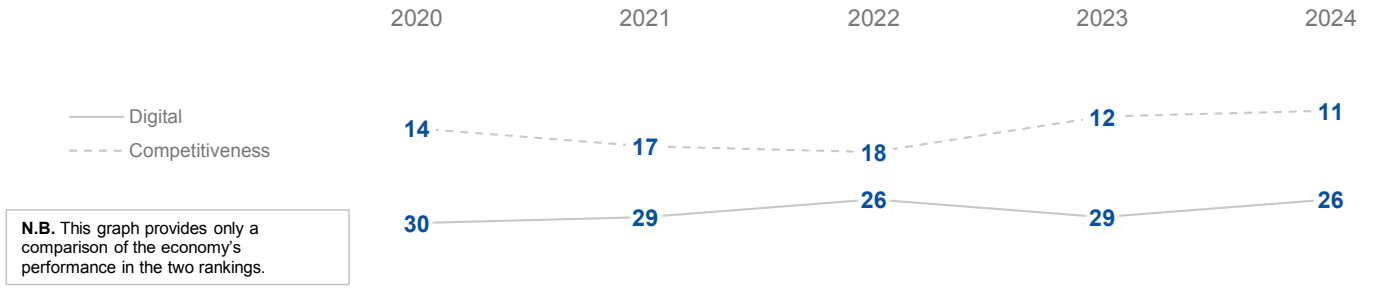
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

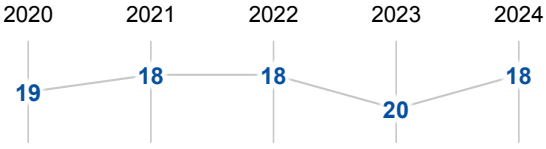
	2020	2021	2022	2023	2024
OVERALL	30	29	26	29	26
Knowledge	45	44	38	38	36
Technology	25	19	17	16	19
Future readiness	24	23	23	26	21

COMPETITIVENESS & DIGITAL RANKINGS

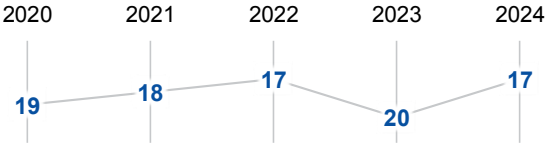


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



QATAR

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	15	19	11	10	06
Training & education	53	54	45	51	55
Scientific concentration	60	59	59	60	54

Talent	Rank
Educational assessment PISA - Math	46
International experience	03
Foreign highly skilled personnel	07
▶ Management of cities	02
Digital/Technological skills	05
Net flow of international students	12

Training & education	Rank
Employee training	20
▷ Total public expenditure on education	64
Higher education achievement	51
Pupil-teacher ratio (tertiary education)	35
Graduates in Sciences	55
Women with degrees	-
Computer science education index	51

Scientific concentration	Rank
Total expenditure on R&D (%)	47
Total R&D personnel per capita	49
Female researchers	41
R&D productivity by publication	51
Scientific and technical employment	49
High-tech patent grants	10
Robots in Education and R&D	52
AI articles	15

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	29	27	27	23	23
Capital	19	24	21	22	16
Technological framework	31	16	15	18	24

Regulatory framework	Rank
Starting a business	47
Enforcing contracts	56
Immigration laws	06
Development & application of tech.	05
Scientific research legislation	07
Intellectual property rights	13
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	34
Funding for technological development	04
Banking and financial services	08
Country credit rating	16
Venture capital	09
▷ Investment in Telecommunications	61

Technological framework	Rank
Communications technology	11
▶ Mobile broadband subscribers	02
Wireless broadband	10
▶ Internet users	01
Internet bandwidth speed	35
▷ High-tech exports (%)	59
Secure internet servers	53

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	27	26	29	33	28
Business agility	17	17	14	11	18
IT integration	28	28	28	27	27

Adaptive attitudes	Rank
▷ E-Participation	60
Internet retailing	53
Tablet possession	09
Smartphone possession	05
Attitudes toward globalization	16
Flexibility and adaptability	13

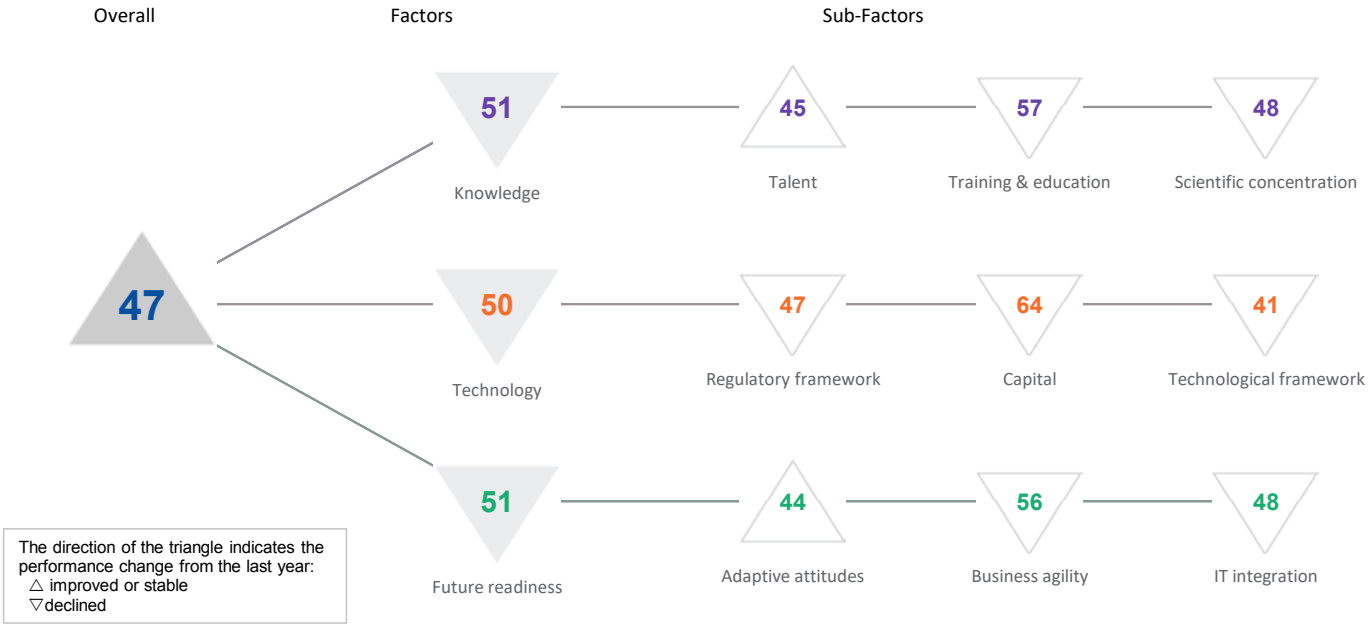
Business agility	Rank
Opportunities and threats	16
World robots distribution	56
Agility of companies	19
Use of big data and analytics	04
Knowledge transfer	09
Entrepreneurial fear of failure	21

IT integration	Rank
E-Government	45
▶ Public-private partnerships	02
▶ Cyber security	02
Software piracy	39
Government cyber security capacity	16
▷ Privacy protection by law exists	61

ROMANIA

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

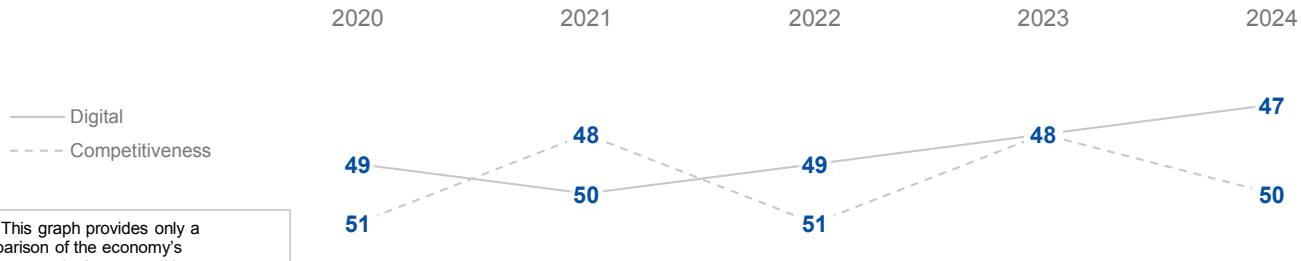


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	49	50	49	48	47
Knowledge	53	52	49	49	51
Technology	48	47	48	49	50
Future readiness	49	49	51	47	51

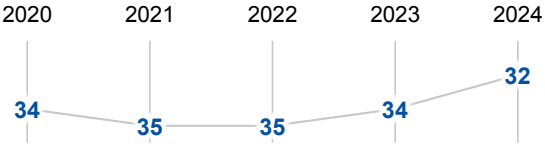
COMPETITIVENESS & DIGITAL RANKINGS



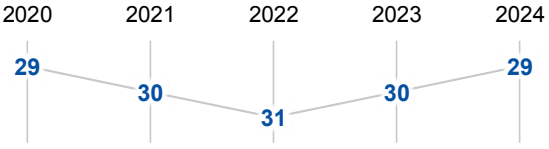
N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



ROMANIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	51	50	51	50	45
Training & education	54	59	55	56	57
Scientific concentration	39	43	44	47	48

Talent	Rank
Educational assessment PISA - Math	41
International experience	30
Foreign highly skilled personnel	44
Management of cities	57
Digital/Technological skills	32
Net flow of international students	39

Training & education	Rank
▷ Employee training	60
Total public expenditure on education	57
Higher education achievement	55
Pupil-teacher ratio (tertiary education)	49
▶ Graduates in Sciences	16
Women with degrees	54
Computer science education index	50

Scientific concentration	Rank
Total expenditure on R&D (%)	53
Total R&D personnel per capita	48
▶ Female researchers	13
R&D productivity by publication	23
Scientific and technical employment	48
High-tech patent grants	35
Robots in Education and R&D	37
AI articles	46

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	43	40	39	39	47
Capital	61	61	61	59	64
Technological framework	37	40	41	40	41

Regulatory framework	Rank
Starting a business	39
▶ Enforcing contracts	18
Immigration laws	34
Development & application of tech.	46
Scientific research legislation	45
Intellectual property rights	55
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	54
Funding for technological development	46
▷ Banking and financial services	58
Country credit rating	53
Venture capital	42
▷ Investment in Telecommunications	64

Technological framework	Rank
Communications technology	41
Mobile broadband subscribers	53
Wireless broadband	43
Internet users	44
▶ Internet bandwidth speed	04
High-tech exports (%)	41
Secure internet servers	33

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	45	42	46	48	44
Business agility	53	57	59	45	56
IT integration	54	50	42	42	48

Adaptive attitudes	Rank
E-Participation	47
Internet retailing	45
Tablet possession	29
Smartphone possession	41
Attitudes toward globalization	54
Flexibility and adaptability	42

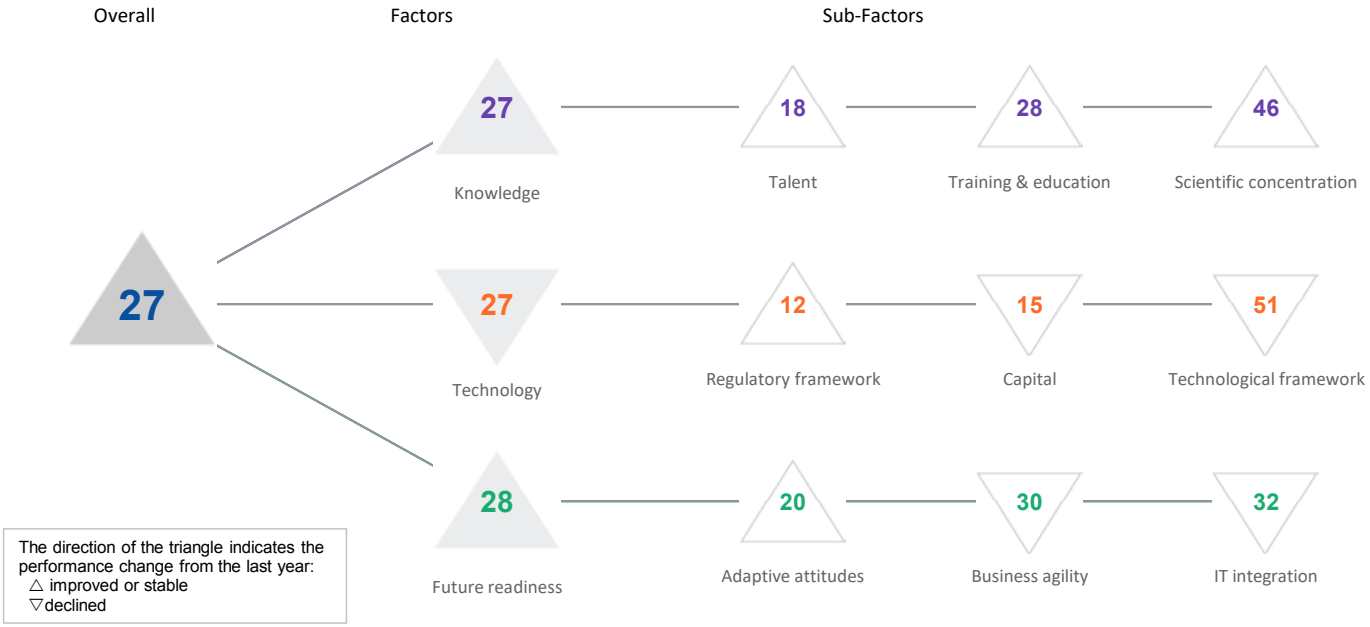
Business agility	Rank
Opportunities and threats	55
World robots distribution	35
▷ Agility of companies	62
▶ Use of big data and analytics	18
Knowledge transfer	42
Entrepreneurial fear of failure	49

IT integration	Rank
▷ E-Government	57
Public-private partnerships	48
Cyber security	36
Software piracy	53
Government cyber security capacity	40
Privacy protection by law exists	34

SAUDI ARABIA

DIGITAL TRENDS - OVERALL

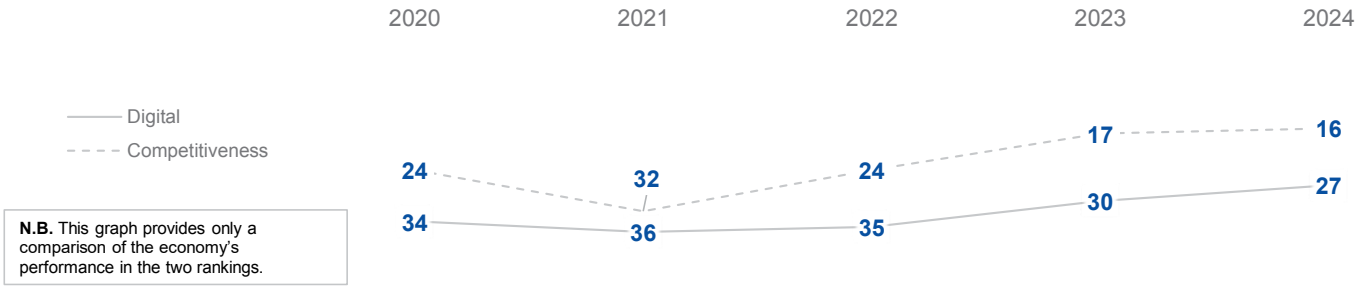
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	34	36	35	30	27
Knowledge	46	50	37	35	27
Technology	24	24	26	17	27
Future readiness	28	32	37	30	28

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS > 20 MILLION (30 economies)

SAUDI ARABIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	34	32	28	19	18
Training & education	34	34	24	30	28
Scientific concentration	62	64	58	55	46

Talent	Rank
▷ Educational assessment PISA - Math	52
International experience	08
Foreign highly skilled personnel	04
Management of cities	19
Digital/Technological skills	14
Net flow of international students	34

Training & education	Rank
Employee training	10
Total public expenditure on education	29
Higher education achievement	31
Pupil-teacher ratio (tertiary education)	43
Graduates in Sciences	17
Women with degrees	35
Computer science education index	18

Scientific concentration	Rank
Total expenditure on R&D (%)	52
Total R&D personnel per capita	50
Female researchers	23
R&D productivity by publication	08
Scientific and technical employment	-
High-tech patent grants	32
▷ Robots in Education and R&D	54
AI articles	19

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	25	30	25	14	12
Capital	05	15	22	09	15
Technological framework	47	35	34	36	51

Regulatory framework	Rank
Starting a business	22
Enforcing contracts	36
Immigration laws	09
▶ Development & application of tech.	02
Scientific research legislation	21
Intellectual property rights	27
AI policies passed into law	21

Capital	Rank
IT & media stock market capitalization	50
▶ Funding for technological development	02
Banking and financial services	04
Country credit rating	28
▶ Venture capital	02
Investment in Telecommunications	42

Technological framework	Rank
Communications technology	14
Mobile broadband subscribers	38
Wireless broadband	15
▶ Internet users	01
Internet bandwidth speed	47
▷ High-tech exports (%)	66
▷ Secure internet servers	61

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	37	46	33	32	20
Business agility	28	35	32	25	30
IT integration	24	24	33	29	32

Adaptive attitudes	Rank
E-Participation	06
Internet retailing	48
Tablet possession	45
Smartphone possession	04
Attitudes toward globalization	13
Flexibility and adaptability	11

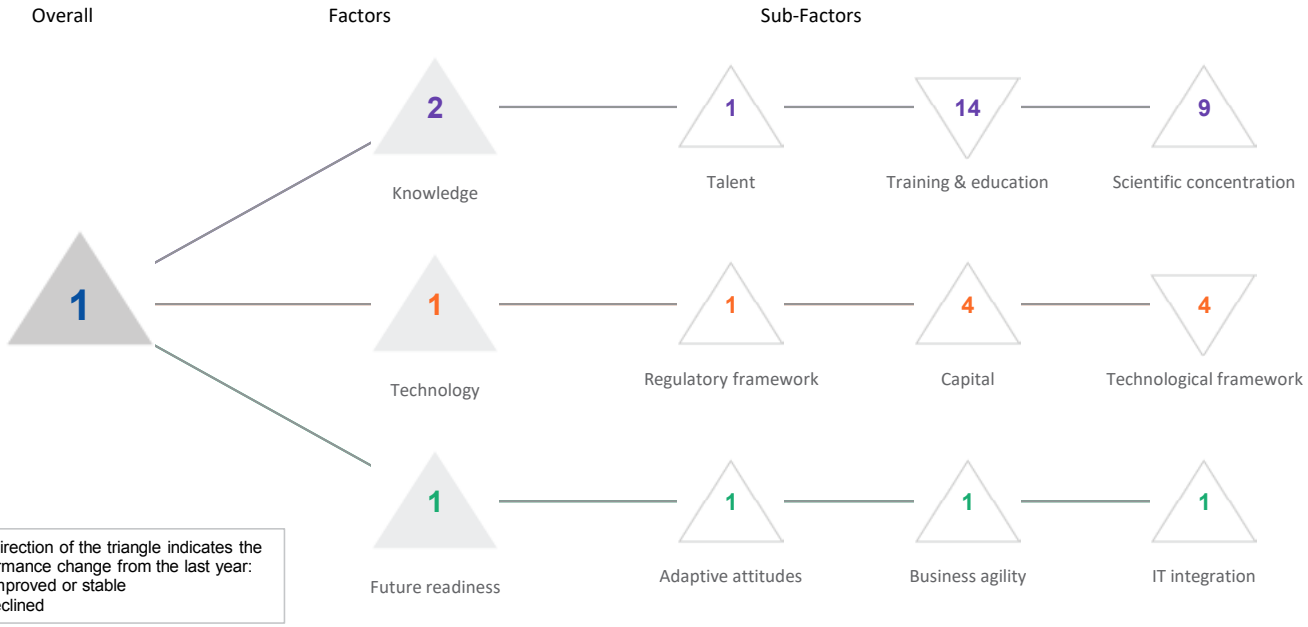
Business agility	Rank
Opportunities and threats	11
World robots distribution	51
Agility of companies	18
Use of big data and analytics	20
Knowledge transfer	24
Entrepreneurial fear of failure	51

IT integration	Rank
E-Government	06
Public-private partnerships	04
▶ Cyber security	01
Software piracy	39
Government cyber security capacity	15
▷ Privacy protection by law exists	66

SINGAPORE

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

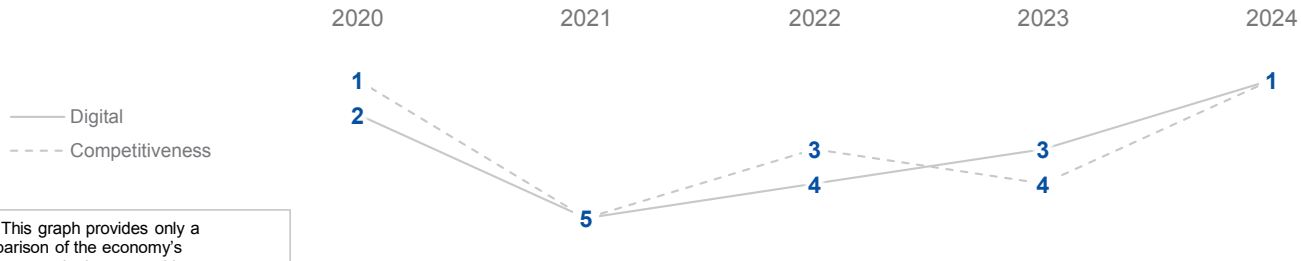


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	02	05	04	03	01
Knowledge	02	04	05	03	02
Technology	01	03	01	01	01
Future readiness	12	11	10	10	01

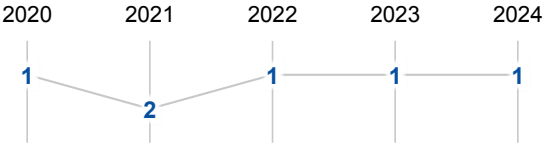
COMPETITIVENESS & DIGITAL RANKINGS



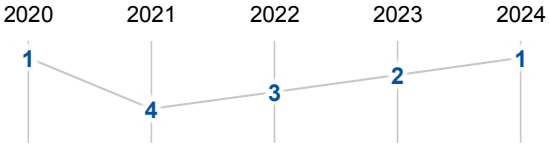
N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)



POPULATIONS < 20 MILLION (37 economies)



SINGAPORE

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	01	02	03	04	01
Training & education	07	13	09	09	14
Scientific concentration	10	11	11	11	09

Talent	Rank
Educational assessment PISA - Math	02
International experience	02
Foreign highly skilled personnel	02
Management of cities	01
Digital/Technological skills	02
Net flow of international students	04

Training & education	Rank
Employee training	04
▷ Total public expenditure on education	65
Higher education achievement	02
Pupil-teacher ratio (tertiary education)	27
Graduates in Sciences	03
▷ Women with degrees	41
Computer science education index	37

Scientific concentration	Rank
Total expenditure on R&D (%)	20
Total R&D personnel per capita	16
▷ Female researchers	44
R&D productivity by publication	39
Scientific and technical employment	30
▶ High-tech patent grants	01
Robots in Education and R&D	30
AI articles	05

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	01	05	01	01	01
Capital	11	14	11	15	04
Technological framework	01	02	02	02	04

Regulatory framework	Rank
Starting a business	03
▶ Enforcing contracts	01
Immigration laws	37
▶ Development & application of tech.	01
Scientific research legislation	01
Intellectual property rights	02
AI policies passed into law	07

Capital	Rank
IT & media stock market capitalization	30
▶ Funding for technological development	01
Banking and financial services	01
Country credit rating	01
Venture capital	01
▷ Investment in Telecommunications	60

Technological framework	Rank
Communications technology	07
Mobile broadband subscribers	28
Wireless broadband	17
Internet users	14
Internet bandwidth speed	02
High-tech exports (%)	13
Secure internet servers	04

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	20	11	17	13	01
Business agility	11	12	09	14	01
IT integration	03	07	08	11	01

Adaptive attitudes	Rank
E-Participation	06
Internet retailing	27
Tablet possession	14
Smartphone possession	03
Attitudes toward globalization	03
Flexibility and adaptability	05

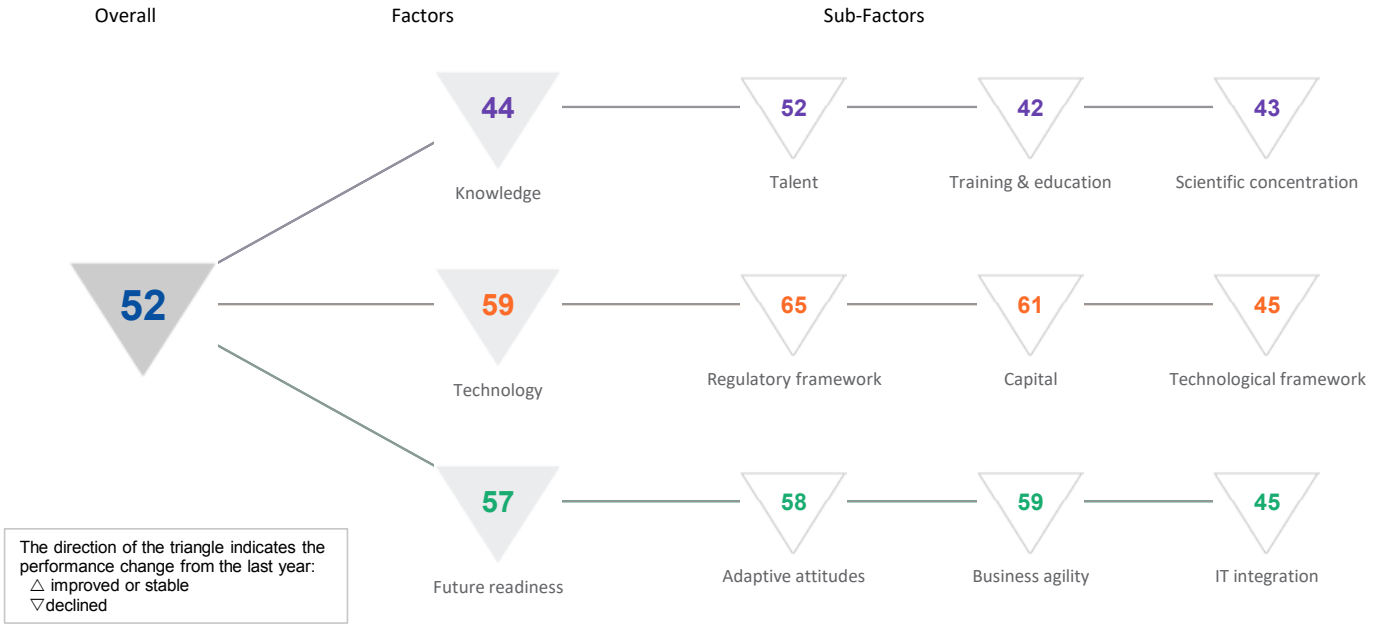
Business agility	Rank
Opportunities and threats	04
World robots distribution	14
Agility of companies	04
Use of big data and analytics	03
Knowledge transfer	02
Entrepreneurial fear of failure	-

IT integration	Rank
E-Government	03
▶ Public-private partnerships	01
Cyber security	03
Software piracy	17
Government cyber security capacity	04
▷ Privacy protection by law exists	48

SLOVAK REPUBLIC

DIGITAL TRENDS - OVERALL

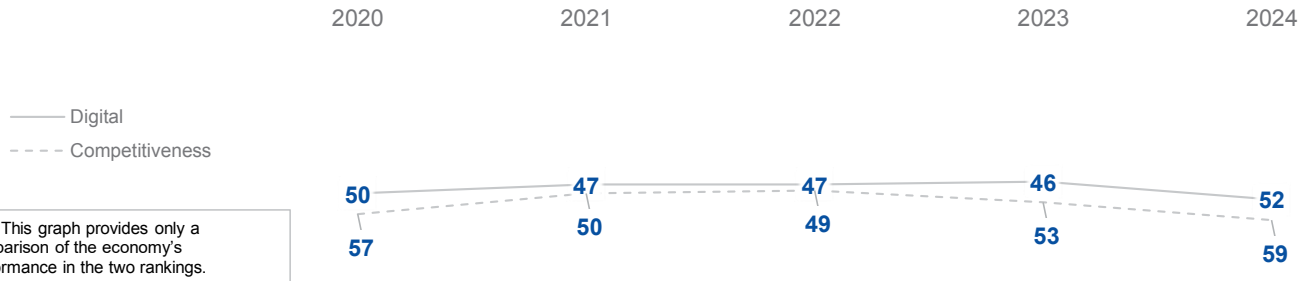
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	50	47	47	46	52
Knowledge	51	46	44	42	44
Technology	51	45	53	54	59
Future readiness	51	46	45	48	57

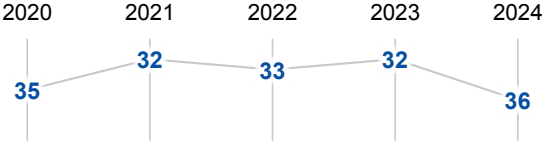
COMPETITIVENESS & DIGITAL RANKINGS



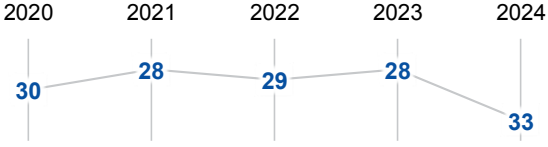
N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



SLOVAK REPUBLIC

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	53	52	44	48	52
Training & education	52	49	43	40	42
Scientific concentration	38	40	39	39	43

Talent	Rank
Educational assessment PISA - Math	34
International experience	50
▷ Foreign highly skilled personnel	66
Management of cities	46
Digital/Technological skills	27
Net flow of international students	59

Training & education	Rank
Employee training	50
Total public expenditure on education	38
Higher education achievement	42
▶ Pupil-teacher ratio (tertiary education)	17
Graduates in Sciences	40
Women with degrees	39
Computer science education index	48

Scientific concentration	Rank
Total expenditure on R&D (%)	40
Total R&D personnel per capita	37
▶ Female researchers	22
R&D productivity by publication	45
Scientific and technical employment	42
High-tech patent grants	25
Robots in Education and R&D	32
AI articles	42

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	61	60	58	55	65
Capital	47	42	58	58	61
Technological framework	38	39	40	42	45

Regulatory framework	Rank
Starting a business	51
Enforcing contracts	34
▷ Immigration laws	67
▷ Development & application of tech.	66
Scientific research legislation	62
Intellectual property rights	56
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	59
Funding for technological development	59
Banking and financial services	37
Country credit rating	34
Venture capital	54
Investment in Telecommunications	37

Technological framework	Rank
▶ Communications technology	20
Mobile broadband subscribers	50
Wireless broadband	44
Internet users	37
Internet bandwidth speed	28
High-tech exports (%)	48
Secure internet servers	25

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	50	49	50	52	58
Business agility	62	60	50	51	59
IT integration	44	40	39	36	45

Adaptive attitudes	Rank
E-Participation	43
Internet retailing	39
▶ Tablet possession	23
Smartphone possession	30
▷ Attitudes toward globalization	65
▷ Flexibility and adaptability	66

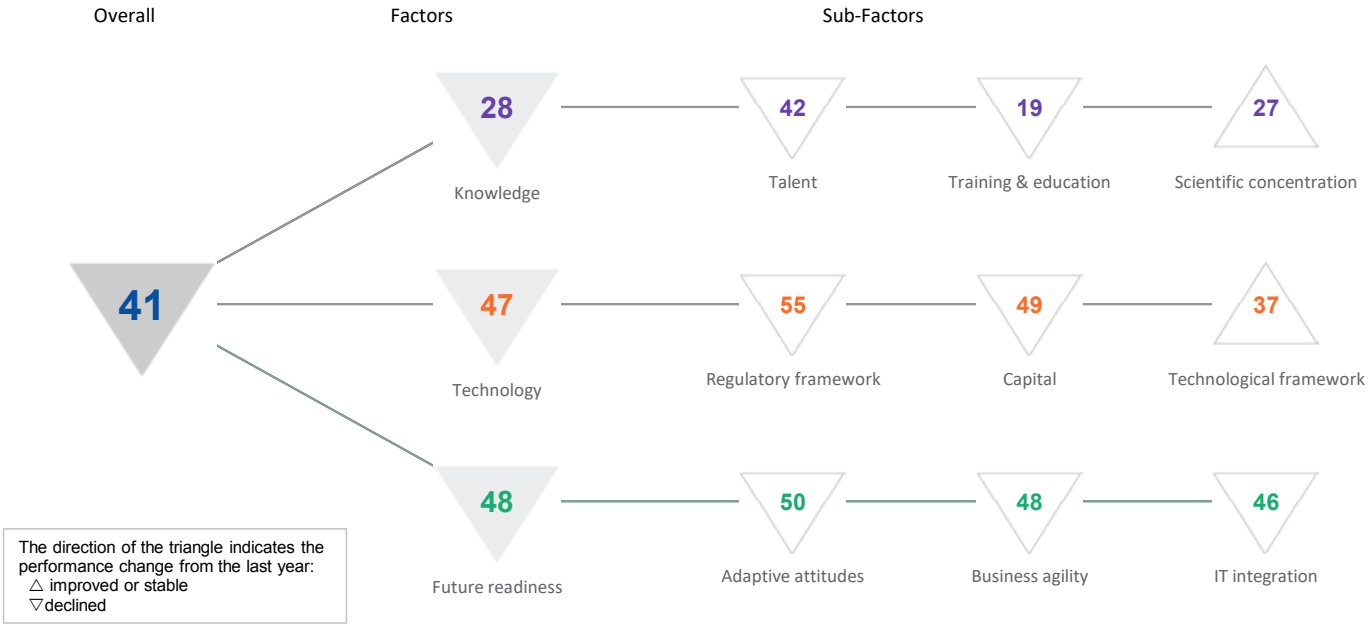
Business agility	Rank
Opportunities and threats	60
World robots distribution	28
Agility of companies	50
Use of big data and analytics	42
Knowledge transfer	64
Entrepreneurial fear of failure	38

IT integration	Rank
E-Government	52
Public-private partnerships	52
Cyber security	57
Software piracy	26
Government cyber security capacity	43
▶ Privacy protection by law exists	01

SLOVENIA

DIGITAL TRENDS - OVERALL

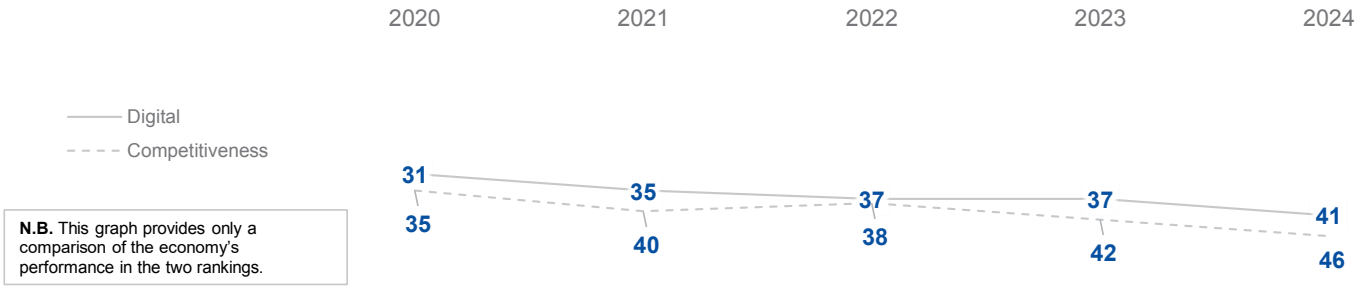
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

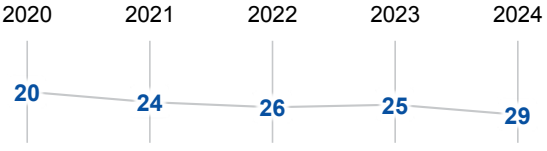
	2020	2021	2022	2023	2024
OVERALL	31	35	37	37	41
Knowledge	29	30	26	27	28
Technology	35	39	38	45	47
Future readiness	37	40	41	39	48

COMPETITIVENESS & DIGITAL RANKINGS

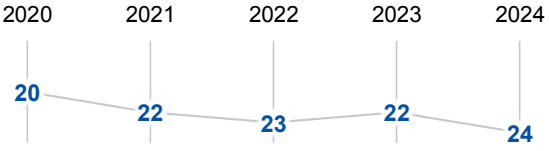


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS < 20 MILLION (37 economies)



SLOVENIA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	35	37	38	39	42
Training & education	22	23	18	13	19
Scientific concentration	33	31	28	29	27

Talent	Rank
Educational assessment PISA - Math	19
International experience	56
▷ Foreign highly skilled personnel	62
Management of cities	37
Digital/Technological skills	30
Net flow of international students	23

Training & education	Rank
Employee training	24
▶ Total public expenditure on education	10
Higher education achievement	27
▶ Pupil-teacher ratio (tertiary education)	10
▶ Graduates in Sciences	10
Women with degrees	27
Computer science education index	38

Scientific concentration	Rank
Total expenditure on R&D (%)	18
Total R&D personnel per capita	17
Female researchers	37
R&D productivity by publication	56
▶ Scientific and technical employment	15
High-tech patent grants	29
Robots in Education and R&D	33
AI articles	16

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	38	45	43	48	55
Capital	28	39	38	38	49
Technological framework	34	33	35	41	37

Regulatory framework	Rank
Starting a business	24
Enforcing contracts	55
Immigration laws	57
Development & application of tech.	55
Scientific research legislation	41
Intellectual property rights	36
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	44
Funding for technological development	42
Banking and financial services	54
Country credit rating	32
Venture capital	55
Investment in Telecommunications	23

Technological framework	Rank
Communications technology	35
Mobile broadband subscribers	23
Wireless broadband	38
Internet users	38
Internet bandwidth speed	39
High-tech exports (%)	47
▶ Secure internet servers	13

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	38	41	45	38	50
Business agility	31	40	33	39	48
IT integration	31	35	37	38	46

Adaptive attitudes	Rank
E-Participation	32
Internet retailing	33
Tablet possession	18
Smartphone possession	50
▷ Attitudes toward globalization	61
▷ Flexibility and adaptability	62

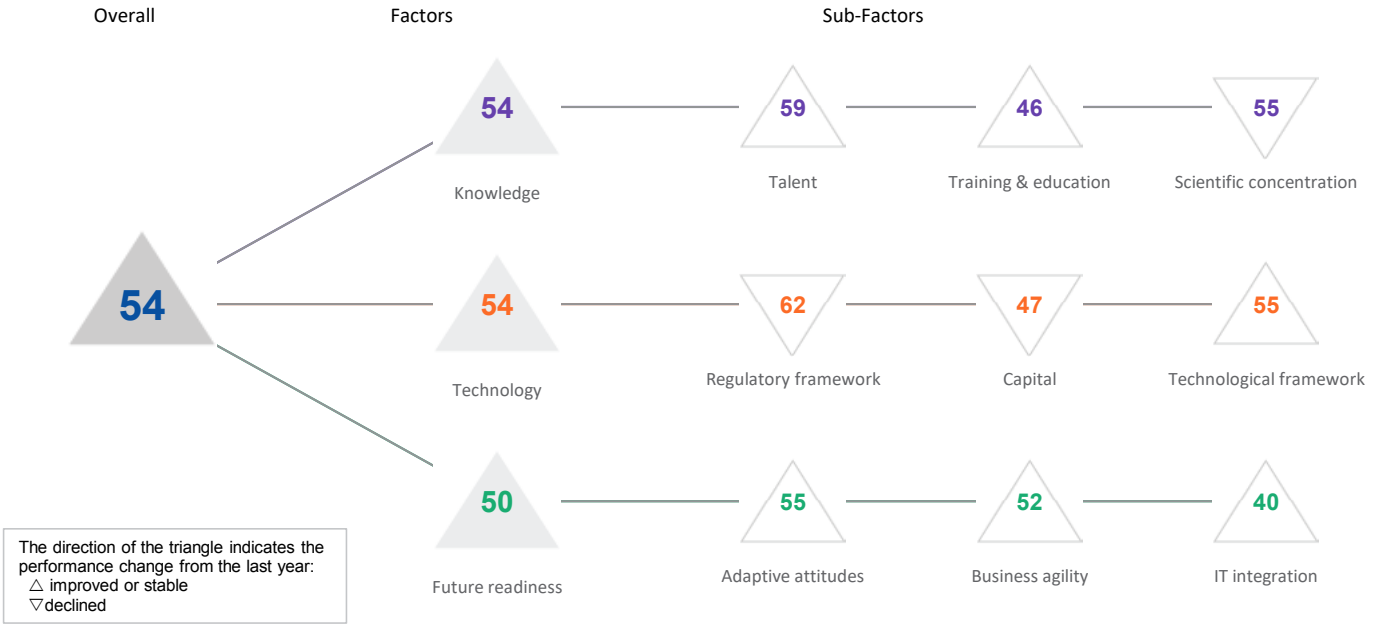
Business agility	Rank
Opportunities and threats	40
World robots distribution	33
Agility of companies	38
Use of big data and analytics	46
Knowledge transfer	52
Entrepreneurial fear of failure	26

IT integration	Rank
E-Government	30
▷ Public-private partnerships	62
Cyber security	28
Software piracy	30
▷ Government cyber security capacity	61
Privacy protection by law exists	23

SOUTH AFRICA

DIGITAL TRENDS - OVERALL

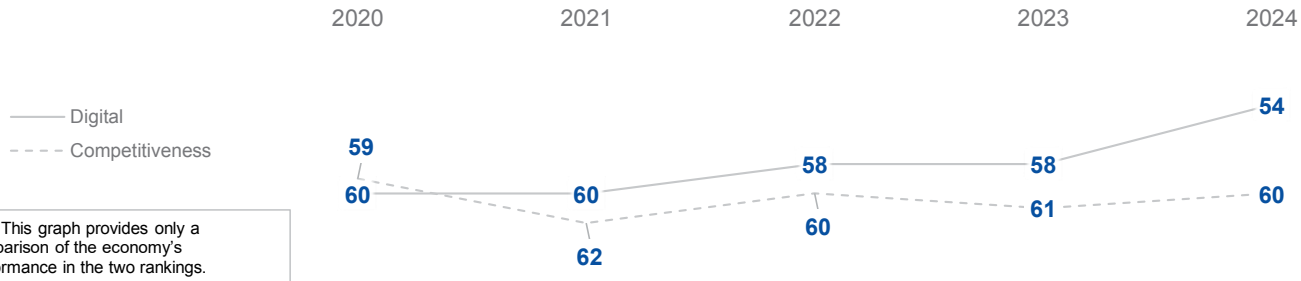
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

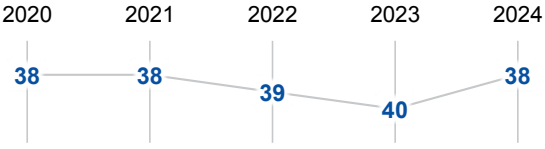
	2020	2021	2022	2023	2024
OVERALL	60	60	58	58	54
Knowledge	60	62	54	58	54
Technology	55	59	58	59	54
Future readiness	57	59	59	56	50

COMPETITIVENESS & DIGITAL RANKINGS

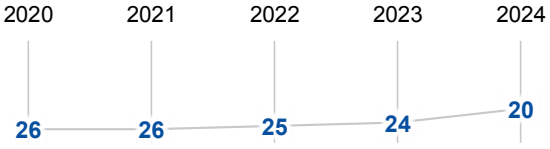


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS > 20 MILLION (30 economies)



SOUTH AFRICA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	59	58	57	60	59
Training & education	60	62	50	49	46
Scientific concentration	53	53	53	53	55

Talent	Rank
Educational assessment PISA - Math	-
International experience	35
Foreign highly skilled personnel	48
▷ Management of cities	66
Digital/Technological skills	52
Net flow of international students	38

Training & education	Rank
Employee training	46
▶ Total public expenditure on education	02
▷ Higher education achievement	61
Pupil-teacher ratio (tertiary education)	42
Graduates in Sciences	56
Women with degrees	57
Computer science education index	45

Scientific concentration	Rank
Total expenditure on R&D (%)	49
Total R&D personnel per capita	54
▶ Female researchers	13
R&D productivity by publication	21
Scientific and technical employment	-
High-tech patent grants	54
Robots in Education and R&D	45
AI articles	55

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	56	59	53	56	62
Capital	32	36	51	45	47
Technological framework	57	61	60	61	55

Regulatory framework	Rank
▷ Starting a business	61
Enforcing contracts	52
▷ Immigration laws	65
Development & application of tech.	60
Scientific research legislation	44
Intellectual property rights	48
AI policies passed into law	39

Capital	Rank
▶ IT & media stock market capitalization	07
Funding for technological development	57
Banking and financial services	55
Country credit rating	58
Venture capital	58
▶ Investment in Telecommunications	12

Technological framework	Rank
Communications technology	52
Mobile broadband subscribers	47
Wireless broadband	42
Internet users	60
▷ Internet bandwidth speed	61
High-tech exports (%)	55
Secure internet servers	37

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	59	59	57	57	55
Business agility	58	59	57	54	52
IT integration	50	55	55	56	40

Adaptive attitudes	Rank
E-Participation	24
Internet retailing	57
Tablet possession	55
Smartphone possession	38
Attitudes toward globalization	44
Flexibility and adaptability	41

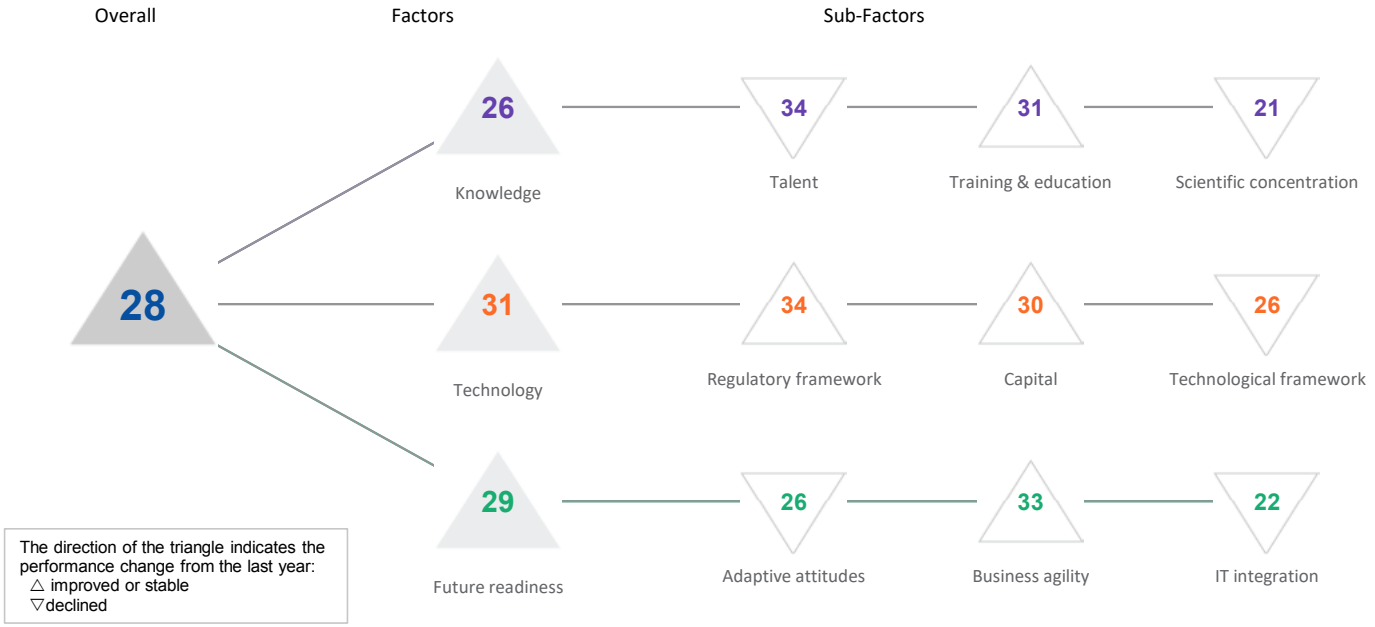
Business agility	Rank
Opportunities and threats	34
World robots distribution	32
Agility of companies	44
Use of big data and analytics	31
Knowledge transfer	45
Entrepreneurial fear of failure	50

IT integration	Rank
E-Government	36
Public-private partnerships	55
Cyber security	53
Software piracy	20
Government cyber security capacity	52
▶ Privacy protection by law exists	13

SPAIN

DIGITAL TRENDS - OVERALL

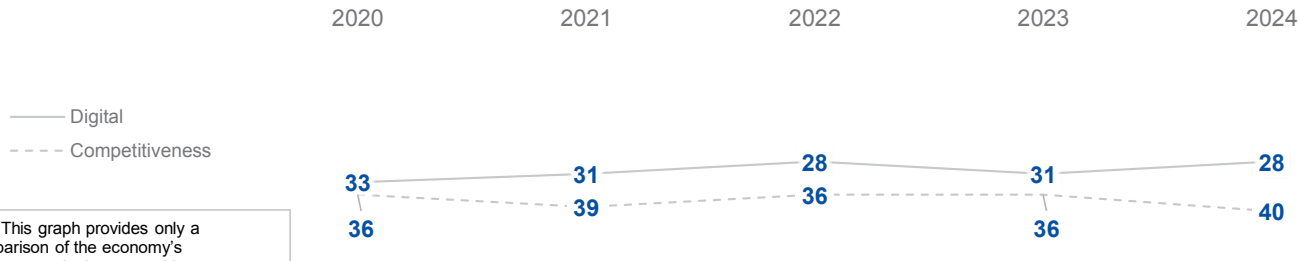
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

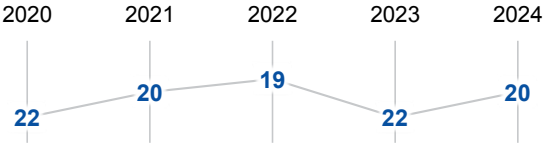
	2020	2021	2022	2023	2024
OVERALL	33	31	28	31	28
Knowledge	32	31	27	26	26
Technology	33	33	33	31	31
Future readiness	40	35	27	29	29

COMPETITIVENESS & DIGITAL RANKINGS

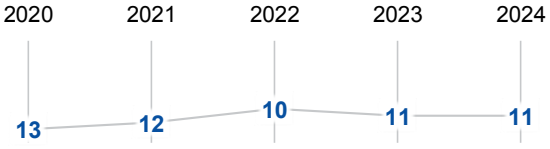


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS > 20 MILLION (30 economies)



SPAIN

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	32	31	31	27	34
Training & education	42	40	35	35	31
Scientific concentration	20	23	20	19	21

Talent	Rank
Educational assessment PISA - Math	28
International experience	48
Foreign highly skilled personnel	21
Management of cities	36
Digital/Technological skills	43
Net flow of international students	32

Training & education	Rank
Employee training	41
Total public expenditure on education	40
Higher education achievement	23
Pupil-teacher ratio (tertiary education)	21
Graduates in Sciences	42
Women with degrees	29
▶ Computer science education index	07

Scientific concentration	Rank
Total expenditure on R&D (%)	29
Total R&D personnel per capita	31
Female researchers	21
▶ R&D productivity by publication	09
Scientific and technical employment	22
High-tech patent grants	40
▶ Robots in Education and R&D	07
AI articles	28

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	36	37	35	38	34
Capital	34	34	31	30	30
Technological framework	27	24	28	22	26

Regulatory framework	Rank
Starting a business	41
Enforcing contracts	22
Immigration laws	49
Development & application of tech.	41
▷ Scientific research legislation	59
Intellectual property rights	38
AI policies passed into law	11

Capital	Rank
IT & media stock market capitalization	21
▷ Funding for technological development	51
Banking and financial services	43
Country credit rating	39
Venture capital	34
Investment in Telecommunications	11

Technological framework	Rank
Communications technology	23
Mobile broadband subscribers	35
Wireless broadband	37
Internet users	21
▶ Internet bandwidth speed	07
High-tech exports (%)	38
Secure internet servers	32

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	35	33	25	21	26
Business agility	48	49	44	43	33
IT integration	30	29	20	19	22

Adaptive attitudes	Rank
E-Participation	28
Internet retailing	28
Tablet possession	31
▶ Smartphone possession	10
Attitudes toward globalization	33
▷ Flexibility and adaptability	51

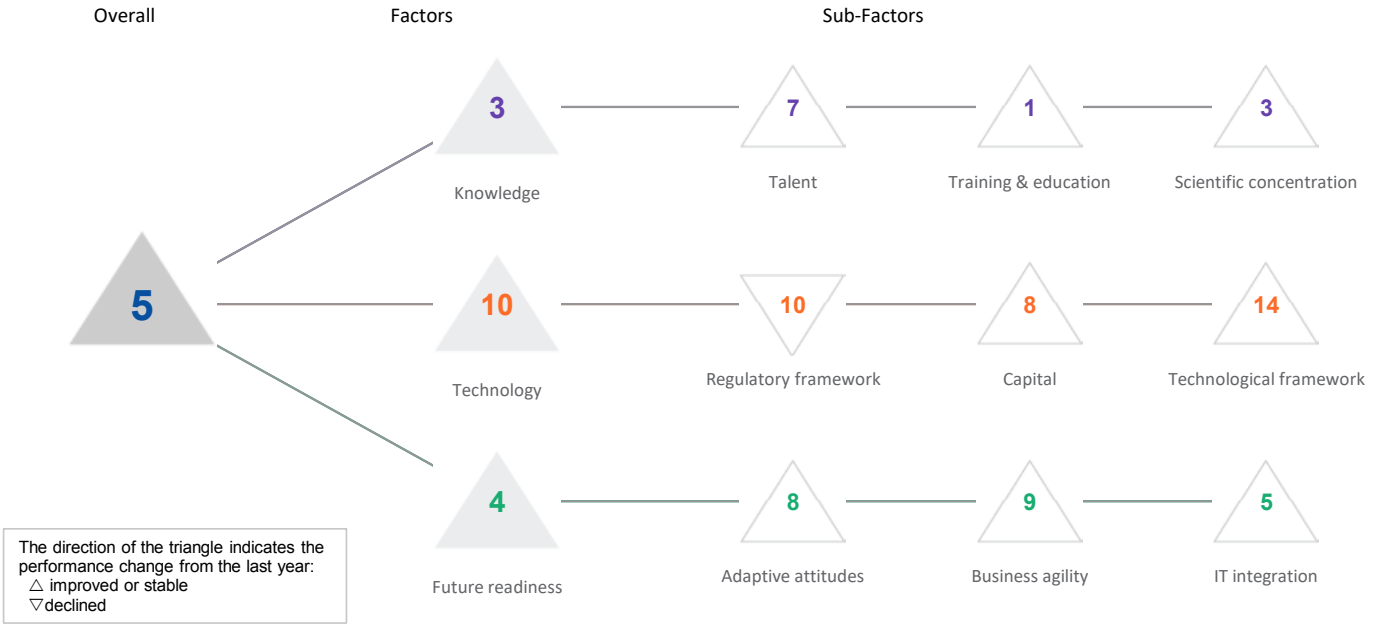
Business agility	Rank
Opportunities and threats	24
World robots distribution	10
Agility of companies	28
▷ Use of big data and analytics	52
▷ Knowledge transfer	51
Entrepreneurial fear of failure	31

IT integration	Rank
E-Government	17
Public-private partnerships	25
Cyber security	44
Software piracy	33
Government cyber security capacity	13
Privacy protection by law exists	16

SWEDEN

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

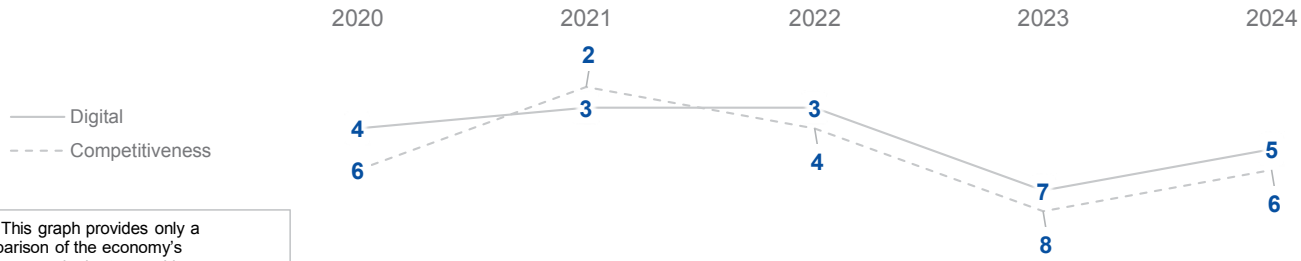


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	04	03	03	07	05
Knowledge	04	02	02	05	03
Technology	06	08	05	11	10
Future readiness	07	06	04	08	04

COMPETITIVENESS & DIGITAL RANKINGS

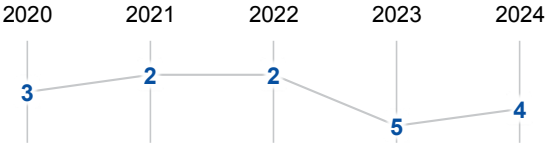


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS < 20 MILLION (37 economies)



SWEDEN

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	09	07	06	13	07
Training & education	02	02	04	04	01
Scientific concentration	06	04	02	04	03

Talent	Rank
Educational assessment PISA - Math	23
International experience	05
Foreign highly skilled personnel	15
Management of cities	12
Digital/Technological skills	04
Net flow of international students	27

Training & education	Rank
Employee training	05
Total public expenditure on education	05
Higher education achievement	19
Pupil-teacher ratio (tertiary education)	20
Graduates in Sciences	14
Women with degrees	08
Computer science education index	24

Scientific concentration	Rank
Total expenditure on R&D (%)	05
Total R&D personnel per capita	12
▷ Female researchers	36
▷ R&D productivity by publication	40
▶ Scientific and technical employment	01
High-tech patent grants	08
Robots in Education and R&D	20
AI articles	12

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	05	03	02	07	10
Capital	04	05	07	08	08
Technological framework	11	13	09	17	14

Regulatory framework	Rank
Starting a business	23
Enforcing contracts	30
Immigration laws	24
Development & application of tech.	04
▶ Scientific research legislation	03
Intellectual property rights	07
▷ AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	27
Funding for technological development	05
Banking and financial services	14
▶ Country credit rating	01
Venture capital	06
▷ Investment in Telecommunications	50

Technological framework	Rank
Communications technology	15
Mobile broadband subscribers	13
Wireless broadband	33
Internet users	19
Internet bandwidth speed	18
High-tech exports (%)	28
Secure internet servers	24

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	08	05	07	10	08
Business agility	10	13	10	17	09
IT integration	04	05	04	08	05

Adaptive attitudes	Rank
E-Participation	30
Internet retailing	14
▶ Tablet possession	01
Smartphone possession	46
Attitudes toward globalization	04
Flexibility and adaptability	23

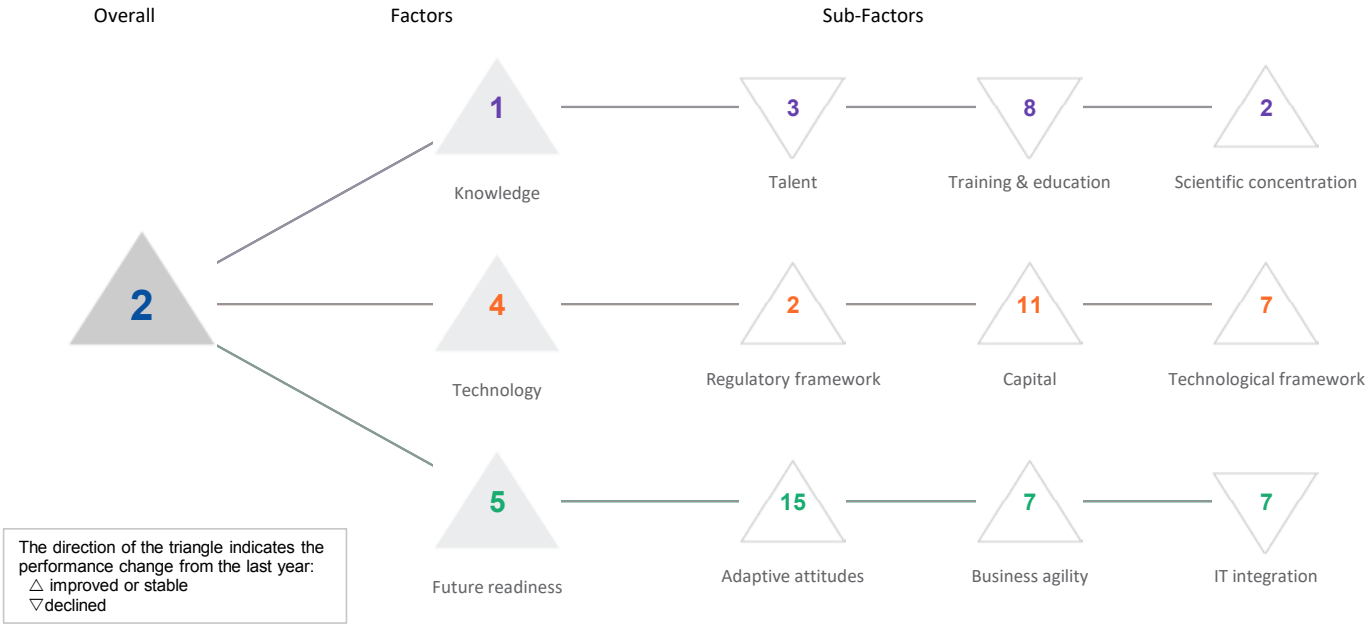
Business agility	Rank
Opportunities and threats	10
▷ World robots distribution	21
Agility of companies	10
▶ Use of big data and analytics	01
Knowledge transfer	05
Entrepreneurial fear of failure	25

IT integration	Rank
E-Government	14
Public-private partnerships	10
Cyber security	10
Software piracy	06
Government cyber security capacity	21
Privacy protection by law exists	20

SWITZERLAND

DIGITAL TRENDS - OVERALL

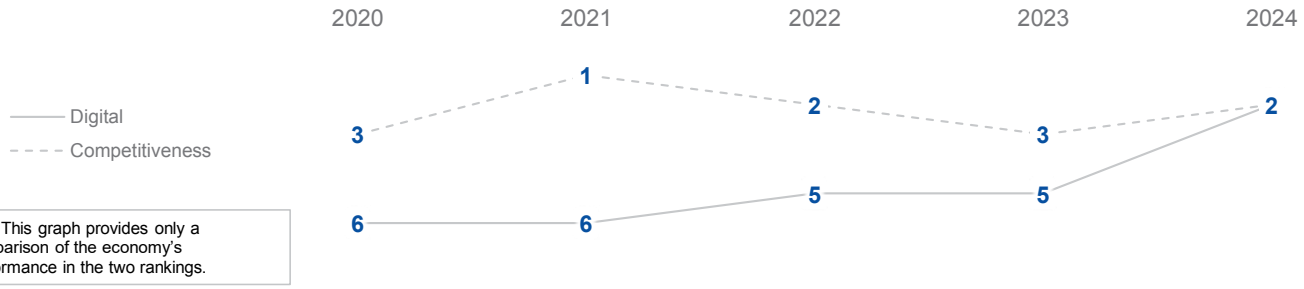
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	06	06	05	05	02
Knowledge	03	01	01	01	01
Technology	11	11	12	10	04
Future readiness	05	03	07	06	05

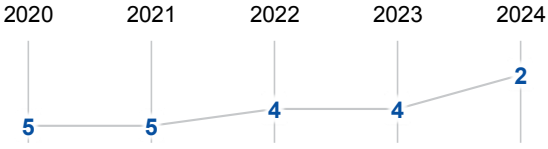
COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS < 20 MILLION (37 economies)



SWITZERLAND

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	02	03	02	02	03
Training & education	14	07	08	07	08
Scientific concentration	09	08	08	10	02

Talent	Rank
Educational assessment PISA - Math	08
▶ International experience	01
▶ Foreign highly skilled personnel	01
Management of cities	07
Digital/Technological skills	10
Net flow of international students	08

Training & education	Rank
Employee training	02
Total public expenditure on education	13
Higher education achievement	21
Pupil-teacher ratio (tertiary education)	06
Graduates in Sciences	26
Women with degrees	32
Computer science education index	14

Scientific concentration	Rank
Total expenditure on R&D (%)	08
Total R&D personnel per capita	09
Female researchers	29
▷ R&D productivity by publication	35
Scientific and technical employment	03
High-tech patent grants	22
Robots in Education and R&D	16
AI articles	03

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	10	09	08	04	02
Capital	14	12	12	11	11
Technological framework	14	11	11	12	07

Regulatory framework	Rank
Starting a business	36
▷ Enforcing contracts	40
Immigration laws	12
Development & application of tech.	06
Scientific research legislation	02
▶ Intellectual property rights	01
AI policies passed into law	17

Capital	Rank
▷ IT & media stock market capitalization	49
Funding for technological development	06
Banking and financial services	03
Country credit rating	01
Venture capital	15
Investment in Telecommunications	30

Technological framework	Rank
▶ Communications technology	01
Mobile broadband subscribers	12
▷ Wireless broadband	52
Internet users	13
Internet bandwidth speed	10
High-tech exports (%)	09
Secure internet servers	05

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	09	10	12	16	15
Business agility	06	04	07	07	07
IT integration	07	04	06	06	07

Adaptive attitudes	Rank
E-Participation	27
Internet retailing	09
Tablet possession	08
Smartphone possession	17
Attitudes toward globalization	20
Flexibility and adaptability	26

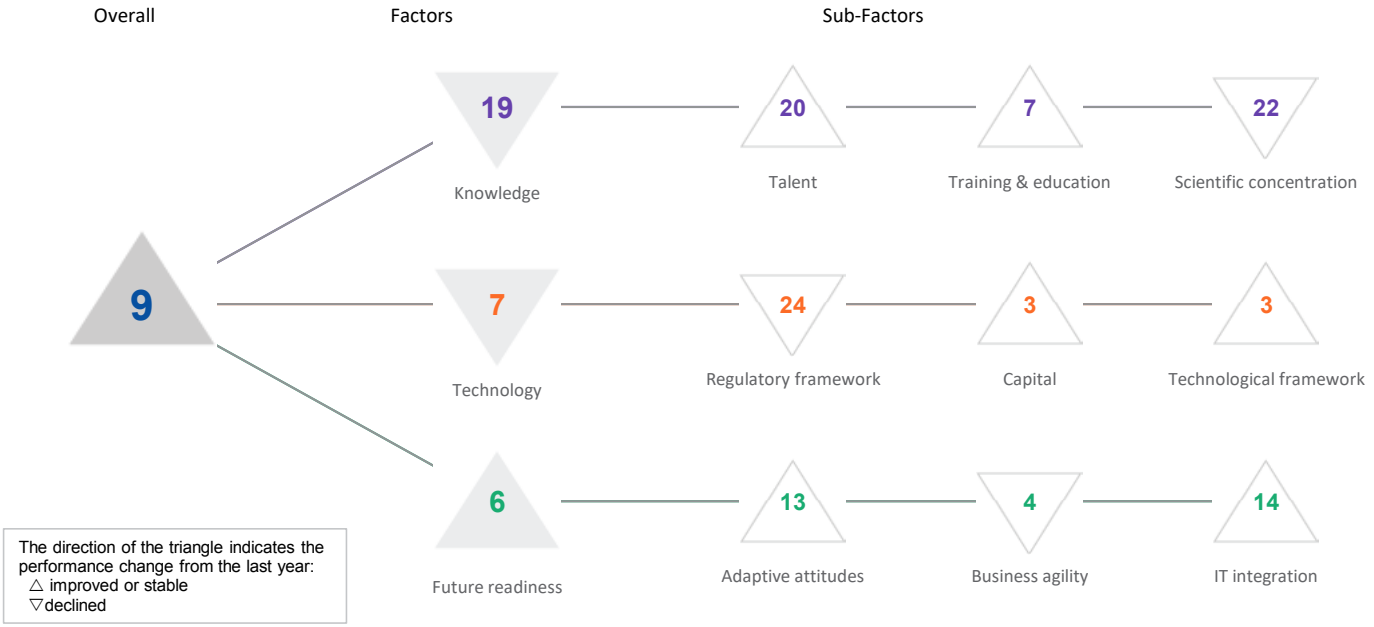
Business agility	Rank
Opportunities and threats	08
World robots distribution	24
Agility of companies	08
Use of big data and analytics	25
▶ Knowledge transfer	01
Entrepreneurial fear of failure	10

IT integration	Rank
E-Government	25
Public-private partnerships	05
Cyber security	11
Software piracy	10
▷ Government cyber security capacity	34
Privacy protection by law exists	27

TAIWAN (CHINESE TAIPEI)

DIGITAL TRENDS - OVERALL

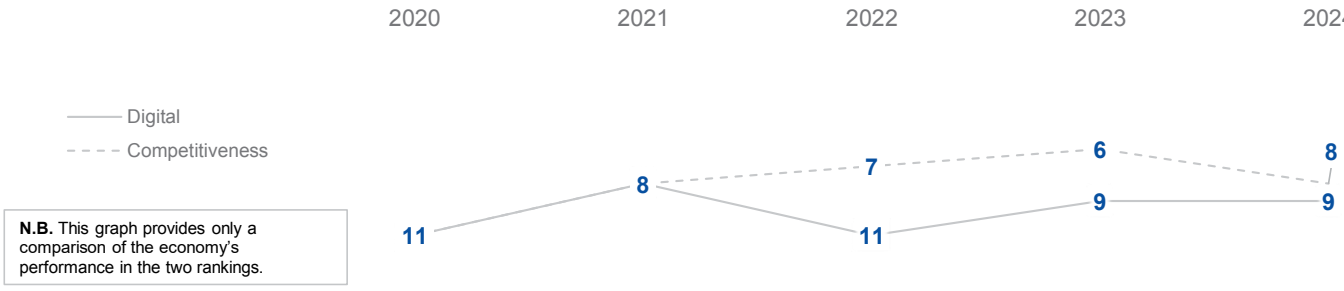
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

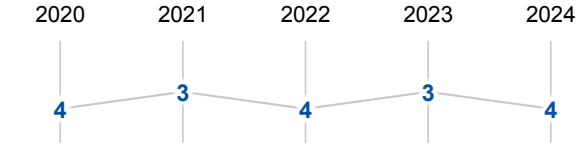
	2020	2021	2022	2023	2024
OVERALL	11	08	11	09	09
Knowledge	18	16	18	18	19
Technology	05	02	06	03	07
Future readiness	08	07	08	07	06

COMPETITIVENESS & DIGITAL RANKINGS

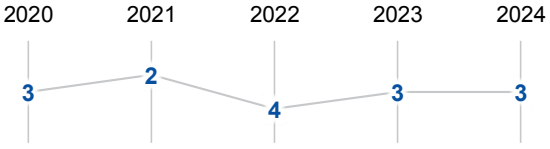


PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)



POPULATIONS > 20 MILLION (30 economies)



TAIWAN (CHINESE TAIPEI)

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	18	17	21	22	20
Training & education	21	12	11	10	07
Scientific concentration	18	19	21	21	22

Talent	Rank
Educational assessment PISA - Math	03
International experience	41
▷ Foreign highly skilled personnel	49
Management of cities	10
Digital/Technological skills	42
Net flow of international students	16

Training & education	Rank
Employee training	08
▷ Total public expenditure on education	53
▶ Higher education achievement	03
▷ Pupil-teacher ratio (tertiary education)	51
Graduates in Sciences	06
Women with degrees	07
Computer science education index	13

Scientific concentration	Rank
▶ Total expenditure on R&D (%)	03
▶ Total R&D personnel per capita	02
▷ Female researchers	54
R&D productivity by publication	34
▷ Scientific and technical employment	46
High-tech patent grants	17
Robots in Education and R&D	19
AI articles	27

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	16	16	14	16	24
Capital	08	02	09	05	03
Technological framework	04	04	04	05	03

Regulatory framework	Rank
Starting a business	10
Enforcing contracts	11
Immigration laws	39
Development & application of tech.	24
Scientific research legislation	13
Intellectual property rights	18
AI policies passed into law	39

Capital	Rank
▶ IT & media stock market capitalization	01
Funding for technological development	14
Banking and financial services	12
Country credit rating	15
Venture capital	11
Investment in Telecommunications	38

Technological framework	Rank
Communications technology	21
Mobile broadband subscribers	15
Wireless broadband	06
Internet users	31
Internet bandwidth speed	13
High-tech exports (%)	03
Secure internet servers	-

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	14	13	13	17	13
Business agility	01	02	05	01	04
IT integration	17	15	13	14	14

Adaptive attitudes	Rank
E-Participation	-
Internet retailing	29
Tablet possession	22
Smartphone possession	20
Attitudes toward globalization	05
Flexibility and adaptability	10

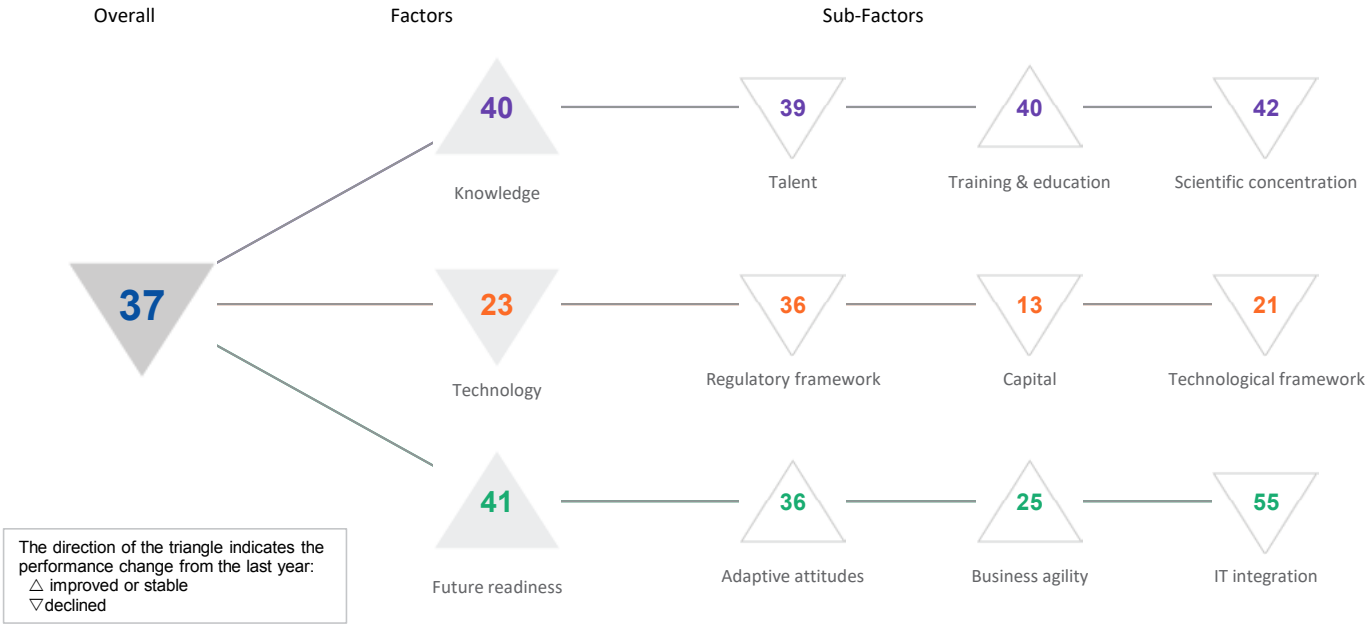
Business agility	Rank
Opportunities and threats	05
World robots distribution	07
▶ Agility of companies	02
Use of big data and analytics	05
Knowledge transfer	10
Entrepreneurial fear of failure	23

IT integration	Rank
E-Government	-
Public-private partnerships	14
Cyber security	16
Software piracy	25
Government cyber security capacity	08
Privacy protection by law exists	46

THAILAND

DIGITAL TRENDS - OVERALL

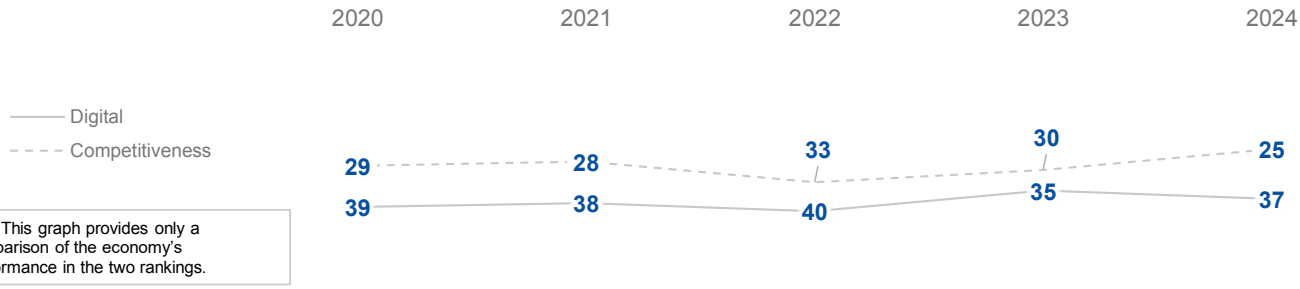
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	39	38	40	35	37
Knowledge	43	42	45	41	40
Technology	22	22	20	15	23
Future readiness	45	44	49	42	41

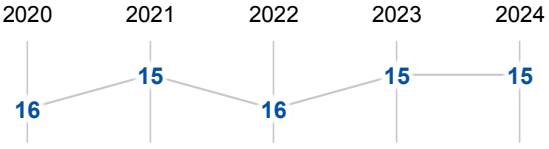
COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 economies)

POPULATIONS > 20 MILLION (30 economies)



THAILAND

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	36	39	37	35	39
Training & education	55	56	57	52	40
Scientific concentration	37	36	36	38	42

Talent	Rank
Educational assessment PISA - Math	50
International experience	19
Foreign highly skilled personnel	18
Management of cities	23
Digital/Technological skills	39
Net flow of international students	42

Training & education	Rank
Employee training	22
Total public expenditure on education	32
Higher education achievement	44
▷ Pupil-teacher ratio (tertiary education)	55
Graduates in Sciences	13
Women with degrees	49
Computer science education index	39

Scientific concentration	Rank
Total expenditure on R&D (%)	37
Total R&D personnel per capita	45
▶ Female researchers	09
R&D productivity by publication	28
▷ Scientific and technical employment	56
High-tech patent grants	36
Robots in Education and R&D	13
▷ AI articles	57

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	31	29	34	31	36
Capital	17	19	20	12	13
Technological framework	25	22	18	15	21

Regulatory framework	Rank
Starting a business	26
Enforcing contracts	28
Immigration laws	35
Development & application of tech.	31
Scientific research legislation	43
Intellectual property rights	49
AI policies passed into law	39

Capital	Rank
▶ IT & media stock market capitalization	09
Funding for technological development	30
Banking and financial services	19
Country credit rating	42
Venture capital	25
▶ Investment in Telecommunications	08

Technological framework	Rank
Communications technology	17
Mobile broadband subscribers	19
Wireless broadband	28
Internet users	40
▶ Internet bandwidth speed	08
High-tech exports (%)	18
Secure internet servers	48

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	53	53	52	42	36
Business agility	44	34	41	34	25
IT integration	43	43	50	49	55

Adaptive attitudes	Rank
E-Participation	37
Internet retailing	38
▷ Tablet possession	57
Smartphone possession	26
▶ Attitudes toward globalization	11
Flexibility and adaptability	27

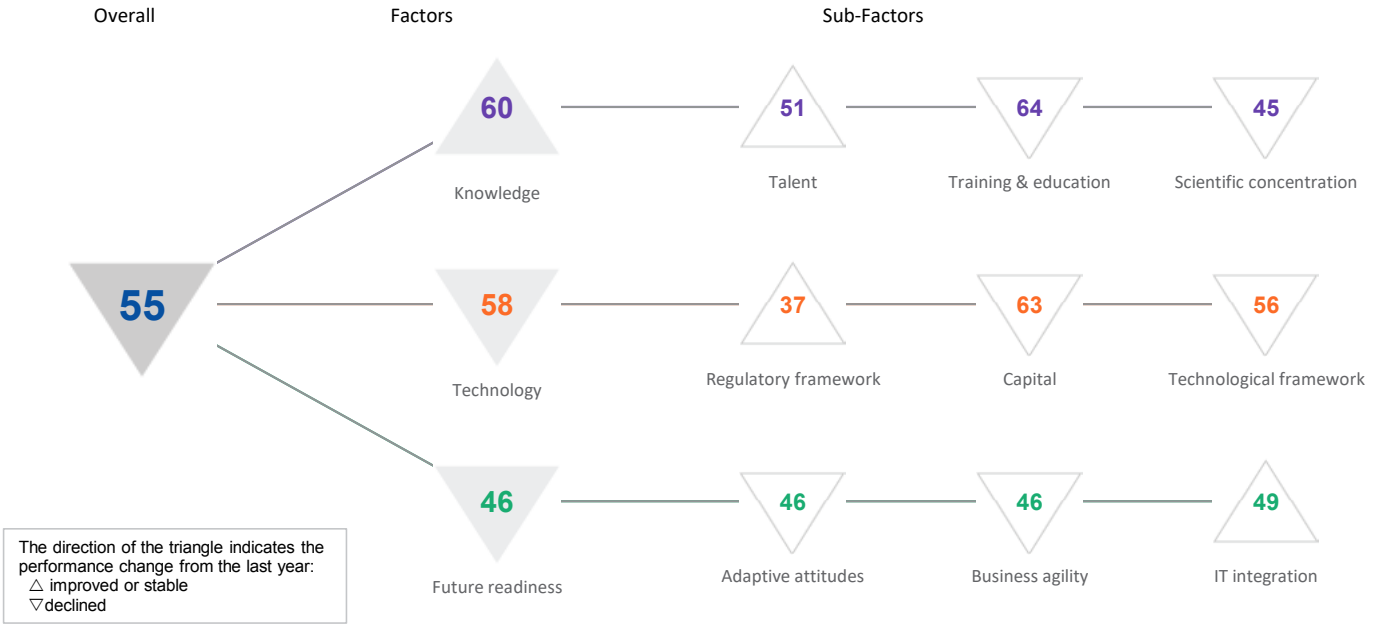
Business agility	Rank
Opportunities and threats	27
World robots distribution	11
Agility of companies	30
Use of big data and analytics	29
Knowledge transfer	30
Entrepreneurial fear of failure	37

IT integration	Rank
E-Government	44
Public-private partnerships	24
Cyber security	39
▷ Software piracy	57
Government cyber security capacity	-
Privacy protection by law exists	54

TÜRKIYE

DIGITAL TRENDS - OVERALL

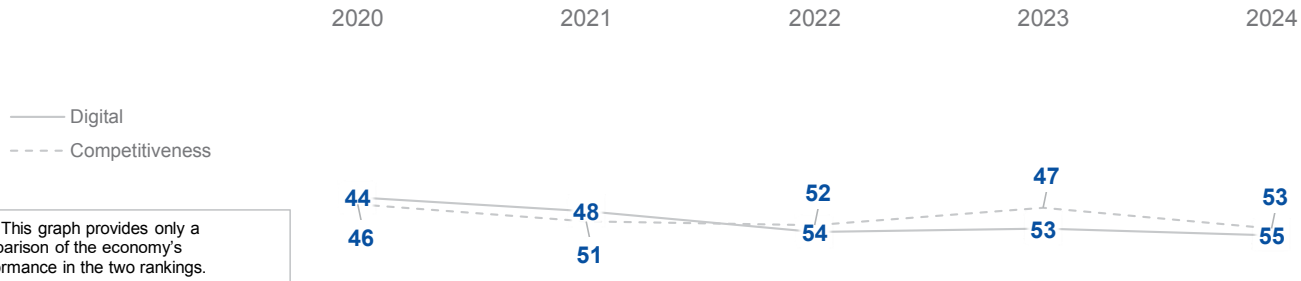
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

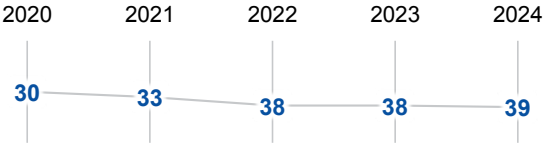
	2020	2021	2022	2023	2024
OVERALL	44	48	54	53	55
Knowledge	56	57	59	61	60
Technology	42	52	54	55	58
Future readiness	34	41	44	44	46

COMPETITIVENESS & DIGITAL RANKINGS

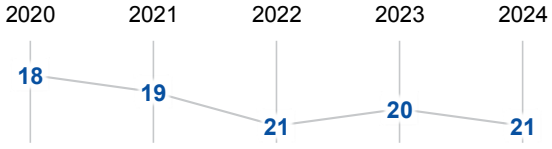


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)



POPULATIONS > 20 MILLION (30 economies)



TÜRKIYE

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	38	49	47	51	51
Training & education	62	63	63	63	64
Scientific concentration	45	41	41	41	45

Talent	Rank
Educational assessment PISA - Math	38
International experience	51
Foreign highly skilled personnel	59
Management of cities	45
Digital/Technological skills	47
Net flow of international students	25

Training & education	Rank
Employee training	57
Total public expenditure on education	45
Higher education achievement	36
▷ Pupil-teacher ratio (tertiary education)	61
Graduates in Sciences	53
Women with degrees	51
Computer science education index	33

Scientific concentration	Rank
Total expenditure on R&D (%)	32
Total R&D personnel per capita	42
Female researchers	31
▶ R&D productivity by publication	11
Scientific and technical employment	45
High-tech patent grants	52
Robots in Education and R&D	28
AI articles	45

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	34	41	44	40	37
Capital	51	60	60	60	63
Technological framework	51	48	52	53	56

Regulatory framework	Rank
Starting a business	35
▶ Enforcing contracts	20
Immigration laws	25
Development & application of tech.	42
Scientific research legislation	50
▷ Intellectual property rights	61
▶ AI policies passed into law	21

Capital	Rank
IT & media stock market capitalization	51
Funding for technological development	49
Banking and financial services	46
▷ Country credit rating	61
▷ Venture capital	63
Investment in Telecommunications	44

Technological framework	Rank
Communications technology	44
▷ Mobile broadband subscribers	63
Wireless broadband	57
Internet users	51
Internet bandwidth speed	58
High-tech exports (%)	58
Secure internet servers	42

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	32	34	42	40	46
Business agility	20	29	42	35	46
IT integration	42	47	54	55	49

Adaptive attitudes	Rank
▶ E-Participation	19
Internet retailing	41
Tablet possession	53
Smartphone possession	22
Attitudes toward globalization	49
Flexibility and adaptability	40

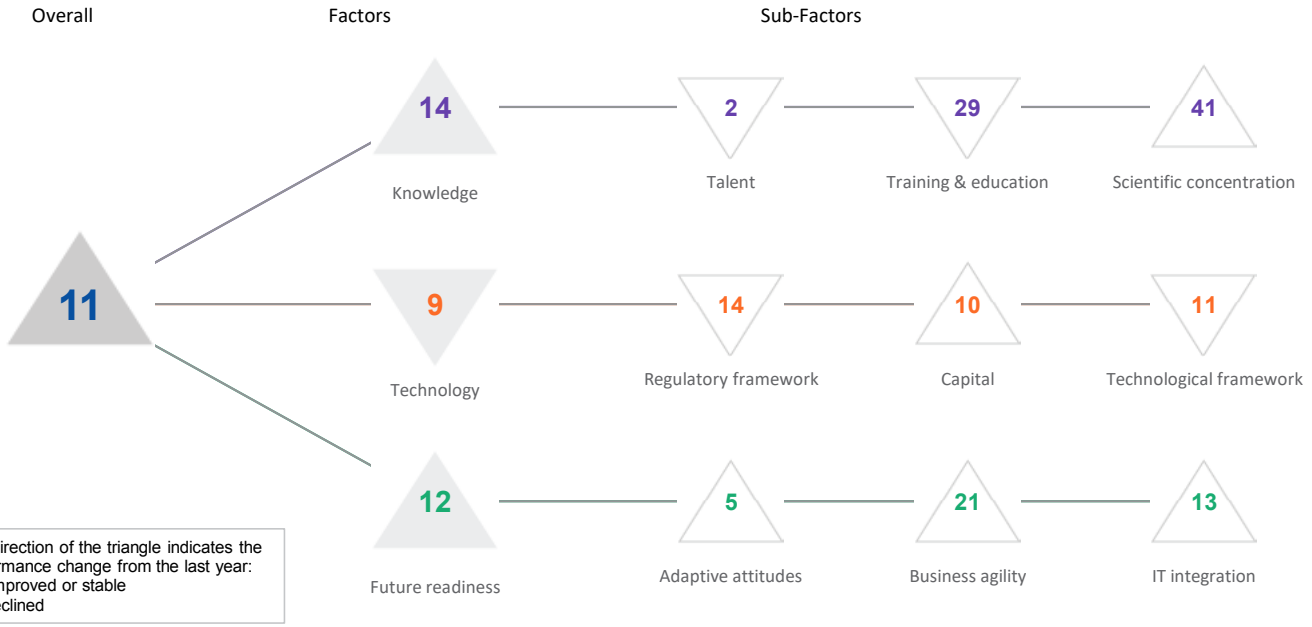
Business agility	Rank
Opportunities and threats	45
World robots distribution	18
Agility of companies	54
Use of big data and analytics	48
Knowledge transfer	50
▶ Entrepreneurial fear of failure	15

IT integration	Rank
E-Government	26
Public-private partnerships	49
Cyber security	52
Software piracy	50
Government cyber security capacity	39
Privacy protection by law exists	39

UAE

DIGITAL TRENDS - OVERALL

OVERALL PERFORMANCE (67 economies)

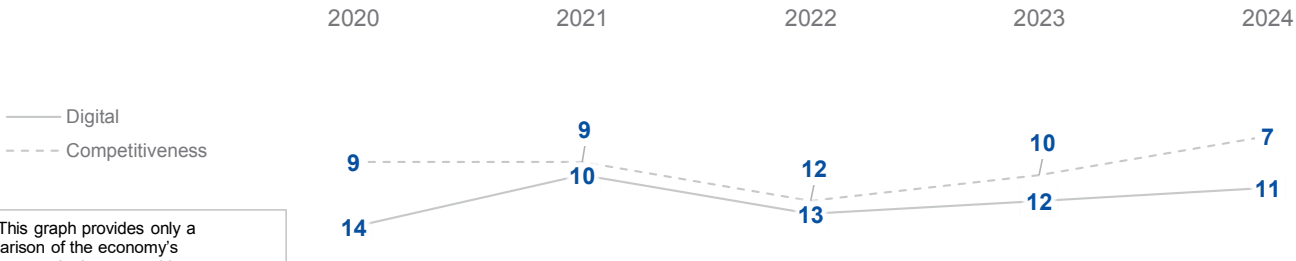


The direction of the triangle indicates the performance change from the last year:
△ improved or stable
▽declined

OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	14	10	13	12	11
Knowledge	31	18	15	17	14
Technology	04	05	03	04	09
Future readiness	11	12	20	23	12

COMPETITIVENESS & DIGITAL RANKINGS

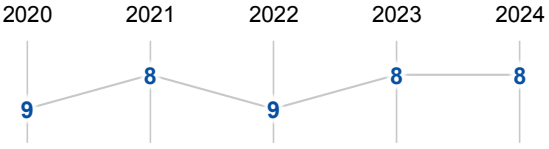


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS < 20 MILLION (37 economies)



UAE

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	05	01	01	01	02
Training & education	44	25	22	25	29
Scientific concentration	52	52	46	51	41

Talent	Rank
Educational assessment PISA - Math	39
International experience	04
Foreign highly skilled personnel	05
Management of cities	03
Digital/Technological skills	15
▶ Net flow of international students	01

Training & education	Rank
Employee training	37
▷ Total public expenditure on education	46
Higher education achievement	18
Pupil-teacher ratio (tertiary education)	44
Graduates in Sciences	05
Women with degrees	09
Computer science education index	41

Scientific concentration	Rank
Total expenditure on R&D (%)	35
Total R&D personnel per capita	38
Female researchers	38
▷ R&D productivity by publication	46
Scientific and technical employment	34
High-tech patent grants	23
Robots in Education and R&D	41
AI articles	14

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	03	02	03	08	14
Capital	10	11	10	17	10
Technological framework	08	05	03	03	11

Regulatory framework	Rank
Starting a business	08
Enforcing contracts	09
▶ Immigration laws	03
Development & application of tech.	14
Scientific research legislation	27
Intellectual property rights	42
AI policies passed into law	28

Capital	Rank
IT & media stock market capitalization	36
Funding for technological development	17
Banking and financial services	22
Country credit rating	20
Venture capital	07
Investment in Telecommunications	13

Technological framework	Rank
Communications technology	30
Mobile broadband subscribers	44
▶ Wireless broadband	01
▶ Internet users	01
Internet bandwidth speed	19
High-tech exports (%)	43
▷ Secure internet servers	50

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	15	15	16	14	05
Business agility	12	10	26	31	21
IT integration	08	10	24	26	13

Adaptive attitudes	Rank
E-Participation	32
Internet retailing	25
▶ Tablet possession	02
Smartphone possession	11
Attitudes toward globalization	06
Flexibility and adaptability	09

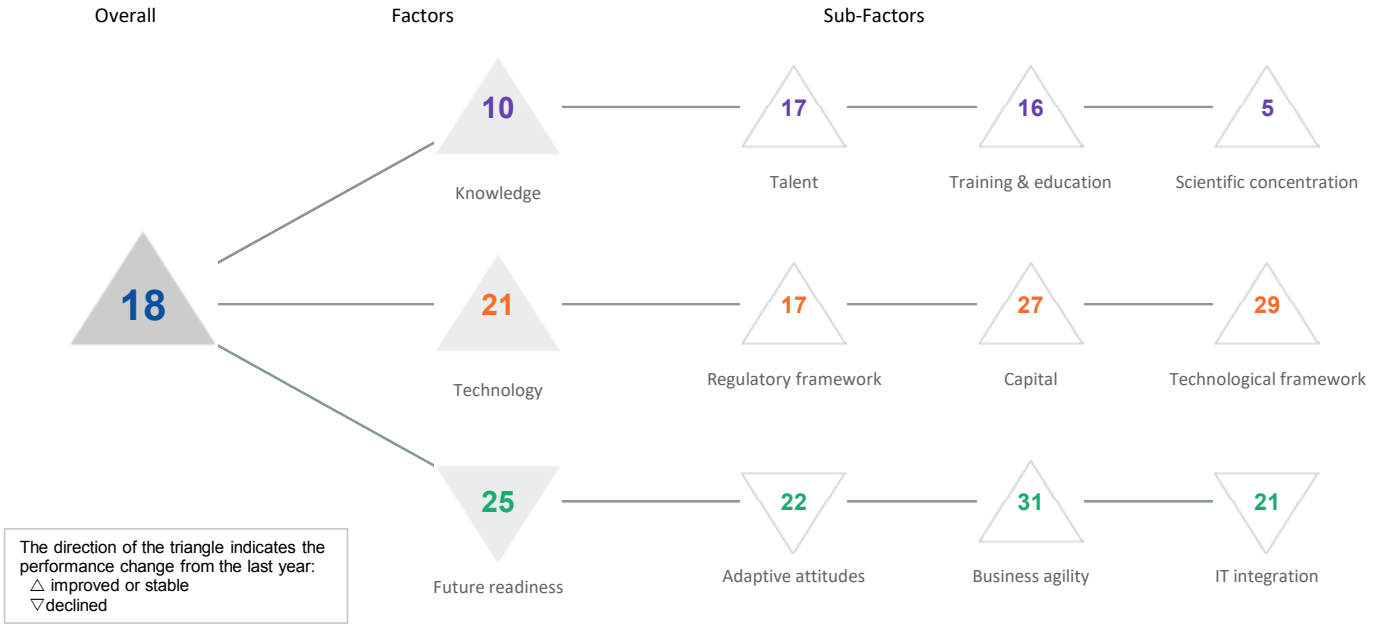
Business agility	Rank
Opportunities and threats	12
▷ World robots distribution	50
Agility of companies	12
Use of big data and analytics	32
Knowledge transfer	27
Entrepreneurial fear of failure	14

IT integration	Rank
E-Government	11
Public-private partnerships	12
Cyber security	08
Software piracy	20
Government cyber security capacity	07
▷ Privacy protection by law exists	60

UNITED KINGDOM

DIGITAL TRENDS - OVERALL

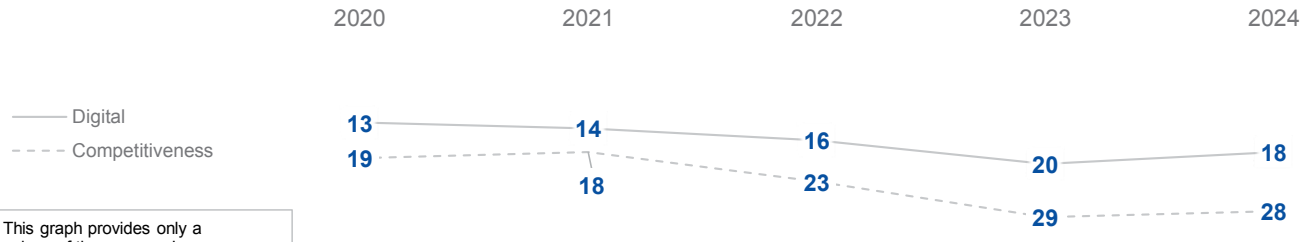
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	13	14	16	20	18
Knowledge	13	13	12	13	10
Technology	16	17	25	29	21
Future readiness	13	13	16	18	25

COMPETITIVENESS & DIGITAL RANKINGS

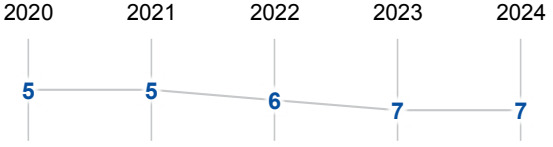


N.B. This graph provides only a comparison of the economy's performance in the two rankings.

PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (43 economies)

POPULATIONS > 20 MILLION (30 economies)



UNITED KINGDOM

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	10	11	15	18	17
Training & education	25	26	19	27	16
Scientific concentration	08	07	06	06	05

Talent	Rank
Educational assessment PISA - Math	12
International experience	29
Foreign highly skilled personnel	25
Management of cities	31
Digital/Technological skills	33
▶ Net flow of international students	03

Training & education	Rank
Employee training	44
Total public expenditure on education	15
Higher education achievement	14
Pupil-teacher ratio (tertiary education)	29
Graduates in Sciences	37
Women with degrees	18
▶ Computer science education index	02

Scientific concentration	Rank
Total expenditure on R&D (%)	12
Total R&D personnel per capita	27
Female researchers	24
R&D productivity by publication	12
▶ Scientific and technical employment	04
High-tech patent grants	14
Robots in Education and R&D	08
AI articles	20

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	17	20	24	30	17
Capital	22	18	28	31	27
Technological framework	22	19	29	32	29

Regulatory framework	Rank
Starting a business	09
Enforcing contracts	26
▷ Immigration laws	59
Development & application of tech.	35
Scientific research legislation	15
Intellectual property rights	24
▶ AI policies passed into law	02

Capital	Rank
IT & media stock market capitalization	35
Funding for technological development	27
Banking and financial services	31
Country credit rating	22
Venture capital	13
▷ Investment in Telecommunications	53

Technological framework	Rank
Communications technology	47
Mobile broadband subscribers	27
Wireless broadband	26
Internet users	18
Internet bandwidth speed	38
High-tech exports (%)	11
Secure internet servers	20

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	11	09	10	07	22
Business agility	25	23	28	36	31
IT integration	11	09	16	20	21

Adaptive attitudes	Rank
▶ E-Participation	03
Internet retailing	04
Tablet possession	13
▷ Smartphone possession	51
▷ Attitudes toward globalization	56
▷ Flexibility and adaptability	54

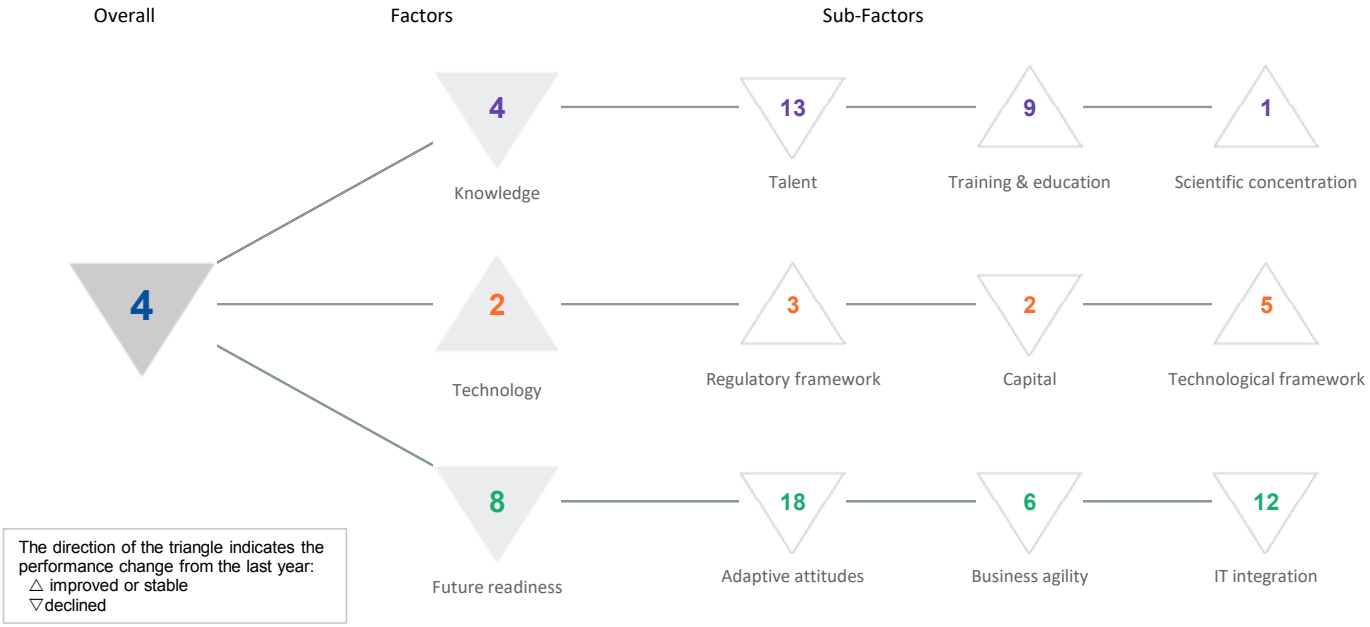
Business agility	Rank
Opportunities and threats	32
World robots distribution	15
Agility of companies	43
Use of big data and analytics	30
Knowledge transfer	22
Entrepreneurial fear of failure	46

IT integration	Rank
E-Government	07
Public-private partnerships	38
Cyber security	29
Software piracy	10
Government cyber security capacity	23
Privacy protection by law exists	49

USA

DIGITAL TRENDS - OVERALL

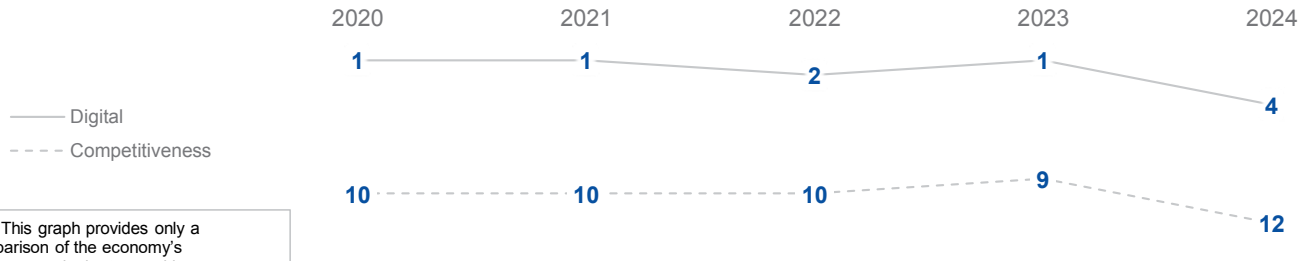
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	01	01	02	01	04
Knowledge	01	03	04	02	04
Technology	07	04	09	06	02
Future readiness	02	01	03	02	08

COMPETITIVENESS & DIGITAL RANKINGS



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

PEER GROUPS RANKINGS

THE AMERICAS (10 economies)

POPULATIONS > 20 MILLION (30 economies)

USA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	14	13	14	12	13
Training & education	24	24	23	20	09
Scientific concentration	01	02	01	01	01

Talent	Rank
Educational assessment PISA - Math	33
International experience	28
Foreign highly skilled personnel	03
Management of cities	24
Digital/Technological skills	11
Net flow of international students	24

Training & education	Rank
Employee training	36
Total public expenditure on education	08
Higher education achievement	21
Pupil-teacher ratio (tertiary education)	18
▷ Graduates in Sciences	44
Women with degrees	11
▶ Computer science education index	01

Scientific concentration	Rank
Total expenditure on R&D (%)	04
Total R&D personnel per capita	18
Female researchers	-
R&D productivity by publication	03
Scientific and technical employment	21
High-tech patent grants	04
Robots in Education and R&D	03
▷ AI articles	38

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	22	12	12	12	03
Capital	01	01	02	01	02
Technological framework	07	09	13	09	05

Regulatory framework	Rank
Starting a business	29
Enforcing contracts	16
▷ Immigration laws	46
Development & application of tech.	13
Scientific research legislation	16
Intellectual property rights	28
▶ AI policies passed into law	01

Capital	Rank
IT & media stock market capitalization	05
Funding for technological development	07
Banking and financial services	10
Country credit rating	12
Venture capital	03
Investment in Telecommunications	31

Technological framework	Rank
Communications technology	19
Mobile broadband subscribers	22
Wireless broadband	08
Internet users	12
Internet bandwidth speed	05
High-tech exports (%)	23
▶ Secure internet servers	02

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	03	01	04	02	18
Business agility	02	01	04	02	06
IT integration	10	03	10	09	12

Adaptive attitudes	Rank
E-Participation	10
▶ Internet retailing	02
Tablet possession	17
Smartphone possession	44
▷ Attitudes toward globalization	58
Flexibility and adaptability	22

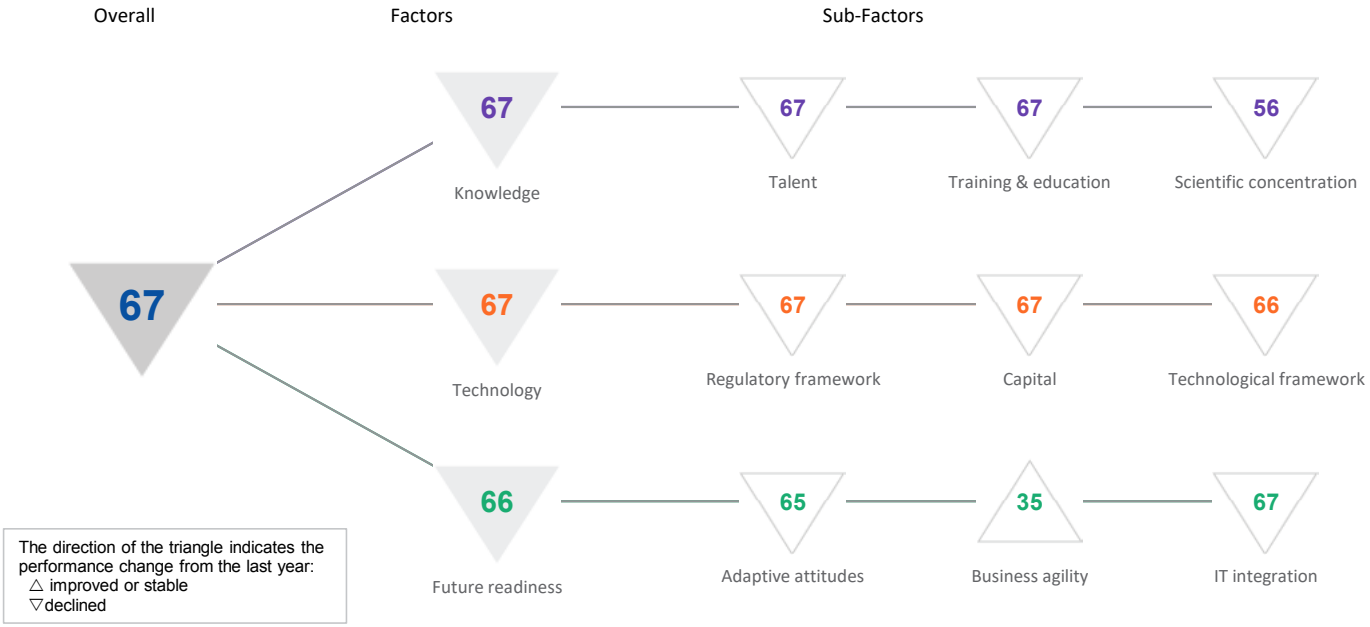
Business agility	Rank
Opportunities and threats	21
World robots distribution	04
Agility of companies	13
Use of big data and analytics	06
Knowledge transfer	18
Entrepreneurial fear of failure	28

IT integration	Rank
E-Government	19
Public-private partnerships	16
Cyber security	37
▶ Software piracy	01
Government cyber security capacity	17
▷ Privacy protection by law exists	45

VENEZUELA

DIGITAL TRENDS - OVERALL

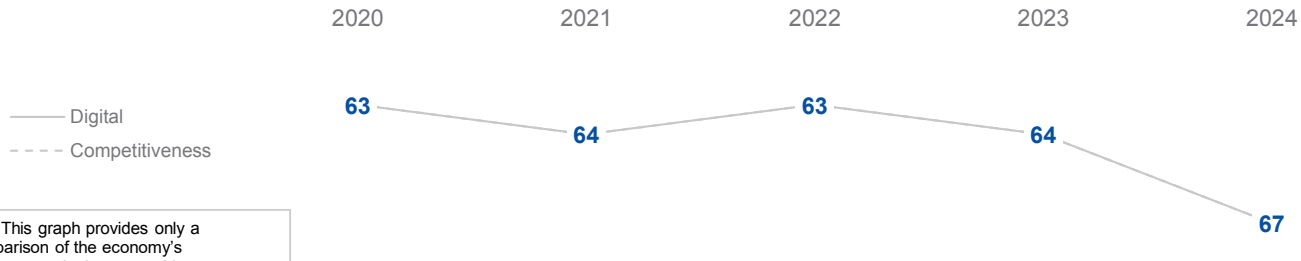
OVERALL PERFORMANCE (67 economies)



OVERALL & FACTORS - 5 years

	2020	2021	2022	2023	2024
OVERALL	63	64	63	64	67
Knowledge	61	61	63	64	67
Technology	63	64	63	64	67
Future readiness	63	64	63	64	66

COMPETITIVENESS & DIGITAL RANKINGS



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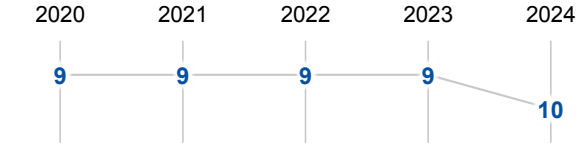
PEER GROUPS RANKINGS

THE AMERICAS (10 economies)



POPULATIONS > 20 MILLION (30 economies)

VENEZUELA

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

▶ Overall Top Strengths ▷ Overall Top Weaknesses

KNOWLEDGE

Sub-Factors	2020	2021	2022	2023	2024
Talent	63	64	63	62	67
Training & education	47	52	60	64	67
Scientific concentration	48	49	47	45	56

Talent	Rank
Educational assessment PISA - Math	57
International experience	64
Foreign highly skilled personnel	67
Management of cities	67
Digital/Technological skills	66
Net flow of international students	-

Training & education	Rank
Employee training	62
Total public expenditure on education	66
Higher education achievement	-
Pupil-teacher ratio (tertiary education)	-
Graduates in Sciences	-
Women with degrees	-
Computer science education index	61

Scientific concentration	Rank
Total expenditure on R&D (%)	-
Total R&D personnel per capita	-
▶ Female researchers	03
R&D productivity by publication	-
Scientific and technical employment	-
High-tech patent grants	62
Robots in Education and R&D	54
AI articles	67

TECHNOLOGY

Sub-Factors	2020	2021	2022	2023	2024
Regulatory framework	63	64	63	64	67
Capital	63	64	63	64	67
Technological framework	63	63	63	64	66

Regulatory framework	Rank
Starting a business	66
Enforcing contracts	63
Immigration laws	53
Development & application of tech.	67
Scientific research legislation	67
▷ Intellectual property rights	67
AI policies passed into law	39

Capital	Rank
IT & media stock market capitalization	-
▷ Funding for technological development	67
Banking and financial services	67
▷ Country credit rating	67
▷ Venture capital	67
Investment in Telecommunications	-

Technological framework	Rank
Communications technology	67
Mobile broadband subscribers	-
▷ Wireless broadband	67
Internet users	-
Internet bandwidth speed	64
High-tech exports (%)	-
Secure internet servers	62

FUTURE READINESS

Sub-Factors	2020	2021	2022	2023	2024
Adaptive attitudes	63	64	63	64	65
Business agility	49	52	55	44	35
IT integration	63	64	63	64	67

Adaptive attitudes	Rank
E-Participation	64
Internet retailing	-
Tablet possession	47
Smartphone possession	64
Attitudes toward globalization	55
▶ Flexibility and adaptability	29

Business agility	Rank
▶ Opportunities and threats	19
World robots distribution	57
Agility of companies	56
Use of big data and analytics	54
Knowledge transfer	63
▶ Entrepreneurial fear of failure	04

IT integration	Rank
E-Government	63
Public-private partnerships	64
Cyber security	67
Software piracy	64
Government cyber security capacity	48
Privacy protection by law exists	63

Notes and Sources

Notes and Sources by Criteria

The source of the survey criteria is:
IMD World Competitiveness Center's Executive Opinion Survey 2024 which was conducted from March-May 2024, with a total of 6,612 responses used in the construction of the ranking.

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 2023 (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 2023 and national sources

0.0.1 [B] **Exchange rate**
IMF International Financial Statistics
IMF World Ecopnomic Outlook April 2024

Period average.

0.0.2 [B] **Population - market size**
IMF World Economic Outlook April 2024
National sources

Mid-year estimates. Brazil, Bulgaria, Saudi Arabia: break in series in 2023. 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 Main Economic Indicators - complete database
National sources

Provisional data or estimates for most recent year. Malaysia: Data for 2023 is sum of 4 quarters. Taiwan (Chinese Taipei): Data 2021 and 2022 are revised according to the annual revisions released by DGBAS in November 2023, 2023 is the latest preliminary estimate in February 2024.

Knowledge

Talent

1.1.1 **Educational assessment PISA - Math**
PISA (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 SAR, 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
National sources

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
UNESCO
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: Total disbursements to the Department of Education and State Colleges and Universities.

1.2.3 Higher education achievement

OECD Education at a Glance
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 (MCKO-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).

1.2.4 Pupil-teacher ratio (tertiary education)

UNESCO
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

OECD Education at a Glance
UNESCO

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
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: Share of women with tertiary level degree (age 25-44).

1.2.7 **Computer science education index**
World University Ranking, Times Higher Education

IMD WCC developed index calculated from the Times Higher Education ranking of the top 1'000 university computer science courses, measuring the quantity and quality of the universities in each economy. 33% weighting is the number of universities in THES ranking for each country, 33% weighting is the total score, 33% weighting is the total score per capita.

Scientific concentration

1.3.1 **Total expenditure on R&D (%)**
OECD Main Science and Technology Indicators
UNESCO
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
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 (Chinese Taipei): 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 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
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 "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
TIPO for Taiwan (Chinese Taipei)

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 (Chinese Taipei): 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.

1.3.8 AI articles

Scopus

Annual count of the number of articles in Scopus using the keyword artificial intelligence, by author's institution, per capita.

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.

2.1.7 **AI policies passed into law**
Digital Policy Alert

Cumulative count of AI related bills passed into law.

Capital

2.2.1 **IT & media stock market capitalization**
Refinitiv - used to be Thomson Reuters - Thomson One banker

Datastream Telecom, Media and IT (TMT) Market Value in national currency. Calculated as a percentage of Datastream Total Market Value in national currency. Figures for close-of-business on the 29th March each year.

2.2.4 **Country credit rating**
Fitch, Moody's and S&P

IMD WCC created index of the three country credit ratings Fitch, Moody's and S&P. Each rating, including the outlook, is converted to a numerical score from 20-0 and totalled for each country.

2.2.6 **Investment in Telecommunications**
Passport, Source: © Euromonitor International
National sources

Investment refers to as the annual capital expenditure; this is the gross annual investment in telecom (including fixed, mobile and other services) for acquiring property and network. The term investment means the expenditure associated with acquiring the ownership of property (including intellectual and non-tangible property such as computer software) and plant. This includes expenditure on initial installations and on additions to existing installations where the usage is expected to be over an extended period of time. Note that this applies to telecom services that are available to the public, and exclude investment in telecom software or equipment for private use.

Technological framework

2.3.2 **Mobile broadband subscribers**
Fitch Solutions - used to be 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

World Development Indicators (World Bank)
National sources

Average of available sources

2.3.5 Internet bandwidth speed

M-Labs / cable.co.uk
Ookla
Bandwidth Place

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 (2022); Ookla (2023); and Bandwith Place (2022).

2.3.6 High-tech exports (%)

World Development Indicators (World Bank)
National sources

High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.

2.3.7 Secure internet servers

Netcraft (http://www.netcraft.com/) and World Bank population estimates.

The count of publicly-trusted TLS/SSL certificates, per capita

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
National sources

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

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

Varieties of Democracy (V-Dem) 2022

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 exists

Digital Society Project

Question: Does a legal framework to protect Internet users' privacy and their data exist?
Responses: 0: No. 1: Yes

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..

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