

IMD World Digital Competitiveness Ranking 2023



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Preface

I am delighted to present the seventh edition of the IMD World Digital Competitiveness Ranking (WDCR).

Once again, we have analyzed the capacity of economies with differing levels of prosperity and resources – and of varying sizes and mentalities – to embrace new digital technologies and use them to transform government practices, business models, and society in general in a way that improves people’s lives. The total number of economies assessed in the 2023 WDCR is 64, with Kuwait making its début.

Building “digital nations” – that is, creating systems that help companies and individuals to adopt digital tech seamlessly – should be a top priority for executives and anyone who has an influence on governmental activities in 2024.

This year has been peppered with colorful talks on Artificial Intelligence (AI) with equal doses of concern, excitement, and conjecture as to how it could shake up our lives, starting with our jobs. AI is set to generate enormous productivity gains by automating many tasks that previously required human intervention, but I do not think it is about to replace our jobs, despite the hype.

That said, tasks set to be replaced do include creative ones just as much as those that are routine. The increased efficiency that will ensue is going to reduce costs, but employment levels could also drop. AI will fill the gap though, as I see it, by providing personalized services, thereby boosting quality of life and satisfaction. This is, of course, in an ideal use case of the technology.

While we measure no specific AI indicators as such in the WDCR – that is, we are not yet measuring the uptake of chatbots, say – AI sits silently at the core of several of the subfactors into which we group our hard data and survey replies. These are, namely: talent, regulatory and technological frameworks, and adaptive attitudes and business agility. On a data level, the quality of digital regulation, the funding available for technology development, and the degree of company agility are all data points that are enmeshed with AI.

AI and cybercrime, too, exist in symbiosis. AI assists in password cracking via algorithms and in hacking via its automation abilities. As my colleagues address in their analytical report that follows my macro-outlook for digital competitiveness, a mere 5% of our 4,000 survey respondents (all global senior executives) said they hadn’t implemented any new cybersecurity measures in the past year.

And yet, AI tools have also reduced the need for human involvement in aspects like malware development, scams, and extortion within cybercriminal organizations. This alone knocks the digital talent panorama off its shelf. Cyber security, then, becomes a clear example of the need to assess AI’s trade-offs and to take a very deliberate approach towards using it optimally. Countries cannot do this in isolation but need to lean on regional, if not global, institutions to do so.

At the IMD World Competitiveness Center, we are, as ever, indebted to our partner institutes, the IMD alumni community, and our panel of experts for offering a combination of data and invaluable insights without which our rankings would be mere pipedreams and not the tools for positive action they have become. Thank you.



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

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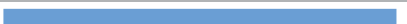


User Guide for the IMD World Digital Competitiveness Ranking

Overall and Breakdown: Digital Rankings

The IMD World Digital Competitiveness Ranking

The IMD World Digital Competitiveness Ranking presents the 2023 overall rankings for the 64 economies covered by the WCY. The rankings are calculated on the basis of the 54 ranked criteria: 34 hard and 20 survey data. The countries are ranked from the most to the least digital competitive. The final column shows the improvement or decline from the previous year. The index value or “score” is also indicated for each country.











2023 COMPETITIVENESS RANKING

| | | | Score | | |
|----|-------------|-----------------------------------------------------------------------------------|--------|---|---|
| 01 | USA |  | 100.00 | ↗ | 1 |
| 02 | Netherlands |  | 98.10 | ↗ | 4 |
| 03 | Singapore |  | 97.40 | ↗ | 1 |
| 04 | Denmark |  | 96.93 | ↘ | 3 |
| 05 | Switzerland |  | 96.24 | - | - |

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).

Population over 20 million



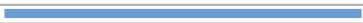







| | | | Score |
|----|----------------|-------------------------------------------------------------------------------------|--------|
| 01 | USA |  | 100.00 |
| 02 | Korea Rep. |  | 94.80 |
| 03 | Taiwan, China |  | 93.73 |
| 04 | Canada |  | 91.98 |
| 05 | Australia |  | 85.28 |
| 06 | China |  | 84.41 |
| 07 | United Kingdom |  | 83.12 |
| 08 | Germany |  | 80.86 |
| 09 | France |  | 78.65 |
| 10 | Saudi Arabia |  | 76.99 |

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 (2022) are shown in brackets. Similar to the Overall Digital Ranking, the values or “scores” are indicated for each Factor. However, there is only one economy that has a score of 100 and one economy with a score of 0 across all four Factors.

KNOWLEDGE

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

| | | | Score | | |
|----|---------------|-------------------------------------------------------------------------------------|-------|---|---|
| 01 | Switzerland |  | 92.90 | - | - |
| 02 | USA |  | 92.56 | ↗ | 2 |
| 03 | Singapore |  | 92.11 | ↗ | 2 |
| 04 | Canada |  | 91.89 | ✓ | 1 |
| 05 | Sweden |  | 90.55 | ✓ | 3 |
| 06 | Hong Kong SAR |  | 89.81 | ↗ | 1 |
| 07 | Netherlands |  | 88.96 | ↗ | 1 |
| 08 | Israel |  | 86.58 | ↗ | 2 |
| 09 | Denmark |  | 86.19 | ✓ | 3 |
| 10 | Korea Rep. |  | 83.99 | ↗ | 6 |

Overall Ranking and Digital Competitiveness Factors

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

| | OVERALL | | | | | KNOWLEDGE | | | | | TECHNOLOGY | | | | | FUTURE READINESS | | | | |
|-----------|---------|------|------|------|------|-----------|------|------|------|------|------------|------|------|------|------|------------------|------|------|------|------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Argentina | 59 | 59 | 61 | 59 | 61 | 58 | 50 | 55 | 58 | 62 | 56 | 62 | 62 | 62 | 63 | 56 | 47 | 52 | 46 | 49 |
| Australia | 14 | 15 | 20 | 14 | 16 | 15 | 17 | 19 | 14 | 15 | 14 | 14 | 18 | 15 | 18 | 14 | 17 | 22 | 17 | 20 |
| Austria | 20 | 17 | 16 | 18 | 22 | 10 | 11 | 10 | 13 | 16 | 32 | 28 | 32 | 36 | 35 | 23 | 16 | 16 | 13 | 19 |
| Bahrain | - | - | - | 32 | 38 | - | - | - | 34 | 36 | - | - | - | 23 | 30 | - | - | - | 36 | 46 |
| Belgium | 25 | 25 | 26 | 23 | 15 | 23 | 21 | 21 | 21 | 12 | 21 | 19 | 23 | 24 | 19 | 25 | 25 | 26 | 25 | 16 |
| Botswana | - | - | 63 | 61 | 60 | - | - | 64 | 55 | 52 | - | - | 63 | 59 | 52 | - | - | 63 | 61 | 63 |
| Brazil | 57 | 51 | 51 | 52 | 57 | 59 | 57 | 51 | 51 | 57 | 57 | 57 | 55 | 55 | 60 | 43 | 43 | 45 | 47 | 52 |
| Bulgaria | 45 | 45 | 52 | 48 | 55 | 46 | 47 | 53 | 48 | 53 | 42 | 45 | 51 | 51 | 56 | 48 | 44 | 55 | 50 | 58 |
| Canada | 11 | 12 | 13 | 10 | 11 | 05 | 05 | 07 | 03 | 04 | 13 | 13 | 15 | 14 | 13 | 18 | 15 | 15 | 11 | 11 |

Digital Sub-factor Rankings

A summary of the rankings for all nine sub-factors is presented for the 64 economies for 2023. It is possible, at a glance, to determine in what areas of digital competitiveness an economy excels or has particular weaknesses and to make comparisons between countries. These rankings provide a more detailed examination of specific aspects of the digital transformation and can be used to, for example, evaluate the technological framework of a country or support international investment decisions. We view the rankings as a tool for managers or policy makers to use when they analyze the above questions. Of course, each company must take into consideration the logic of its own economic sector, economic forecasts and its own traditions as well as governments should consider the national identity and value system of their economy..

| | KNOWLEDGE | | | TECHNOLOGY | | | FUTURE READINESS | | | |
|-----------|-----------|----------------------|--------------------------|----------------------|---------|-------------------------|--------------------|------------------|----------------|-----------|
| | Talent | Training & education | Scientific concentration | Regulatory framework | Capital | Technological framework | Adaptive attitudes | Business agility | IT integration | |
| Argentina | 61 | 60 | 50 | 57 | 63 | 56 | 55 | 38 | 53 | Argentina |
| Australia | 08 | 28 | 16 | 15 | 16 | 31 | 04 | 42 | 23 | Australia |
| Austria | 20 | 11 | 17 | 34 | 34 | 38 | 24 | 22 | 13 | Austria |
| Bahrain | 15 | 55 | 34 | 29 | 47 | 14 | 49 | 32 | 50 | Bahrain |
| Belgium | 07 | 22 | 18 | 05 | 18 | 39 | 39 | 09 | 15 | Belgium |

Digital Competitiveness Country Profiles

Each two page profile analyses the performance of one of the 64 economies that are included in the IMD World Digital Competitiveness Ranking. The economies are presented in alphabetical order. The term economy signifies an economic entity and does not imply any political independence. It is possible, in one glimpse, to evaluate the digital evolution of each economy over time and its relative strengths and weaknesses. However, each economy's particular situation is influenced by its development level, political restraints and social value system.

User Guide for the IMD World Digital Competitiveness Ranking

Page 1: Digital Competitiveness – Overall and factors trends

This page shows the overall, factors and sub-factors ranking performances of the country in 2023, their 5-years trends and a comparison of between competitiveness and digital competitiveness rankings. The following indicators are presented:

DIGITAL TRENDS - OVERALL

ARGENTINA

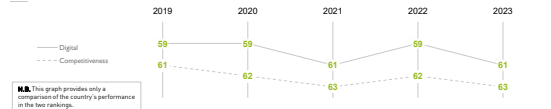
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 59 | 59 | 61 | 59 | 61 |
| Knowledge | 58 | 50 | 55 | 58 | 62 |
| Technology | 56 | 62 | 62 | 62 | 63 |
| Future readiness | 56 | 47 | 52 | 46 | 49 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS



1. Overall Performance

Overall, factors and sub-factors digital ranking performances of the country in 2023. 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's 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.

| | KNOWLEDGE | | | TECHNOLOGY | | | FUTURE READINESS | | | Argentina |
|-----------|-----------|----------------------|--------------------------|----------------------|---------|-------------------------|--------------------|------------------|---------------|-----------|
| | Talent | Training & education | Scientific concentration | Regulatory framework | Capital | Technological framework | Adaptive attitudes | Business agility | IT integrator | |
| Argentina | 61 | 60 | 50 | 57 | 63 | 56 | 55 | 38 | 53 | Argentina |
| Australia | 08 | 28 | 16 | 15 | 16 | 31 | 04 | 42 | 23 | Australia |
| Austria | 20 | 11 | 17 | 34 | 34 | 38 | 24 | 22 | 13 | Austria |
| Bahrain | 15 | 55 | 34 | 29 | 47 | 14 | 49 | 32 | 50 | Bahrain |
| Belgium | 07 | 22 | 18 | 05 | 18 | 39 | 39 | 09 | 15 | Belgium |

Population over 20 million

| Rank | Country | Score |
|------|----------------|--------|
| 01 | USA | 100.00 |
| 02 | Korea Rep. | 94.80 |
| 03 | Taiwan, China | 93.73 |
| 04 | Canada | 91.98 |
| 05 | Australia | 85.28 |
| 06 | China | 84.41 |
| 07 | United Kingdom | 83.12 |
| 08 | Germany | 80.86 |
| 09 | France | 78.65 |
| 10 | Saudi Arabia | 76.99 |

| | OVERALL | | | | | KNOWLEDGE | | | | | TECHNOLOGY | | | | | FUTURE READINESS | | | | |
|-----------|---------|------|------|------|------|-----------|------|------|------|------|------------|------|------|------|------|------------------|------|------|------|------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Argentina | 59 | 59 | 61 | 59 | 61 | 58 | 50 | 55 | 58 | 62 | 56 | 62 | 62 | 62 | 63 | 56 | 47 | 52 | 46 | 46 |
| Australia | 14 | 15 | 20 | 14 | 16 | 15 | 17 | 19 | 14 | 15 | 14 | 14 | 16 | 15 | 18 | 14 | 17 | 22 | 17 | 20 |
| Austria | 20 | 17 | 16 | 18 | 22 | 10 | 11 | 10 | 13 | 16 | 32 | 28 | 32 | 36 | 35 | 23 | 16 | 16 | 13 | 19 |
| Bahrain | - | - | - | 32 | 38 | - | - | - | 34 | 36 | - | - | - | 23 | 30 | - | - | - | 36 | 46 |
| Belgium | 25 | 25 | 26 | 23 | 15 | 23 | 21 | 21 | 21 | 12 | 21 | 19 | 23 | 24 | 19 | 25 | 25 | 26 | 25 | 16 |
| Botswana | - | - | 63 | 61 | 60 | - | - | 64 | 55 | 52 | - | - | 63 | 59 | 52 | - | - | 63 | 51 | 63 |
| Brazil | 57 | 51 | 51 | 52 | 57 | 59 | 57 | 51 | 51 | 57 | 57 | 57 | 55 | 55 | 60 | 43 | 43 | 45 | 47 | 52 |
| Bulgaria | 45 | 45 | 52 | 48 | 55 | 46 | 47 | 53 | 48 | 53 | 42 | 45 | 51 | 51 | 56 | 48 | 44 | 55 | 50 | 58 |
| Canada | 11 | 12 | 13 | 10 | 11 | 05 | 05 | 07 | 03 | 04 | 13 | 13 | 15 | 14 | 13 | 18 | 15 | 15 | 11 | 11 |

Page 2: Factors breakdown & Strengths and Weaknesses

This page shows the country's performance over time for each of the nine sub-factors composing the three Digital Competitiveness Factors (Knowledge, Technology and Future Readiness) and their 54 criteria rankings for 2023.

FACTORS BREAKDOWN - STRENGTHS AND WEAKNESSES

ARGENTINA

► Overall top strengths
▷ Overall top weaknesses

KNOWLEDGE

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

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 54 | Employee training | 62 | Total expenditure on R&D (%) | 52 |
| International experience | 52 | Total public expenditure on education | 35 | Total R&D personnel per capita | 43 |
| Foreign highly-skilled personnel | 62 | Higher education achievement | 38 | ► Female researchers | 2 |
| Management of cities | 58 | Pupil-teacher ratio (tertiary education) | 22 | R&D productivity by publication | 23 |
| Digital/Technological skills | 57 | Graduates in Sciences | 59 | Scientific and technical employment | 51 |
| ► Net flow of international students | 16 | Women with degrees | 32 | High-tech patents grants | 58 |
| | | | | Robots in Education and R&D | 36 |

TECHNOLOGY

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

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

FUTURE READINESS

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

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|-----------------------------------|------|------------------------------------|------|
| E-Participation | 27 | ► Opportunities and threats | 14 | E-Government | 29 |
| Internet retailing | 39 | ► World robots distribution | 36 | Public-private partnerships | 57 |
| Tablet possession | 40 | Agility of companies | 57 | Cyber security | 61 |
| Smartphone possession | 50 | Use of big data and analytics | 41 | Software piracy | 58 |
| Attitudes toward globalization | 61 | Knowledge transfer | 56 | Government cyber security capacity | 33 |
| | | ► Entrepreneurial fear of failure | 8 | Privacy protection by law content | 31 |

1. Factors Breakdown

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

2. Strengths and Weaknesses

This section highlights the economy's strongest and weakest criteria included in the World Digital Competitiveness Ranking. The triangles (►) identify the five top criteria in which the economy ranks best (strengths—filled triangle) and the five criteria in which its performance is the worst (weaknesses—empty triangle) compared to the other countries included in the WCY sample. The selection of indicators is determined by the standard deviation values (STD) of the country for that specific criteria. In other words, the criteria selected represent the highest STD values and the lowest STD values among the 54 indicators composing the World Digital Competitiveness Ranking and can thus be considered the digital competitive advantages and disadvantages of the economy.

The full criteria names can be found in the Appendix and the statistical tables are available for subscribers of the IMD World Competitiveness Online.

It is important to note that what constitutes a strength or weakness is relative to each economy's circumstances or development. Also, the ranking position of a country may not necessarily improve or decline as a consequence of its own evolution since it is always relative to the performance of the other economies. Therefore, an improvement may not be reflected by a higher ranking position if other economies have performed better for the criterion in question. The same can be said for any declines in performance—the economy's ranking position relative to the others may or may not fall, depending on how the other economies have performed.

| | OVERALL | | | | | KNOWLEDGE | | | | |
|-----------|---------|------|------|------|------|-----------|------|------|------|------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Argentina | 59 | 59 | 61 | 59 | 61 | 58 | 50 | 55 | 58 | 62 |
| Australia | 14 | 15 | 20 | 14 | 16 | 15 | 17 | 19 | 14 | 15 |
| Austria | 20 | 17 | 16 | 18 | 22 | 10 | 11 | 10 | 13 | 16 |
| Bahrain | - | - | - | 32 | 38 | - | - | - | 34 | 36 |
| Belgium | 25 | 25 | 26 | 23 | 15 | 23 | 21 | 21 | 21 | 12 |
| Botswana | - | - | 63 | 61 | 60 | - | - | 64 | 55 | 52 |
| Brazil | 57 | 51 | 51 | 52 | 57 | 59 | 57 | 51 | 51 | 57 |
| Bulgaria | 45 | 45 | 52 | 48 | 55 | 46 | 47 | 53 | 48 | 53 |
| Canada | 11 | 12 | 13 | 10 | 11 | 05 | 05 | 07 | 03 | 04 |

| | KNOWLEDGE | | | TECHNOLOGY | | | FUTURE READINESS | | |
|-----------|-----------|----------------------|--------------------------|----------------------|---------|-------------------------|--------------------|------------------|----------------|
| | Talent | Training & education | Scientific concentration | Regulatory framework | Capital | Technological framework | Adaptive attitudes | Business agility | IT integration |
| Argentina | 61 | 60 | 50 | 57 | 63 | 56 | 55 | 38 | 53 |
| Australia | 08 | 28 | 16 | 15 | 16 | 31 | 04 | 42 | 23 |
| Austria | 20 | 11 | 17 | 34 | 34 | 38 | 24 | 22 | 13 |
| Bahrain | 15 | 55 | 34 | 29 | 47 | 14 | 49 | 32 | 50 |
| Belgium | 07 | 22 | 18 | 05 | 18 | 39 | 39 | 09 | 15 |

Striving towards being a digital nation in the era of artificial intelligence

Professor Arturo Bris

Director

IMD World Competitiveness Center

National strategies pay heed to the key role that technology is currently playing in accelerating economic growth and generating prosperity. Just look at the transformational impact of automation on industries such as automotive, logistics, and engineering, or the significant increase in service exports (mostly technology-related) in most developed countries. In many cases, we observe that technology has contributed to making countries more competitive.

And yet, in the western world, the revolution in robotics and automation for the last two decades – together with the incorporation of new technologies such as big data analytics, blockchain, and machine learning – has not been accompanied by significant improvements in productivity. Overall, between 2008 and 2004, this metric, measured as GDP per employee, has stayed flat.

Building “digital nations” – by which we mean countries that facilitate the full adoption of digital technologies by companies and individuals – should be a priority, and indeed the top countries in this year’s IMD Digital Competitiveness Ranking are those that could be considered as such.

This year has been characterized by the emergence of Artificial Intelligence (AI) as a transformative technology for our societies. AI, first and foremost, is going to generate productivity gains by automating many tasks that previously required human intervention. This will create such a degree of efficiency that costs will

be reduced, but this could have a negative effect on employment levels. By providing personalized services, however, AI will improve quality of life and satisfaction.

It is possible that AI could help us solve some of our most pressing environmental and social challenges through still unthinkable creative solutions. AI will transform our economies and help develop some sectors, though this could be at the expense of others.

Also, let us not forget that, by allowing the processing of data in a much faster and effective way, AI will speed up the digitalization of societies and therefore the growth of digital nations.

The potential of AI does not obscure the fact that to make algorithms work, access to large amounts of information is needed, posing a risk to privacy and raising ethical and regulatory concerns. This can be dealt with by a national and global response.

Given there is a certain consensus that AI will create new jobs, but also one saying it will destroy them, how it will ultimately fare in terms of social development is unclear. In this context, what is in store for those digital nations that are undergoing the AI revolution?

We hope this year’s IMD World Digital Competitiveness Ranking helps shed light on the key factors that, at a national level, could really help countries to combine prosperity and economic development with digital transformation and the development of AI solutions.

What makes a nation truly digital?

Since the Center’s first digital ranking in 2017, we have defended the view that granting individuals access to technology, and therefore enabling them to reap the rewards, is primarily the responsibility of governments. Only when the necessary digital infrastructure and regulations are in place can private-sector companies develop solutions that improve our quality of life. Lessons

from consistently high performers in our ranking since its inception – the United States (first in 2023, Denmark (fourth in 2023), Singapore (third in 2023), and Estonia (18th in 2023) – are illustrative examples of the possible paths towards incorporating technology from the top down.

1. The first ingredient in the recipe for a successful digital nation is digital infrastructure. It will surprise many readers that, in our assessment of digital competitiveness, China is not in the top 10. One fundamental reason for this is that the quality of its digital infrastructure is not uniform across the country. On top of that, the country's internet bandwidth speed ranks just 18th out of 64 economies and the quality of its communications technology ranks 14th. The World Bank has identified five countries that account for 75% of the total investment in digital infrastructure in the world in 2023: China, Brazil, India, Indonesia, and Vietnam. These countries captured \$68.3 billion in investments. ¹Seen in terms of per-capita contributions, the figures are modest for China though.

2. Infrastructure development requires both data governance and digital governance. Regulation is paramount for making sure that the benefits of technology are captured by society and not mis-used or indeed exploited by corporations. Ironically, the top country in this year's ranking — the United States — ranks just 37th in *Private Protection by Law Content*, an indicator measuring the extent to which private data is protected. By contrast, it should not be surprising that many European countries populate the list of the most digitally advanced nations (there are five in just the top 10) and that this is largely due to the fact that the EU Data Governance Act (DGA), enacted in 2022 and taking effect in September 2023, has established robust procedures to facilitate the safe utilization of certain protected public-sector data subject to the rights of individual citizens, such as trade secrets, personal data, and data protected by intellectual property.²

3. One salient distinctive factor among the most digital of nations is a good availability of digital identity programs. They take the form of technology-driven ID solutions, like in Denmark or Estonia, or personal IDs based on biometric individual characteristics such as Aadhaar in India. Digital identity is the main tool for making e-government solutions feasible, but also for integrating private-sector applications of technology into citizens'

daily lives. National ID programs also differ in terms of how extended they are across the population and range from being mandatory (e.g., Estonia and Saudi Arabia) to voluntary (e.g., the EU), where take-up is subsequently lower.³

4. A combination of digital infrastructure and digital governance is needed to make technology available to citizens. Then, a final requirement for making a digital nation is the cultural acceptance of technology. Such acceptance can be endogenous to both infrastructure and regulation in the sense that people's trust in their national framework can be jeopardized by either weak data protection or unsafe digital infrastructure, or a combination of both. This results in different degrees of technology utilization across countries. For instance, Estonia ranks first in the 2023 World Digital Competitiveness Ranking in the E-Participation indicator, followed by South Korea, the United States, and Japan. Botswana, Jordan, and Venezuela come last, but Belgium (56th) and Qatar (57th) are also stragglers.

What are the social and economic benefits of national digital transformation? Estonia's digital signature has saved the country 2% of its GDP each year, according to data from the OECD. Additionally, its ICT sector contributes 7% to the country's output. Thus, digital nations are more efficient and cheaper to manage than their non-digital counterparts and allow the digital economy to develop faster and get bigger.⁴

Using data from the World Bank Development Indicators, **Figure 1** plots the relationship between internet usage and GDP per capita in developing economies. There is a strong correlation between the two (the R-Squared of the relationship is 70%), although it is not possible to conclude what the right causality is. Our rankings show the same relationship as this, as the correlation between the 2023 IMD World Competitiveness Ranking and the 2023 IMD World Digital Competitiveness Ranking is also very high.

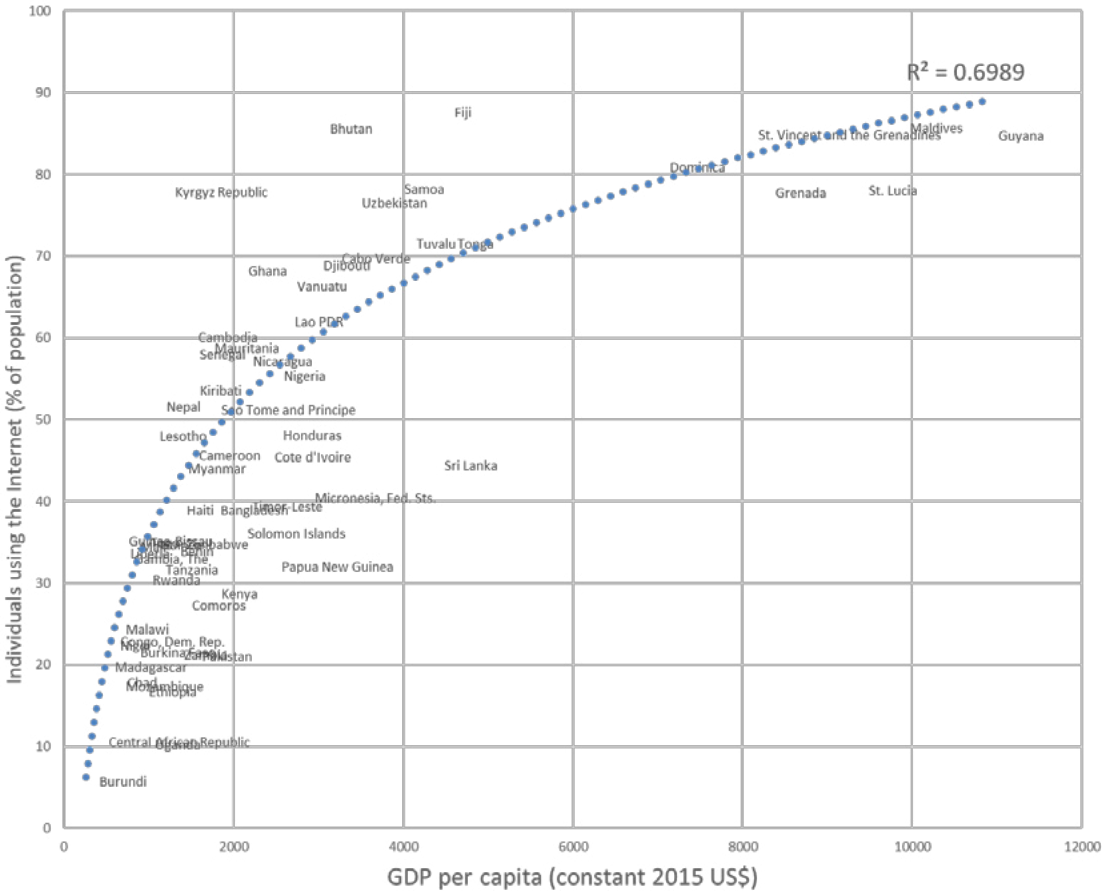
1 <https://www.worldbank.org/en/news/press-release/2023/04/24/data-show-private-infrastructure-investment-continues-to-improve-following-pandemic-slump>

2 See EU Data Governance Act 2022

3 The updated EU digital identity framework allows citizens to identify and authenticate themselves online without having to resort to commercial providers. However, it's not explicitly stated whether this is mandatory or voluntary.

4 OECD (2019), Digital Opportunities for Better Agricultural Policies, OECD Publishing, Paris, <https://doi.org/10.1787/571a0812-en>.

Figure 1: Internet usage and economic development
 Source: World Bank Development Indicators. Data for 2022



The future of digital nations

In the coming years, countries pursuing the “digital imperative” (the need to incorporate technology into their economies) will be faced with headwinds, including the negative externalities of technology and the wealth and income inequalities that result from it. They will also have to grapple with the challenges inherent to achieving a national agenda that preserves both digital transformation and sustainability.

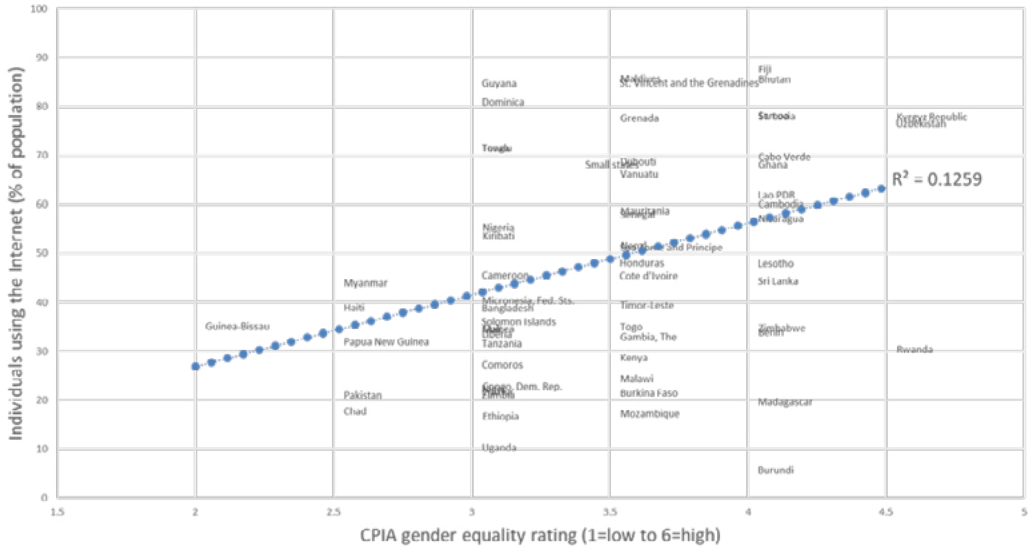
The Global Digital Compact proposed by the United Nations seems like a reasonable approach. It is an initiative proposed by Secretary-General António Guterres to ensure the responsible use of technologies, and it is to be agreed by September 2024. The Compact states the need to make digital agendas consistent with the UN Sustainable Development Goals.

There is abundant academic work showing the impact of digital technology on income inequality. Daud et al. (2020) investigated the relationship between financial development caused by technology and income inequality and concluded that, in the 54 countries analyzed between 2010 and 2015, the income inequality gap increased.⁵ Interestingly, Nguyen (2022) was also able to demonstrate that digitalization narrows inequality in developed economies and widens it in developing economies. Therefore, the relationship between shaped⁶. It seems, then, that developing nations need to pay an initial inequality cost of digital transformation before it begins to see its social benefits emerge gradually.

The relationship between digital transformation and ESG factors is also significant. The 2022 United Nations E-Government Survey⁷ stressed the positive impact of

5 Mohd Daud, Siti Nurazira et al. “Financialization, digital technology and income inequality.” Applied Economics Letters 28 (2020): 1339 - 1343.
 6 Nguyen, Van. “Does Digitalization Widen Income Inequality? A Comparative Assessment for Advanced and Developing Economies.” South East European Journal of Economics and Business 17 (2022): 154 -171.
 7 UN E-Government Survey, available at <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2022>

Figure 2: Technology and Gender Inequality
 Source: World Bank Development Indicators. Data for 2022



digital technologies on closing the gender gap. Such a relationship is, however, difficult to isolate without considering the hidden factors behind the gender gap, such as economic development. **Figure 2** below shows, using two sets of World Bank data, that the relationship between access to the internet and gender inequality is weak, at least in developing economies.

On the other hand, it cannot be denied that digital transformation comes at the expense of natural resources and the environment. A recent paper⁸ by Sharma (2022) finds that digital technologies account for 4% of greenhouse gases, and that their energy consumption increases by 9% per year. One challenge for the future is therefore how to continue the trend towards more technology while preserving social and environmental goals.

Digital nations and artificial intelligence: some guidance

It is not our intention to describe numerous applications of AI technology in this report. However, our analysis shows that countries that want to excel in the use of AI need to focus on the following five priorities:

1. Data access

There is a dilemma of facilitating access to data on the one hand, and respecting privacy concerns on the other. Think, for example, of the banking industry, where the loan application process can be made not only faster, but also more fair and less prone to errors. In a seminal paper, Bartlett et al. (2022) showed⁹ that fintech algorithms charge minority borrowers 40% less on average

than face-to-face lenders, which points to lesser racial discrimination by AI. However, loan approval requires access to data that is not under the possession of banks (social network activity, location data, purchasing and credit-card history) and which therefore requires regulatory clearance and customer approval. How this data is accessed raises questions about how data can travel across borders and whether data-exporting countries can monetize it. The United Nations Conference on Trade and Development’s (UNCTAD’s) 2021 Digital Economy Report shows that 90% of the market capitalization of digital platforms is either the United States’ or China’s,¹⁰ and calls for a more equitable system of data flows across countries.

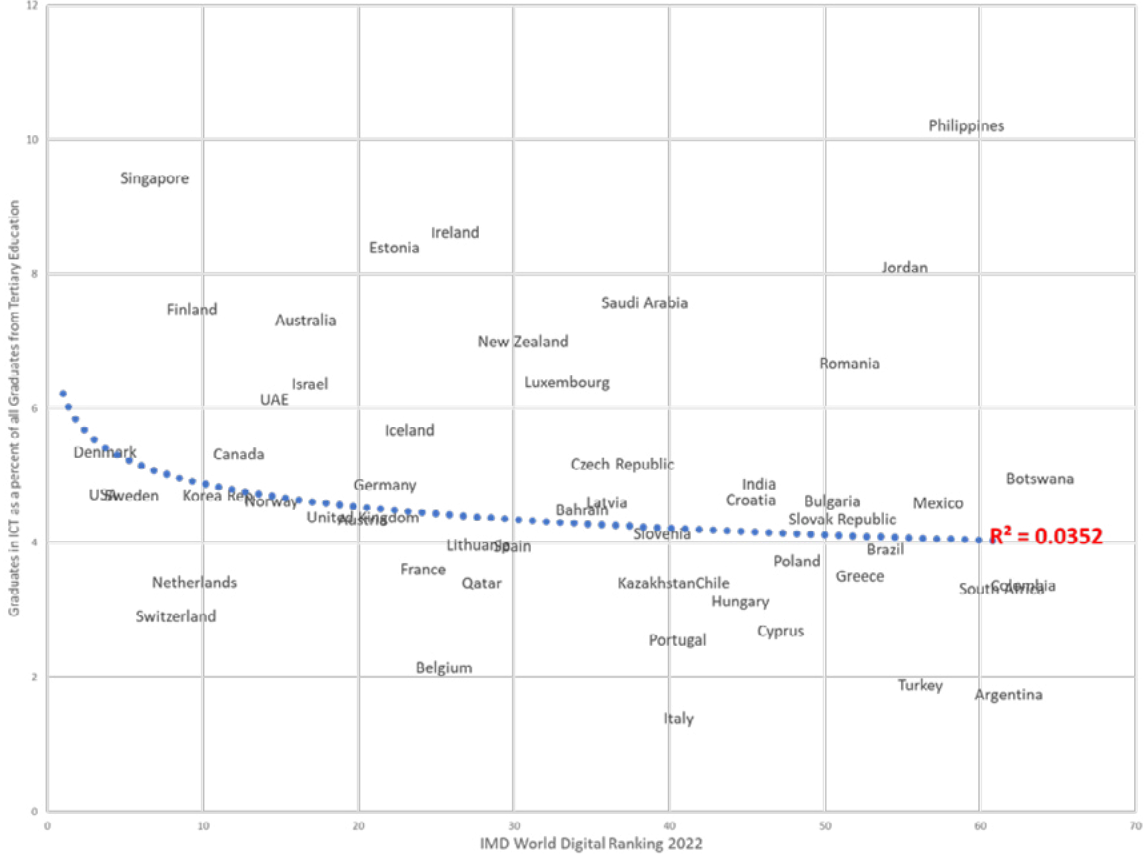
8 Sharma, Pawankumar and Dash, Bibhu, The Digital Carbon Footprint: Threat to An Environmentally Sustainable Future (June 30, 2022). International Journal of Computer Science & Information Technology (IJCSIT) Vol 14, No 3, June 2022, Available at SSRN: <https://ssrn.com/abstract=4335349>

9 Robert Bartlett, Adair Morse, Richard Stanton, Nancy Wallace (2022), “Consumer-lending discrimination in the FinTech Era,” Journal of Financial Economics, Volume 143, Issue 1, 30-56.

10 UNCTAD Digital Economy Report 2021, accessible at https://unctad.org/system/files/official-document/der2021_en.pdf

Figure 3: Digital Talent and Digital Competitiveness

Source of x axis: IMD World Competitiveness Center. The vertical axis plots the percentage of graduates from tertiary education graduating from Information and Communication Technologies programs, both sexes (%) in 2022. Source of y axis: OECD.



2. Digital talent

If AI is going to provide employment opportunities for citizens, nations need to provide the necessary digital skills. There is ample evidence across our rankings that national competitiveness results from investment in education and the provision of those skills required by the labor market. When it comes to technology and AI, the need is even greater.

However, in our analysis of the 2023 IMD World Talent Ranking, we emphasized how, in a world in which talent is global, the importance of national education systems is decreasing. This is so because, today, companies can hire talent anywhere. Besides, because of the opportunities provided by technology, employees can now work remotely –and, in the post-pandemic era, we have seen the emergence of digital nomads and international remote workers. So, for countries, it is important to develop AI skills so locals can innovate and come up with AI applications that make the economy more efficient and encourage the manufacturing of AI hardware (like sensors) at home. For other AI-related activities (like control and monitoring of systems, compliance-related tasks, and so on) the labor market will be global.

The evidence of this can be seen in **Figure 3**, where the relationship between graduates with ICT degrees in tertiary education and the overall digital competitiveness of a country is statistically insignificant (with an R-Squared of 3.5%).

Although it seems that most digitally competitive countries nurture high numbers of digital graduates, it is not a pre-requisite for digital competitiveness. Saudi Arabia has improved its digital skills thanks to the implementation of Vision 2030, yet it still requires opportunities for those graduates. At the same time, Switzerland and the Netherlands, say, do not specialize in digital education, and yet they are able to attract the talent they need, ending up on the top of the rankings.

3. AI regulation

Replacing humans with algorithms requires regulation. We need to control the extent to which private data is exploited, we need rules that solve new and important ethical dilemmas, and we need to protect a person’s personal image, voice, and output so they are not misused by technology. Such regulation is starting to take shape at the national and regional level, and it looks set to continue in the coming years with a global standardization of practices and rules. Without global

coordination, there will be individual country incentives to protect one's interest and benefit from other countries' goodwill.

The European Union, in turn, has decided to regulate AI from the top down through the EU AI Act.¹¹ The European Commission's proposal for an AI framework, the first of its kind in the world, was published on 21 April 2021. GDPR (General Data Protection Regulation) was the seed that set the principles under which AI is regulated in Europe – namely, that data belongs not to the government or the private sector, but to individuals themselves. The EU distinguishes between “Limited-Risk” and “High-Risk” AI systems and foresees different degrees of transparency for each.

AI policies in the US are established in the Algorithmic Accountability Act of 2022, under which companies are required to assess the impact of their systems on privacy and transparency. But this regulation is, as of today, still not enacted.

Any global system to come should build on the fruitful and successful coordination of EU policies that helped make the EU AI Act a reality. It is, of course, difficult to foresee the interest of AI powers such as China and India to agree to regulations that curtail the power of the state in favor of individual rights and privacy.

4. AI infrastructure investment

Unlike their approach to general digital infrastructure, governments today rely on the private sector to generate AI projects and solutions. At the end of 2019, for instance, privately held AI companies in the US attracted nearly USD40bn across more than 3,100 transactions¹² (Arnold et al, 2020). In China it is the state who replaces private capital and with similar outcomes.

The role of the state is to provide adequate regulation and talent (see the previous section), but sometimes it takes the direct participation of AI companies. The German government, for instance, plans to invest one

billion euros in AI during 2023.¹³ Relative to China and the United States, figures in other countries are modest by comparison.

5. Job creation with or without AI

A recent study by McKinsey estimates¹⁴ that in the coming years, and at least in the United States, more people will move toward high-wage jobs – and that fewer workers will be willing to take lower-wage service jobs. This means that routine, low-skilled, and low-paid jobs can easily be done by robots or AI applications. Generative AI in particular will take over 30% of the hours currently worked by humans, according to the study.

Two questions that the report does not answer is (1) whether our economies can generate enough high-wage jobs for those whose tasks are becoming automated, and (2) whether AI will cause a reduction in the salaries of those who will willingly work less once part of their tasks are taken over by machines.

These are particularly important questions for emerging markets. Additionally, we do not know how the introduction of AI applications to the performance of tasks currently outsourced to countries with cheaper labor will impact the latter countries. For instance, apparel manufactures like Inditex and H&M outsource manufacturing to lower-wage countries like Bangladesh and Turkey. In a new era of smart automation operating at near-zero marginal cost, the damage to employment in such developing economies can be severe.

We should also be concerned about how AI could impact the ability of developing economies to compete with “AI-advanced” economies once AI has reduced their cost advantage. There is a risk of the world becoming more fragmented in terms of trade in both goods and services. This will ultimately impact unemployment levels everywhere.

Data protection is also essential for developments in artificial intelligence, and our 2023 findings on this topic – via data we gather on cybersecurity – will be presented by my colleagues in the report that precedes this one.

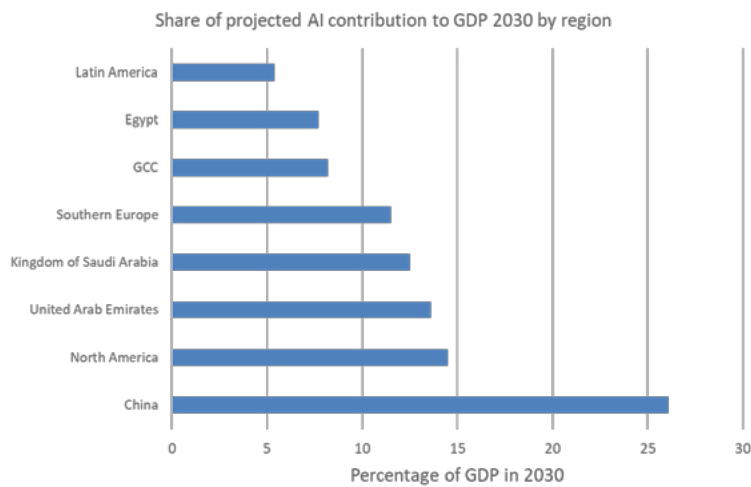
11 See <https://www.weforum.org/agenda/2023/06/european-union-ai-act-explained/>

12 Arnold Zachary, Ilya Rahkovsky, and Tina Huang (2020), “Tracking AI Investment: Initial Findings From the Private Markets,” Center for Security and Emerging Technology.

13 <https://europepmc.org/backend/ptpmcrender.fcgi?accid=PMC1834265&blobtype=pdf>

14 McKinsey 2023, “Generative AI and the Future of Work in America,” available at <https://www.mckinsey.com/mgi/our-research/generative-ai-and-the-future-of-work-in-america>

Figure 4: AI Contribution to GDP in 2024
Source: PWC



The role of artificial intelligence in national competitiveness

AI is going to create efficiency gains, new business opportunities, new jobs, and therefore prosperity and economic growth. Our analysis above describes the risks –social, regulatory, and environmental–brought about by AI. But it seems that, on balance, AI is going to be a driver of prosperity and economic growth. Estimates by PWC shown in **Figure 4** indicate that in countries like China, the AI-related economy could represent more than 25% of GDP in 2030.

Notwithstanding, our key message this year is AI is going to create winners and losers, given the fact that even if the net effect of technology is an increase in the number of jobs available, these will benefit those countries that are currently massively investing in AI, and this will be at the expense of “poorer-AI” countries.

A system of global governance could help alleviate such inequalities. And this is not unrealistic, but how could we really help make it happen? To conclude this report, let us propose some guidance for such a global governance system:

1. AI governance cannot leave any country behind and must include the needs for better technology and infrastructure in emerging markets. The objective of such a global system must be to increase global prosperity. This will require some countries to make some sacrifices, particularly the more AI-developed ones.

2. Regulators must balance corporate interests to reduce costs and increase efficiencies with the national interest of employment generation and prosperity. What is good at the micro level may not be optimal at the aggregate,

national, and global level. Therefore, governments must impose some of the costs of AI development on companies, either through taxes or by creating ecosystems where companies share some of their gains with society.

3. Those nations that are reluctant to abide by global rules must realize that it is in their own interest to have a global system that provides guidance and transparency. Otherwise, in a world of winners and losers, the Luddites will triumph and there will be soon a technology backlash where society will demand a return to a more human, less technology-centered, economy.

4. The efforts to regulate AI at the global level cannot be led by the United Nations. The UN has proven to be an obsolete organization based on a political system that emerged at the end of the Second World War and that gives a dominant position to countries that have lost relevance in the global economy, such as France and the UK, against other countries whose economies are bound to dominate in trade and technology in the 21st century, such as India, Saudi Arabia, and Brazil.

5. The main objective of AI, as with any other technology, is to increase human prosperity: that is, quality of life, life expectancy, availability of jobs, decent salaries, possibilities for education and healthcare and available infrastructure in a green economy. It is not to increase stock prices and replace jobs. Ultimately, AI must be able to make countries more competitive –otherwise, it is simply not a desirable technology.

Appendix: Sub-regions composition

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

Analysis of results

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1. Introduction

This year's results see the US reclaiming the top position in the ranking, a testament to its robust performance across all three factors measured: knowledge, technology, and future readiness. The Netherlands takes second position, advancing four places by bolstering its standing in the knowledge and future readiness factors. Singapore ascends one position to claim third place by improving in the knowledge factor. Denmark, however, drops to fourth place, mainly due to the decline in future readiness and technology factors. Switzerland maintains fifth position, improving both technology and future readiness factors. Unsurprisingly, the top economies are characterized by the pillars of digital nations: digital talent, digital culture, and digital infrastructure.

At the regional level, Eastern Asia continues to lead, with North America and Western Europe in pursuit. Eastern Asia outperforms in all digital factors, notably outshining North America and Western Europe in both technology and future readiness subfactors. While Western Europe and North America exhibit similar scores in these subfactors, regional disparities in the knowledge factor account for Eastern Asia and North America's consistency as core hubs for digital innovation since the inception of the IMD World Digital Competitiveness Ranking (WDCR) in 2017.

2. Regional trends

Regional digital competitiveness levels are mostly stationary in 2023 with few exceptions. **Figure 1** presents the regional overall digital competitiveness ranking trend for the years 2019 to 2023. Over the past year, North America and Ex-CIS and Central Asia have slightly improved their levels of digitalization; Eastern Asia, Western Europe, and South America have, to varying extents, worsened their average digital rankings compared to 2022. Southern Asia & the Pacific, Eastern Europe, and Western Asia & Africa remain relatively stable in their overall average positions.

We are pleased to welcome Kuwait to the WDCR for the first time. As with last year's edition, the economies of Russia and Ukraine are omitted from the ranking due to limited reliability of the data that was able to be collected.

Our model of digital competitiveness considers that in order for digital nations to thrive, they must possess an effective digital infrastructure, digital skills and competences, together with a culture that embraces digital innovation. These elements are intimately related to the factors analyzed by the WDCR: the knowledge factor, quantifying the quality of human capital; the technology factor, capturing the excellence of technological infrastructure; and the future readiness factor, assessing the degree to which technology is adopted by governments, business, and society at large. They are all necessary for countries to excel in the adoption of technology—including artificial intelligence (AI)—and its various applications at the corporate and individual level.

In what follows, we delve into the trends for digital competitiveness at both the regional and economy level. Our exploration this year pays special attention to findings concerning the cybersecurity measures undertaken by companies in the countries we study.

In North America, digital competitiveness levels rise from an average 23rd to 22nd place, with the US and Mexico's improvements compensating for Canada's one position decline. Similarly, Ex-CIS and Central Asia's average digital competitiveness position rises to 48th (up one point from 2022). Eastern Asia remains the most digitally competitive region of the world. However, the average digital competitiveness ranking of the economies in this area (China, Hong Kong SAR, Japan, South Korea, and Taiwan) has declined by one position from 14th to 15th over the past year, confirming a declining trend that began

Figure 1: Average ranking positions by region in overall digital competitiveness 2019-2023

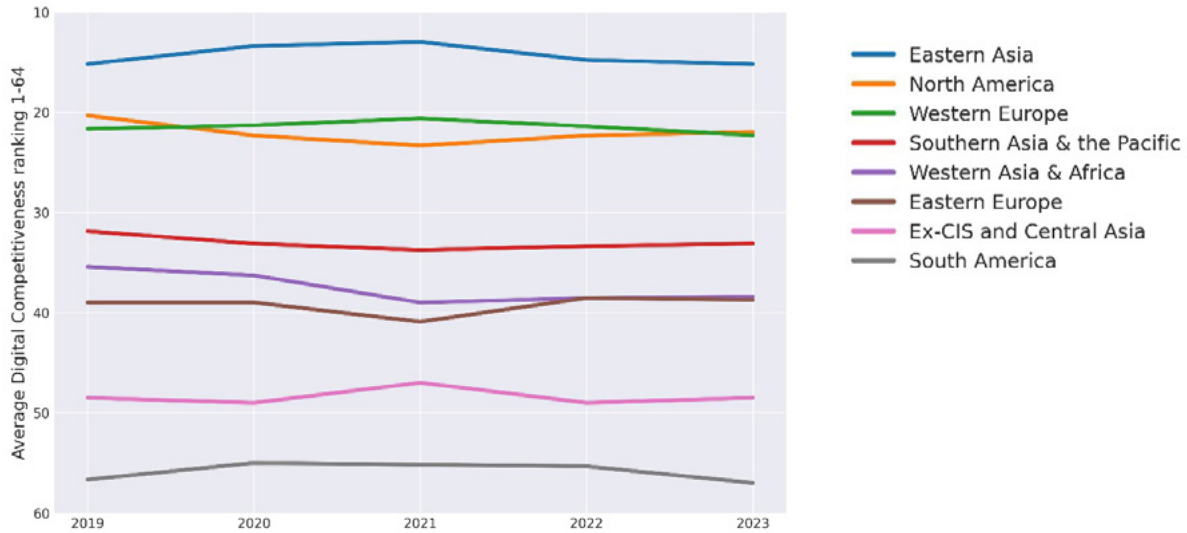
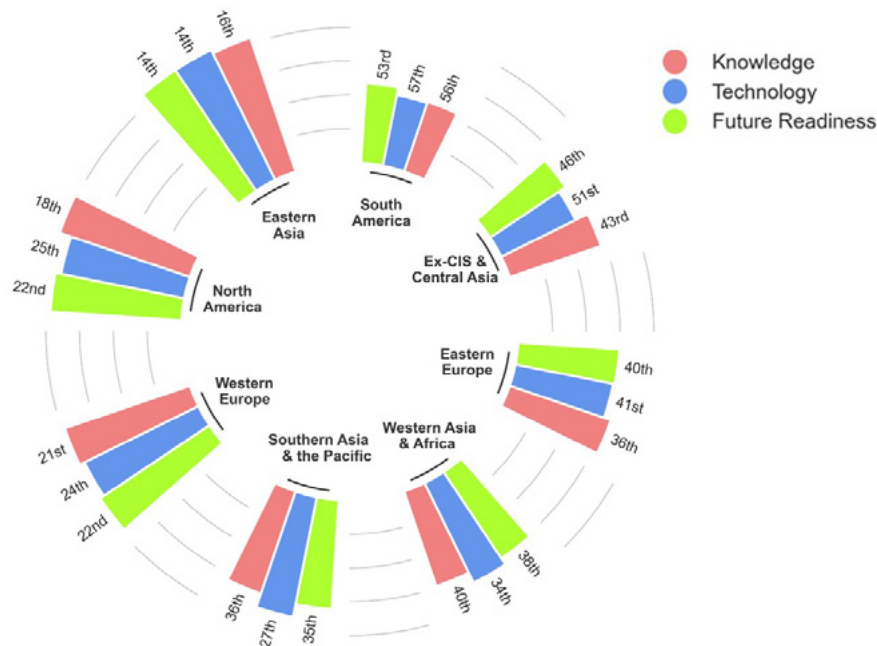


Figure 2: Average digital competitiveness factor ranking by region in 2023



in 2021. Western Europe follows a very similar path too, with an average digital competitiveness level in the region declining over the past two years to 22nd position. South American economies, on average, continue to lag behind in digitalization when compared to the rest of the world regions, further declining to 57th place in 2023. Finally, Eastern European, Southern Asia & the Pacific, Western Asian and African economies maintain a stable average digital competitiveness performance between 2022 and 2023.

Figure 2 presents the sub-regional average rankings in digital competitiveness at factor level. In 2023, Eastern Asia achieves top marks in all digital factors, significantly distancing North America and Western Europe in both technology and future readiness subfactors. While Western Europe and North America share similar

scores in the latter subfactors, regional performances in the knowledge factor point to the fact that Eastern Asia and North America consistently remain the core hubs for digital innovation since the creation of the IMD World Digital Competitiveness Ranking in 2017. **Figure 2** also shows that Southern Asia and the Pacific, as well as Western Asia and Africa, are rapidly closing the gap with the most digitally competitive regions. The average rankings in the technology factor for these two regions highlight the fact that adoption and diffusion of digital technologies in these economies is advancing rapidly. This trend will likely facilitate the progression of these economies as the next innovation challengers to the Eastern Asian, North American, and Western European dominance.

3. Top 10 economies in digital competitiveness

The US returns to the top position in the overall ranking of the IMD World Digital Competitiveness Ranking 2023. The Netherlands moves up to second place (from sixth) and Singapore to third (from fourth). While Denmark declines to the fourth spot down from the top position, Switzerland remains in fifth place. The Republic of Korea rises to sixth place. Conversely, Sweden declines four positions to seventh and Finland one rank to eighth. Taiwan rises to the ninth position, returning to the top 10. Hong Kong SAR rounds up the top of the ranking, dropping one position. The US ranks first out of 64 economies we cover in the overall WDCR. At factor level, the US ranks second in future readiness, second in knowledge, and sixth in technology. Such a strong performance in the digital factors enables the country to recapture the top place in this edition of the ranking. At the subfactor level, the US ranks first in scientific concentration and capital, and second in adaptive attitudes and business agility. However, it's placed at 12th in the talent subfactor, reaching only the 20th position in the training and education subfactor.

The US' top position is underlined by its robust performance at the indicator level, such as in internet retailing and software piracy (first in both), as well as in the availability of venture capital (second), robots in education, and R&D and R&D productivity by publication (number of scientific articles over R&D expenditure as a percentage of GDP), ranking third in the latter two criteria. In addition, the country's performance is strongly improving in several indicators, including internet bandwidth speed (third), the effectiveness of public-private partnerships (ninth), and mobile broadband subscribers (11th). There are, however, some signs of concern for the sustainability of the country's digital competitiveness. For instance, it ranks 35th in PISA (math) educational assessment, 37th in the privacy protection by law content, 41st in the impact of immigration laws on competitiveness, 46th in graduates in sciences, and 50th in attitudes toward globalization. The US also drops positions in various indicators such as e-participation (10th), the efficiency of banking and financial services (18th), investment in telecommunications (as a percentage of GDP, 25th), and the effectiveness of communications technology (35th).

The Netherlands ranks second in the overall WDCR, which represents an improvement (from sixth). The latter largely originates in its advancement in two factors, future readiness and knowledge, in which the country ranks fourth and seventh respectively. It ranks fifth in the technology factor. Among the subfactors, the Netherlands reaches its best performance in regulatory

framework and capital (second in both), talent (third), and adaptive attitudes (sixth). The country's performance in regulatory framework played an important role in its advancement in the overall ranking.

The crucial contributors to the Netherlands' rise in the ranking include its improvements in indicators such as the adequacy of the private sector's cybersecurity (12th), total public expenditure on education (22nd), and higher education achievement (percentage of population with at least tertiary education, 16th). Other contributors are the effectiveness of scientific research legislation (fourth), e-participation (fifth), agility of companies (10th), and the private sector's use of big data and analytics to support decision-making (13th). Among the strengths of the Netherlands at the indicator level are the country credit rating (first) and three indicators in which it ranks second: its attractiveness for foreign highly skilled personnel, IT and media stock market capitalization (percentage of total stock market capitalization), and the adequacy of the implementation of intellectual property rights. The country also performs robustly (third) in knowledge transfer, scientific and technical employment (percentage of total employment), and the availability of senior managers with significant international experience. The Netherlands' weaknesses include government cybersecurity capacity (41st), investment in telecommunications (45th), and contract enforcement (45th). Other indicators in which the Netherlands' performance is deficient include female researchers (percentage of total researchers, 47th) and graduates in sciences (51st). Also, the country declines in internet bandwidth speed (16th) and attitudes toward globalization (11th).

Singapore ranks third in the overall WDCR, progressing one position. It improves in the knowledge factor, reaching the third position. Singapore remains first in the technology factor and 10th in the future readiness factor. At the subfactor level, Singapore is first in the regulatory framework, second in the technological framework, fourth in talent, and ninth in training and education. Although it improves in the adaptive attitudes subfactor (13th), it declines in the business agility subfactor (14th). Singapore's improvement in the overall WDCR is largely due to its continued strong performance in talent, regulatory and technological frameworks, and its improvement in adaptive attitudes.

At the indicator level, progress in some criteria contributes to Singapore's advancement in the overall ranking. These indicators include wireless broadband (penetration rate per 100 people, sixth), tablet possession (percentage

of households, 15th), and scientific and technical employment (22nd). Singapore's strengths include high-tech patent grants (first), enforcing contracts (first), internet bandwidth speed (first), and country credit rating (first). It also performs strongly in higher education achievement and PISA (math) educational assessment (ranking second in both). There are some significant declines in Singapore's performance. It decreases in the effectiveness of public-private partnerships (eighth), the impact of immigration laws (49th), the availability of senior managers with significant international experience (11th), attitudes toward globalization (13th), and the agility of companies (24th). Among Singapore's weaknesses are R&D productivity by publication (42nd), female researchers (45th), privacy protection by law content (50th), and investment in telecommunications (58th).

Denmark loses the top position, dropping to the fourth spot in the overall ranking. The country drops in the future readiness factor (third from first) and to ninth in the knowledge factor (from sixth). It remains in seventh place in the technology factor. Denmark's decline is mainly due to its dwindling performance in the future readiness subfactors, dropping to eighth place in adaptive attitudes (from fifth), to sixth in business agility (from first), and to second in IT integration (from first). It also experiences declines in other subfactors including training and education (12th from seventh) and regulatory framework (10th from sixth). Denmark continues to perform strongly in the talent (fifth) and technological framework (sixth) subfactors.

Denmark experiences significant declines in several indicators, including opportunities and threats (whether companies respond efficiently to opportunities and threats, sixth), the impact of immigration laws (51st), and the quality of education as measured by the pupil-teacher ratio (tertiary education, 19th). Denmark also performs feebly in R&D productivity by publication (43rd) and in IT and media stock market capitalization (55th). It advances significantly, however, in investment in telecommunications (16th) and in graduates in sciences (33rd). The country also continues to perform strongly (first) in several indicators such as the efficiency of banking and financial services and of communications technology, country credit rating, and e-government. Other strengths (ranking second) are the effective management of cities, funding for technological development, and the prioritization of employee training by the private sector.

Switzerland remains in fifth position in the overall WDCR. It remains top in the knowledge factor and improves in the technology (10th) and future readiness factors (sixth).

The country continues to perform robustly in the talent (second), training and education (seventh), regulatory framework (fourth), business agility (seventh), and IT integration (sixth) subfactors. There are some declines in the scientific concentration (10th) and adaptive attitudes (16th) subfactors.

Switzerland progresses significantly in mobile broadband subscribers (first), smartphone possession (20th), total public expenditure on education (14th), and the impact of immigration laws (16th). The country's strengths (ranking first) include the effectiveness of scientific research legislation, the effective enforcement of intellectual property rights, the availability of senior managers with significant international experience, the attractiveness of the country for foreign highly skilled personnel, mobile broadband subscribers, country credit rating, and knowledge transfer between the academic and private sectors. Among its strengths are also privacy protection by law content (third), the prioritization of employee training (fourth), and entrepreneurial fear of failure (fifth). Among Switzerland's largest declines are management of cities (10th), cybersecurity (20th), the use of big data and analytics (30th), e-government (22nd), availability of venture capital (18th), and e-participation (38th). Some of Switzerland's weaknesses are enforcing contracts (40th), wireless broadband (47th), and IT and media stock market capitalization (50th).

The Republic of Korea moves up to sixth position in the overall ranking. Such a rise is due to the country's strong performance in all digital competitiveness factors, improving in all of them. It ranks first in the future readiness factor, 10th in knowledge and 12th in technology. Korea's strongest performances at the subfactor level are in training and education (sixth), scientific concentration (second), technological framework (eighth), adaptive attitudes (first), and business agility (third). Its lowest ranking at this level is in the talent subfactor (31st), followed by the regulatory framework subfactor (26th).

At the indicator level, Korea advances in the quality of education as measured by the pupil-teacher ratio (tertiary education, 25th), total public expenditure on education (26th), prioritization of employee training (23rd), and enforcement of intellectual property rights (28th). Although it progresses in the availability of senior manager with international experience and the effectiveness of public-private partnerships, Korea's performance in this regard remains feeble (51st and 40th respectively). It also performs deficiently and drops positions in several indicators including the availability of funding for technological development (36th), the private sector's efficiency in dealing with opportunities

and threats (43rd), investment in telecommunications (23rd), agility of companies (28th), and impact of immigration laws (46th).

Korea performs strongly (second) in total expenditure on R&D (percentage of GDP), entrepreneurial fear of failure, enforcing contracts, and internet retailing. It also ranks third in world robot distribution, IT & media stock market capitalization, high-tech patent grants, and e-government. Conversely, Korea ranks 44th in the availability of venture capital, 47th in the country's attractiveness for foreign highly skilled personnel, 48th in availability of digital/technological skills, 50th in effectiveness of banking and financial services, 51st in availability of senior managers with international experience, 52nd in the support that the legal environment provides to the development and application of technology, and 55th in female researchers.

Sweden drops to seventh position (from third) in the overall ranking. Sweden declines in all factors, ranking fifth in knowledge (from second), eighth in future readiness (from fourth), and 11th in technology (from fifth). At the subfactor level, it declines in all except training and education, in which Sweden remains in fourth position. Among the more significant drops are in the talent (13th), technological framework (17th), and business agility (17th) subfactors. Sweden, however, remains in strong positions in the scientific concentration (fourth), regulatory framework (seventh), capital (eighth), and IT integration (eighth) subfactors.

Sweden's sluggish performance is largely due to significant declines in several indicators including total R&D personnel per capita (13th), knowledge transfer (ninth), the availability of digital/technological skills (10th), and internet bandwidth speed (20th). Other aspects of the country's deficient performance are in the attractiveness of the country for foreign highly skilled personnel (29th), immigration laws (34th), the effectiveness of public-private partnerships (33rd) and cybersecurity (26th), and the private sector's efficiency in responding to market opportunities and threats (32nd). Sweden's weaknesses include R&D productivity by publication (38th), female researchers (41st), smartphone possession (41st), and investment in telecommunications (49th). On the positive side of the country's performance, Sweden improves in several indicators including e-participation (29th) and the private sector's use of big data and analytics (ninth). In addition, the country remains in a leading position (first) in tablet possession, scientific and technical employment, and country credit rating. Other strengths include development and application of technology

(fourth), total expenditure on R&D (fifth), total public expenditure on education (fifth), and attitudes toward globalization (fifth).

Finland drops to eighth place (from seventh) in the overall ranking. At factor level, it also declines to 11th in knowledge (from ninth) and to ninth in technology (from eighth) but improves in future readiness, moving up to fifth (from sixth). Finland drops in all the subfactors related to knowledge, ranking 11th in talent, 19th in training and education, and 13th in scientific concentration. It also drops to 21st position in business agility (from 16th). However, the country remains in a robust position (third) in the adaptive attitudes and IT integration subfactors. In addition, it improves in the regulatory framework subfactor (from fifth to third) and technological framework (from 12th to 11th).

Finland's overall decline is driven by sluggish performance in several indicators, including women with degrees (the share of women who have a degree) in which it ranks 20th, opportunities and threats (27th), higher education achievement (40th), and agility of companies (23rd). Other substantial declines are in the availability of senior managers with significant international experience (22nd), immigration laws (37th), and the availability of venture capital (albeit it remains in a strong position, eighth). Conversely, this year, Finland's considerable improvements are in e-participation (sixth) and high-tech exports (percentage of manufactured exports, 38th). Among the country's weaknesses are higher education achievement and female researchers (ranking 40th in both), and pupil-teacher ratio (tertiary education, 44th), R&D productivity by publication (48th), and investment in telecommunications (56th). Its strengths include the development and application of technology (first), e-government (second), efficiency of banking and financial services (second), availability of digital/technological skills (second), scientific research legislation (third), the effectiveness of public-private partnerships (third), and cybersecurity (third).

Taiwan returns to the overall top 10 in ninth position. It improves in the technology (third) and future readiness (seventh) factors and remains in the 18th spot in knowledge. Taiwan reaches the top place in the business agility subfactor. It also performs in other subfactors such as capital and technological framework (fifth in both) and, to a lesser extent, in training and education (10th). Taiwan's lowest ranking positions at the subfactor level are in talent (22nd), scientific concentration (21st), and adaptive attitudes (17th).

At the indicator level, Taiwan's largest improvements are in investment in telecommunications (46th), women with degrees (eighth), internet bandwidth speed (13th), and tablet possession (percentage of households, 20th). Conversely, its largest declines are in the availability of senior managers with strong international experience (40th), cybersecurity (19th), development and application of technology (25th), scientific research legislation (16th), and the availability of venture capital (19th).

On the one hand, among Taiwan's strengths (first) are agility of companies, IT and media stock market capitalization, use of big data and analytics, mobile broadband subscribers, and total R&D personnel per capita. It performs robustly in higher education achievement (third), total expenditure on R&D (third), PISA (math) educational assessment (fourth), high-tech exports (fourth), and opportunities and threats (fifth). On the other hand, its weaknesses include privacy protection by law content (40th), availability of senior managers with significant international experience (40th), attractiveness of the economy to foreign highly skilled personnel (44th), and investment in telecommunications (46th). In addition, Taiwan performs poorly in scientific and technical employment (47th), pupil-teacher ratio (tertiary education, 50th), total public expenditure on education (52nd), and percentage of female researchers (54th).

Hong Kong SAR drops one position to 10th place in the overall WDCR. Hong Kong ranks sixth in knowledge and 17th in future readiness, which represents an improvement of one position in both factors. It remains in second place

in the technology factor. Hong Kong performs strongly in all knowledge subfactors, ranking sixth in talent, fifth in training and education, and eighth in scientific concentration. It remains first in the technological framework subfactor, improving in regulatory framework (sixth) and adaptive attitudes (fifth). Its lowest ranking position at the subfactor level is IT integration (47th).

Hong Kong's slight decline in the overall digital ranking is largely due to significant drops in the efficiency of banking and financial services (13th), cybersecurity (14th), use of big data and analytics (23rd), availability of venture capital (21st), total public expenditure on education (50th), and investment in telecommunications (57th).

At the indicator level, however, Hong Kong substantially improves in the number of robots in education and R&D (34th), internet retailing (eighth), its attractiveness for foreign highly skilled personnel (23rd), and the effective management of cities (third). In addition, Hong Kong performs robustly in high-tech exports (first), graduates in sciences (first), high-tech patent grants (second), and smartphone possession (second). Other strengths include wireless broadband (penetration rate per 100 people) and PISA (math) educational assessment, ranking third in both criteria. Its lowest ranking positions at the indicator level are in privacy protection by law content (64th), investment in telecommunications (57th), and total public expenditure on education (50th). Other weaknesses are government cybersecurity capacity (49th) and total expenditure on R&D (41st).

4. Cybersecurity challenges and digital competitiveness

The pandemic forced the proliferation of digital communication. In the professional domain, economies that exhibited the infrastructure that supported remote work embraced the hybrid employment models we currently observe worldwide. In the personal realm, the lockdown and plunge of traveling forced people to digitally connect with family and friends. The rapid technological innovations allowed for a profound change of the digital landscape. The increasing use of technological innovations and expansion of digital society, however, also increased the probability of potential compromises. In fact, the expansion of digital society has also contributed to a surge of cybercrime.

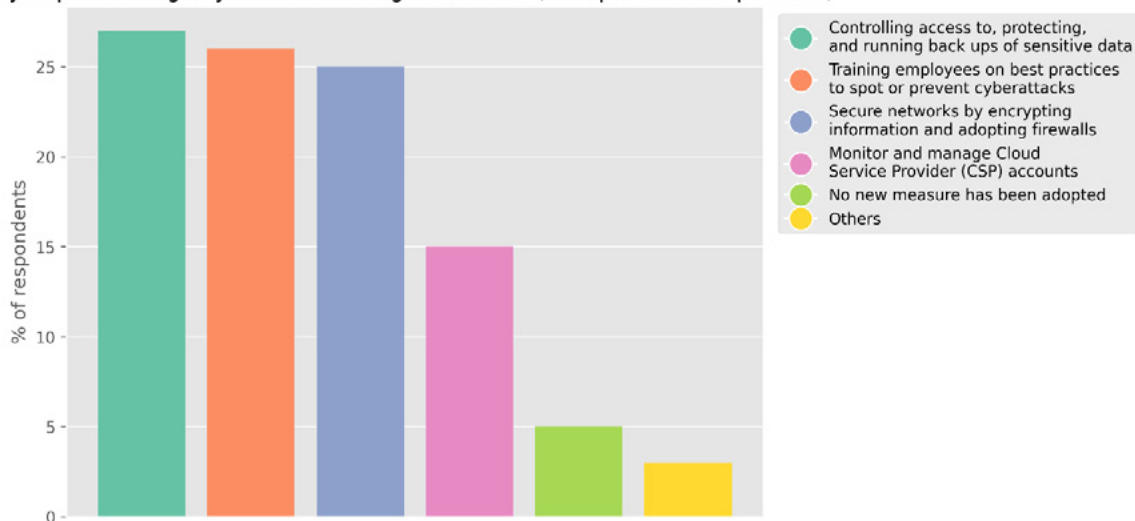
The numbers related to cybercrime are staggering. In 2019, before the start of the COVID-19 pandemic, Statista estimated the cost of cybercrime worldwide to be \$1.16tn. By 2022, it reached the shocking amount of

\$7.08tn. As it was outlined above and in the preceding essay "Striving towards being a digital nation in the era of artificial intelligence", the digital infrastructure of an economy is of paramount importance because it provides the lower technological bound to secure the cyberworld of that economy.

However, the pressure to strengthen cybersecurity falls on companies as well. Proofpoint, Inc., for instance, estimates that among worldwide organizations, 85% experienced a bulk phishing attack while 76% had to deal with a situation involving ransomware. This strongly suggests that given the digital infrastructure of an economy, businesses must be proactive in finding ways to minimize the threat and instances of cyberattacks. Taking this into consideration, we asked the respon-

Figure 3

As a result of increasing cyberattacks, has your company boosted its cybersecurity by implementing any of the following measures? (Multiple answers possible)



dents of our Executive Opinion Survey what steps their company has taken to address the increasing presence of cybercrime.

Figure 3 displays feedback from more than 4,000 executives across 64 economies. They overwhelmingly confirm the implementation of various measures. Predominantly, actions focus on the security of the infrastructure employed. Approximately 27% of the total responses indicated that they control access to, protect, and run backups of sensitive data, while 25% secure the integrity of their network by encrypting information and adopting firewalls. In addition, 26% of the respondents' companies enhance awareness by training their employees on best practices to identify or prevent cyberattacks, while 15% focus on monitoring and managing cloud service provider (CSP) accounts. This robust result emphasizes the widespread realization of the danger and the willingness to safeguard the digital presence of the companies. Notably, only 5% of the respondents declared no new measure was adopted in the past year.

The results remain consistent when we examine the size of the companies under consideration as well. **Figure 4** captures the responses from executives of large companies, that is, companies with more than 250 employees. In this category, the predominant new measures focus on increasing employee awareness. In contrast, for medium size companies with employees between 50 and 250 (**Figure 5**), and small companies with employees below 50 (**Figure 6**), employee training is the third most popular response. However, across all company sizes, the implementation of new measures stands out as the most frequent response.

The trend is similar when we break our sample between 'family' and 'non-family' businesses, although the detailed graphs are not provided here.

A notable difference emerges when we examine the share of executives who reported no additional measures taken. In large companies, only 1% of the respondents claim that no new measures were adopted, compared to 4% for medium-sized companies and to 11% for small companies. Similarly, there exists a much smaller difference between the 4% non-family businesses executives to the 6% of family businesses executives who did not implement any new measure since the year before.

Based on the available data, determining the reason for such an increase is challenging. The possible explanations include executives of small companies are being unaware of the magnitude of the threat, perceiving a low likelihood of exposure to cybercrime, or facing significant costs for implementing new measures. Alternatively, it may be that they were already actively engaged in a number of cybersecurity actions, rendering the need for new measures unnecessary in the previous year.

However, at the country level, results differ. **Figure 7** captures the relationship between the percentage of executives who responded that their companies did not adopt new cybersecurity measures in the preceding year (horizontal axis) and their responses to the survey question regarding the adequacy of cybersecurity addressed by corporations (vertical axis). This relationship is both intriguing and somewhat anticipated.

In economies where executives perceive an inadequate cybersecurity framework (Venezuela, for instance), they tend to implement additional measures within their companies, for instance, Venezuela. However,

Figure 4

As a result of increasing cyberattacks, has your company boosted its cybersecurity by implementing any of the following measures? (Multiple answers possible) - Large (more than 250 employees)

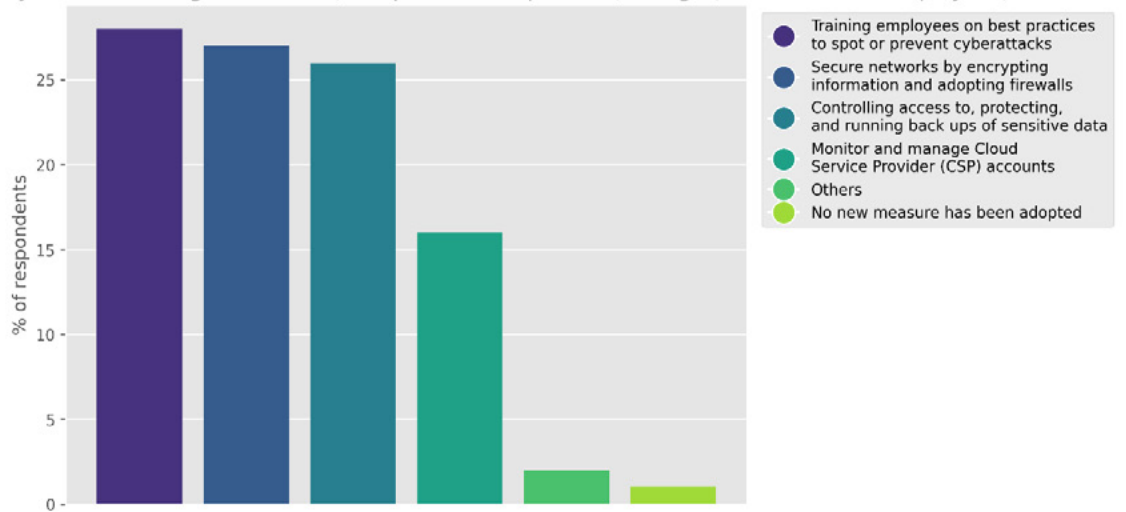


Figure 5

As a result of increasing cyberattacks, has your company boosted its cybersecurity by implementing any of the following measures? (Multiple answers possible) - Medium (from 50 to 250 employees)

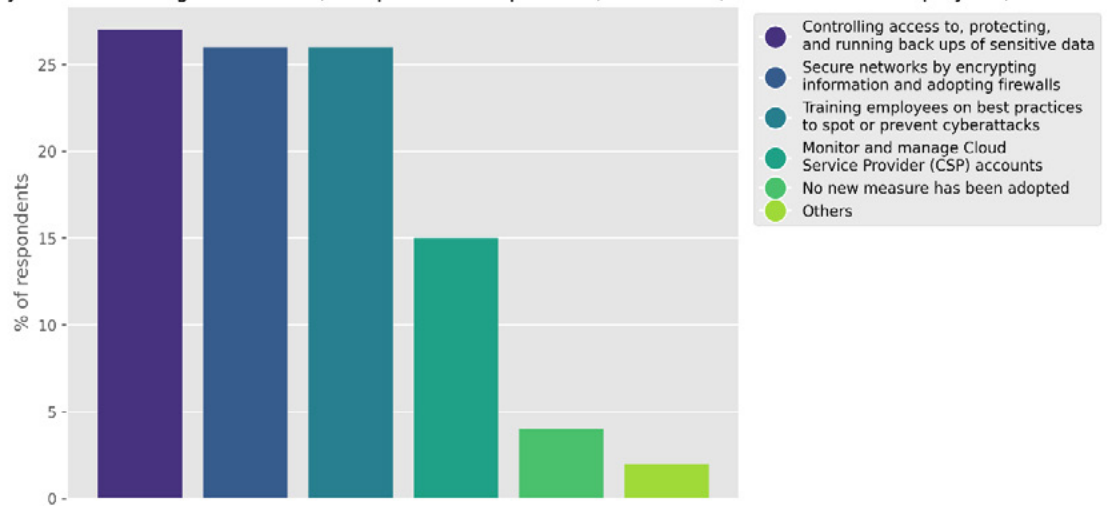


Figure 6

As a result of increasing cyberattacks, has your company boosted its cybersecurity by implementing any of the following measures? (Multiple answers possible) - Small (less than 50 employees)

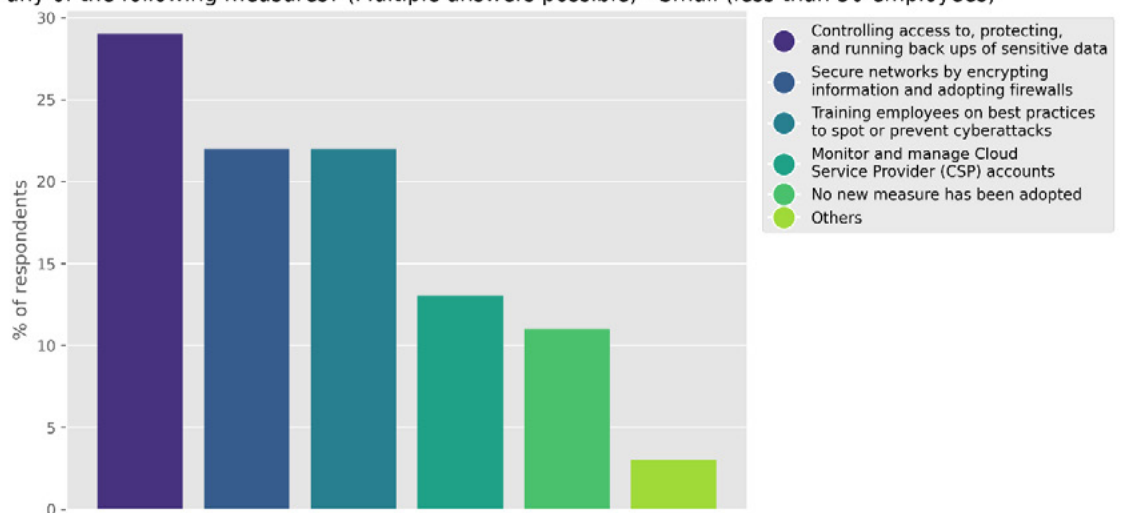
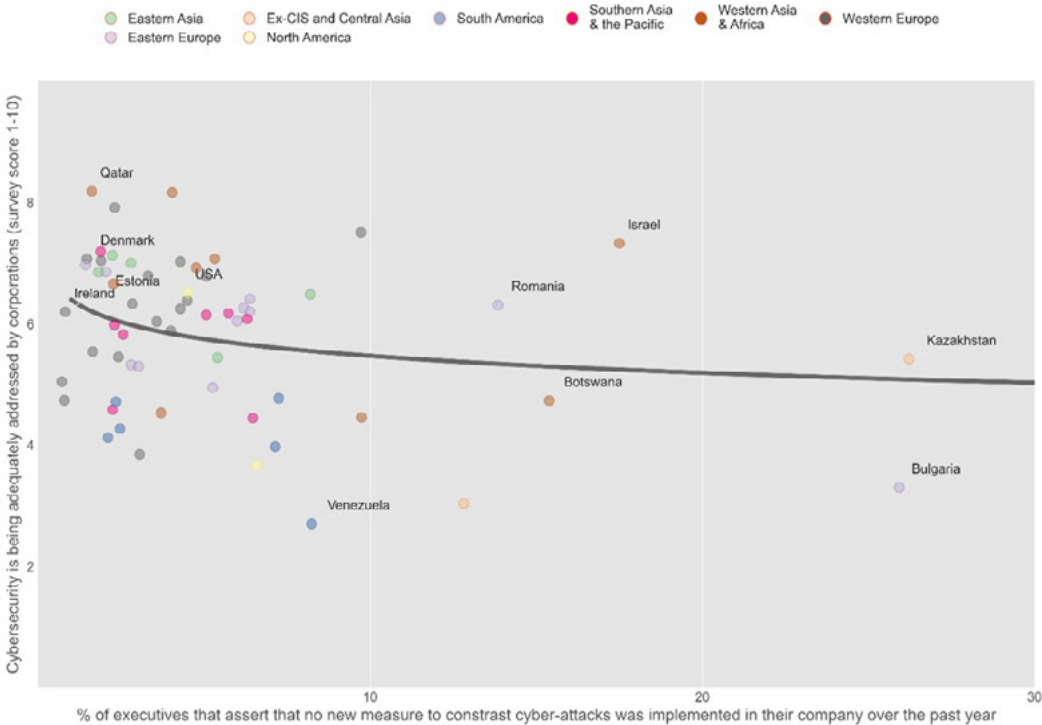


Figure 7



even in economies where cybercrime is adequately addressed, companies bolster their positions by undertaking additional measures. Examples include Qatar, Denmark, Estonia, and the US. Yet, outliers exist, such as Israel, where a strong perception of cybersecurity does not necessarily translate into proactive, company specific measures by companies. Bulgaria and similarly, Kazakhstan are also interesting cases that need further research. Despite executives who reside in these two economies believing that cybercrime can be addressed more effectively, they appear less proactive.

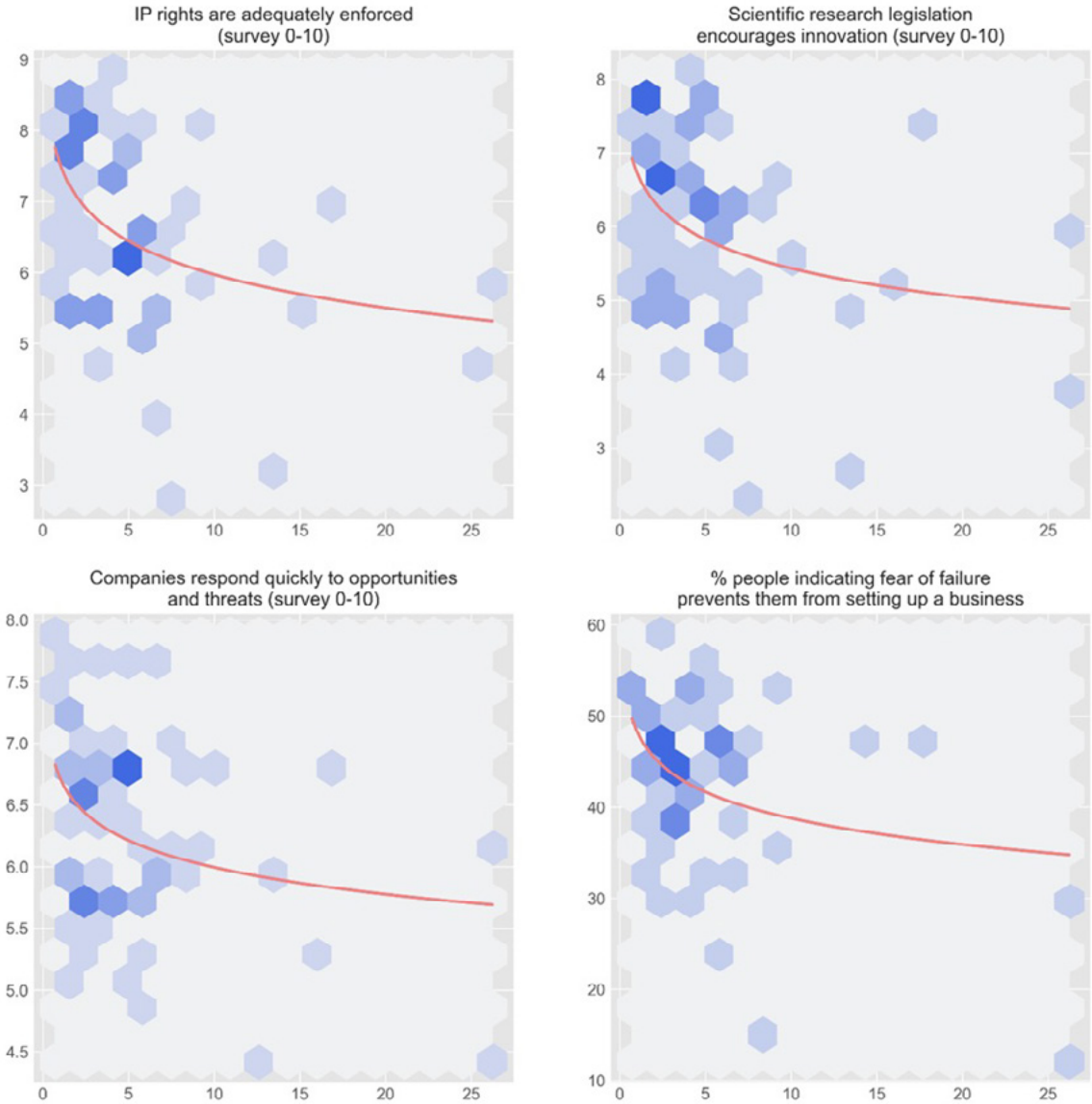
To contextualize these results, we delve deeper into the specific areas that executives find crucial when asserting the need for additional cybersecurity measures. **Figure 8** illustrates four areas exhibiting a robust negative relationship with the share of executives claiming that there have not been new cybersecurity measures, depicted in the horizontal axis. The four criteria measured on the vertical axes include the enforcement of intellectual property (IP) rights, the existence of a legislative framework promoting innovation research, the readiness of companies in dealing with opportunities and threats, and the existence of a prohibitively costly framework for failure, acting as a deterrent to business emergence.

The top graphs in **Figure 8** are related to the general economy. They suggest that in countries where business leaders perceive promotion of innovation (top right graph) and the enforcement of intellectual rights to innovations (top left graph), investing in additional measures to safeguard business digital integrity is considered a worthwhile venture. This outcome is heightened in countries where the private sector demonstrates resilience and agility by swiftly responding to emerging opportunities and threats (bottom left graph). Furthermore, in countries where the cost of failure is high, that is where fear of failure deters business activities, there is an increased likelihood of undertaking additional steps, including implementing new measures, to minimize the probability of a cyber compromise.

In conclusion, as economies grapple with the disruptive forces of the digital age, their capacity to generate value hinges on the resilience of their cybersecurity defenses. This can be realized by acknowledging the interconnected nature of robust cybersecurity measures at the company level and the existence of a protective and proactive regulatory framework at the economy level.

Figure 8

X axis in all charts:
% of executives that assert that no new measure to contrast cyber-attacks was implemented in their company



5. Concluding remarks

The 2023 IMD World Digital Competitiveness Ranking portrays a dynamic landscape marked by shifts at the regional and economy levels of analysis. At the regional level, there is an increase in digital competitiveness for North America, which improves by one place to take 22nd position due to advances in the US and Mexico. Eastern Asia, though still holding its ground as the most digitally competitive region, witnesses a modest dip by one place to the 15th position, extending a trend started in 2021. This decline is mirrored in Western Europe, where the region's average digital competitiveness has declined over the past two years. Furthermore, South American economies continue to lag, securing 57th place in 2023.

The dominance of Eastern Asia across all digital factors stands out; notably, the region surpasses North America and Western Europe, particularly in the technology and future readiness factors. Lastly, Southern Asia & the Pacific, along with Western Asia & Africa, exhibit rapid strides in the technology factor, narrowing the divide with more digitally competitive regions and positioning themselves as potential contenders in innovation.

Examining the top-10 most advanced economies reveals a diverse range of strengths, such as scientific concentration and adaptive attitudes for the US, or dominance in technology and regulatory framework for Singapore. Top economies also exhibited weaknesses, such as adaptive attitudes in Denmark's case, and business agility where Finland is concerned. Such diversity underscores the complexity of the ranking, pointing out the lack of a single path for success in terms of competitiveness.

Adaptation shows itself to be important in this year's ranking. The return of the US to the top place, the re-entry of Taiwan into the top 10, and the significant rise of the Netherlands point to a need for continuous

adaptation. That is to say, countries cannot be complacent from year to year as the digital panorama is a quickly changing one.

In particular, adaptation is needed to address an important threat of our time: cybercrime. Our survey of over 4,000 executives across 64 economies revealed a proactive stance among companies. Around 27% prioritize controlling access, protecting sensitive data, and running backups, while 25% focus on network integrity through encryption and firewalls. Moreover, 26% enhance awareness through employee training and 15% concentrate on monitoring and managing CSP accounts. Notably, a mere 5% reported no new cybersecurity measures in the past year, reflecting widespread recognition of imminent danger.

Dissecting responses based on company size reveals differences in cybersecurity strategies. Large companies predominantly emphasize increasing employee awareness, whereas medium and small companies prioritize employee training. Discrepancies also emerge at the national level, where economies with perceived inadequate cybersecurity frameworks witness a surge in additional cybersecurity measures. Overall, the ranking underscores the interconnectedness of robust cybersecurity practices at the company level with the same at the economy level, in order to achieve sustained value generation in the digital age.

In conclusion, successful digital nations—that is, economies that utilize digital talent, have a resilient and agile culture, and rely on effective digital infrastructure—align their skills and competences, their capacity, and their planned future investments in order to adopt and explore new digital technologies that can transform government practices, business models, and society at large.

IMD World Digital Competitiveness Ranking 2023

The statistical tables are available for subscribers of the

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The 2023 IMD World Digital Competitiveness Ranking

2023 DIGITAL COMPETITIVENESS RANKING

| | | | Score | | |
|----|----------------|--|--------|---|---|
| 01 | USA | | 100.00 | ↗ | 1 |
| 02 | Netherlands | | 98.10 | ↗ | 4 |
| 03 | Singapore | | 97.40 | ↗ | 1 |
| 04 | Denmark | | 96.93 | ↖ | 3 |
| 05 | Switzerland | | 96.24 | - | - |
| 06 | Korea Rep. | | 94.80 | ↗ | 2 |
| 07 | Sweden | | 94.12 | ↖ | 4 |
| 08 | Finland | | 94.05 | ↖ | 1 |
| 09 | Taiwan, China | | 93.73 | ↗ | 2 |
| 10 | Hong Kong SAR | | 93.64 | ↖ | 1 |
| 11 | Canada | | 91.98 | ↖ | 1 |
| 12 | UAE | | 88.86 | ↗ | 1 |
| 13 | Israel | | 87.70 | ↗ | 2 |
| 14 | Norway | | 85.96 | ↖ | 2 |
| 15 | Belgium | | 85.95 | ↗ | 8 |
| 16 | Australia | | 85.28 | ↖ | 2 |
| 17 | Iceland | | 84.94 | ↗ | 4 |
| 18 | Estonia | | 84.77 | ↗ | 2 |
| 19 | China | | 84.41 | ↖ | 2 |
| 20 | United Kingdom | | 83.12 | ↖ | 4 |
| 21 | Ireland | | 81.48 | ↗ | 3 |
| 22 | Austria | | 81.10 | ↖ | 4 |
| 23 | Germany | | 80.86 | ↖ | 4 |
| 24 | Czech Republic | | 79.42 | ↗ | 9 |
| 25 | New Zealand | | 79.08 | ↗ | 2 |
| 26 | Luxembourg | | 78.73 | ↗ | 4 |
| 27 | France | | 78.65 | ↖ | 5 |
| 28 | Lithuania | | 77.23 | ↖ | 3 |
| 29 | Qatar | | 77.01 | ↖ | 3 |
| 30 | Saudi Arabia | | 76.99 | ↗ | 5 |

The IMD World Digital Competitiveness Ranking presents the 2023 overall ranking for the 64 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.

2023 DIGITAL COMPETITIVENESS RANKING

| | | | Score | |
|----|-----------------|-------------------------------------------------------------------------------------|-------|-----|
| 31 | Spain |  | 76.62 | ↙ 3 |
| 32 | Japan |  | 75.43 | ↙ 3 |
| 33 | Malaysia |  | 75.31 | ↙ 2 |
| 34 | Kazakhstan |  | 71.84 | ↗ 2 |
| 35 | Thailand |  | 70.53 | ↗ 5 |
| 36 | Portugal |  | 69.78 | ↗ 2 |
| 37 | Slovenia |  | 69.14 | - |
| 38 | Bahrain |  | 69.06 | ↙ 6 |
| 39 | Poland |  | 66.53 | ↗ 7 |
| 40 | Latvia |  | 66.36 | ↙ 6 |
| 41 | Kuwait |  | 65.14 | - |
| 42 | Chile |  | 64.84 | ↙ 1 |
| 43 | Italy |  | 64.39 | ↙ 4 |
| 44 | Croatia |  | 62.01 | ↙ 1 |
| 45 | Indonesia |  | 60.36 | ↗ 6 |
| 46 | Slovak Republic |  | 58.31 | ↗ 1 |
| 47 | Hungary |  | 58.25 | ↙ 5 |
| 48 | Romania |  | 58.25 | ↗ 1 |
| 49 | India |  | 57.74 | ↙ 5 |
| 50 | Jordan |  | 56.88 | ↗ 3 |
| 51 | Cyprus |  | 54.77 | ↙ 6 |
| 52 | Greece |  | 54.70 | ↙ 2 |
| 53 | Turkey |  | 54.27 | ↗ 1 |
| 54 | Mexico |  | 51.26 | ↗ 1 |
| 55 | Bulgaria |  | 50.66 | ↙ 7 |
| 56 | Peru |  | 50.17 | ↗ 1 |
| 57 | Brazil |  | 49.70 | ↙ 5 |
| 58 | South Africa |  | 48.61 | - |
| 59 | Philippines |  | 48.31 | ↙ 3 |
| 60 | Botswana |  | 47.51 | ↗ 1 |
| 61 | Argentina |  | 46.33 | ↙ 2 |
| 62 | Colombia |  | 45.09 | ↙ 2 |
| 63 | Mongolia |  | 43.03 | ↙ 1 |
| 64 | Venezuela |  | 22.55 | ↙ 1 |

Methodology in a nutshell

- › The IMD World Digital Competitiveness (WDC) Ranking analyzes and ranks the extent to which countries adopt and explore digital technologies leading to transformation in government practices, business models and society in general.
- › As in the case of the IMD World Competitiveness Ranking, we assume that digital transformation takes place primarily at enterprise level (whether private or state-owned) but it also occurs at the government and society levels.
- › Based on our research, the methodology of the WDC ranking defines digital competitiveness into three main factors:

Knowledge

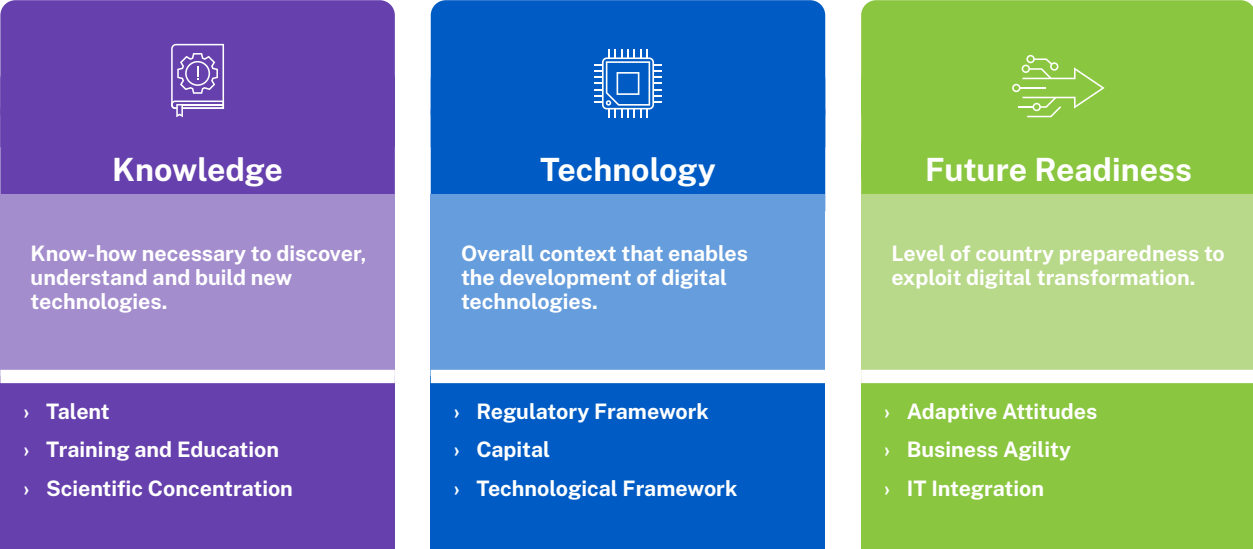
Technology

Future readiness

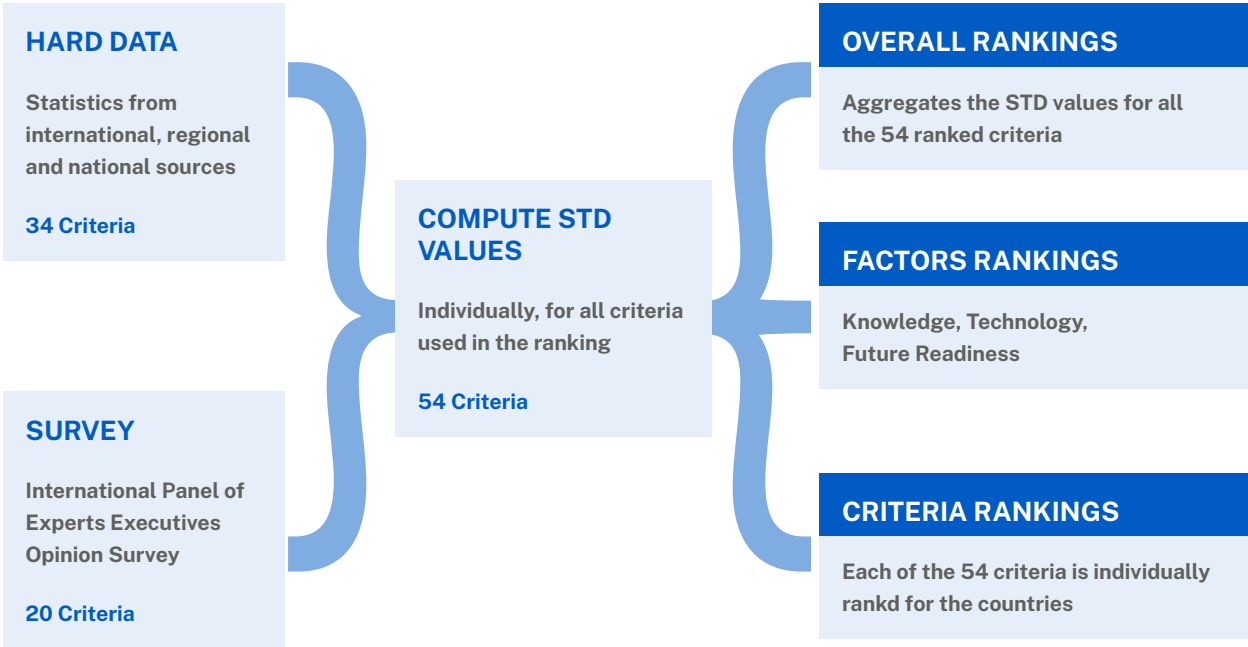
- › In turn, each of these factors is divided into 3 sub-factors which highlight every facet of the areas analyzed. Altogether, the WDC features 9 such sub-factors.
- › These 9 sub-factors comprise 54 criteria, although each sub-factor does not necessarily have the same number of criteria (for example, it takes more criteria to assess Training and Education than to evaluate IT integration).
- › Each sub-factor, independently of the number of criteria it contains, has the same weight in the overall consolidation of results, that is approximately 11.1% ($100 \div 9 \sim 11.1$).
- › Criteria can be hard data, which analyze digital competitiveness as it can be measured (e.g. Internet bandwidth speed) or soft data, which analyze competitiveness as it can be perceived (e.g. Agility of companies). Hard criteria represent a weight of 2/3 in the overall ranking whereas the survey data represent a weight of 1/3.
- › The 54 criteria include 19 new indicators which are only used in the assessment of the WDC ranking. The rest of the indicators are shared with the IMD World Competitiveness Ranking.
- › In addition, two criteria are for background information only, which means that they are not used in calculating the overall competitiveness ranking (i.e., Population and GDP).
- › Finally, aggregating the results of the 9 sub-factors makes the total consolidation, which leads to the overall ranking of the WDC.

What is the IMD World Digital Competitiveness Ranking?

Digital Competitiveness Factors and Sub-factors



Computing the Rankings



The 2023 IMD World Digital Competitiveness Rankings

Population over 20 million

| | | Score |
|----|----------------|--------|
| 01 | USA | 100.00 |
| 02 | Korea Rep. | 94.80 |
| 03 | Taiwan, China | 93.73 |
| 04 | Canada | 91.98 |
| 05 | Australia | 85.28 |
| 06 | China | 84.41 |
| 07 | United Kingdom | 83.12 |
| 08 | Germany | 80.86 |
| 09 | France | 78.65 |
| 10 | Saudi Arabia | 76.99 |
| 11 | Spain | 76.62 |
| 12 | Japan | 75.43 |
| 13 | Malaysia | 75.31 |
| 14 | Thailand | 70.53 |
| 15 | Poland | 66.53 |
| 16 | Italy | 64.39 |
| 17 | Indonesia | 60.36 |
| 18 | India | 57.74 |
| 19 | Turkey | 54.27 |
| 20 | Mexico | 51.26 |
| 21 | Peru | 50.17 |
| 22 | Brazil | 49.70 |
| 23 | South Africa | 48.61 |
| 24 | Philippines | 48.31 |
| 25 | Argentina | 46.33 |
| 26 | Colombia | 45.09 |
| 27 | Venezuela | 22.55 |

Population under 20 million

| | | Score |
|----|-----------------|-------|
| 01 | Netherlands | 98.10 |
| 02 | Singapore | 97.40 |
| 03 | Denmark | 96.93 |
| 04 | Switzerland | 96.24 |
| 05 | Sweden | 94.12 |
| 06 | Finland | 94.05 |
| 07 | Hong Kong SAR | 93.64 |
| 08 | UAE | 88.86 |
| 09 | Israel | 87.70 |
| 10 | Norway | 85.96 |
| 11 | Belgium | 85.95 |
| 12 | Iceland | 84.94 |
| 13 | Estonia | 84.77 |
| 14 | Ireland | 81.48 |
| 15 | Austria | 81.10 |
| 16 | Czech Republic | 79.42 |
| 17 | New Zealand | 79.08 |
| 18 | Luxembourg | 78.73 |
| 19 | Lithuania | 77.23 |
| 20 | Qatar | 77.01 |
| 21 | Kazakhstan | 71.84 |
| 22 | Portugal | 69.78 |
| 23 | Slovenia | 69.14 |
| 24 | Bahrain | 69.06 |
| 25 | Latvia | 66.36 |
| 26 | Kuwait | 65.14 |
| 27 | Chile | 64.84 |
| 28 | Croatia | 62.01 |
| 29 | Slovak Republic | 58.31 |
| 30 | Hungary | 58.25 |
| 31 | Romania | 58.25 |
| 32 | Jordan | 56.88 |
| 33 | Cyprus | 54.77 |
| 34 | Greece | 54.70 |
| 35 | Bulgaria | 50.66 |
| 36 | Botswana | 47.51 |
| 37 | Mongolia | 43.03 |

Selected Breakdowns

GDP per capita greater than \$20,000

| | | Score |
|----|-----------------|--------|
| 01 | USA | 100.00 |
| 02 | Netherlands | 98.10 |
| 03 | Singapore | 97.40 |
| 04 | Denmark | 96.93 |
| 05 | Switzerland | 96.24 |
| 06 | Korea Rep. | 94.80 |
| 07 | Sweden | 94.12 |
| 08 | Finland | 94.05 |
| 09 | Taiwan, China | 93.73 |
| 10 | Hong Kong SAR | 93.64 |
| 11 | Canada | 91.98 |
| 12 | UAE | 88.86 |
| 13 | Israel | 87.70 |
| 14 | Norway | 85.96 |
| 15 | Belgium | 85.95 |
| 16 | Australia | 85.28 |
| 17 | Iceland | 84.94 |
| 18 | Estonia | 84.77 |
| 19 | United Kingdom | 83.12 |
| 20 | Ireland | 81.48 |
| 21 | Austria | 81.10 |
| 22 | Germany | 80.86 |
| 23 | Czech Republic | 79.42 |
| 24 | New Zealand | 79.08 |
| 25 | Luxembourg | 78.73 |
| 26 | France | 78.65 |
| 27 | Lithuania | 77.23 |
| 28 | Qatar | 77.01 |
| 29 | Saudi Arabia | 76.99 |
| 30 | Spain | 76.62 |
| 31 | Japan | 75.43 |
| 32 | Portugal | 69.78 |
| 33 | Slovenia | 69.14 |
| 34 | Bahrain | 69.06 |
| 35 | Latvia | 66.36 |
| 36 | Kuwait | 65.14 |
| 37 | Italy | 64.39 |
| 38 | Slovak Republic | 58.31 |
| 39 | Cyprus | 54.77 |
| 40 | Greece | 54.70 |

GDP per capita less than \$20,000

| | | Score |
|----|--------------|-------|
| 01 | China | 84.41 |
| 02 | Malaysia | 75.31 |
| 03 | Kazakhstan | 71.84 |
| 04 | Thailand | 70.53 |
| 05 | Poland | 66.53 |
| 06 | Chile | 64.84 |
| 07 | Croatia | 62.01 |
| 08 | Indonesia | 60.36 |
| 09 | Hungary | 58.25 |
| 10 | Romania | 58.25 |
| 11 | India | 57.74 |
| 12 | Jordan | 56.88 |
| 13 | Turkey | 54.27 |
| 14 | Mexico | 51.26 |
| 15 | Bulgaria | 50.66 |
| 16 | Peru | 50.17 |
| 17 | Brazil | 49.70 |
| 18 | South Africa | 48.61 |
| 19 | Philippines | 48.31 |
| 20 | Botswana | 47.51 |
| 21 | Argentina | 46.33 |
| 22 | Colombia | 45.09 |
| 23 | Mongolia | 43.03 |
| 24 | Venezuela | 22.55 |









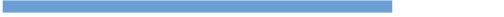





The 2023 IMD World Digital Competitiveness Rankings

Europe - Middle East - Africa










| | | | Score |
|----|-----------------|--|-------|
| 01 | Netherlands | | 98.10 |
| 02 | Denmark | | 96.93 |
| 03 | Switzerland | | 96.24 |
| 04 | Sweden | | 94.12 |
| 05 | Finland | | 94.05 |
| 06 | UAE | | 88.86 |
| 07 | Israel | | 87.70 |
| 08 | Norway | | 85.96 |
| 09 | Belgium | | 85.95 |
| 10 | Iceland | | 84.94 |
| 11 | Estonia | | 84.77 |
| 12 | United Kingdom | | 83.12 |
| 13 | Ireland | | 81.48 |
| 14 | Austria | | 81.10 |
| 15 | Germany | | 80.86 |
| 16 | Czech Republic | | 79.42 |
| 17 | Luxembourg | | 78.73 |
| 18 | France | | 78.65 |
| 19 | Lithuania | | 77.23 |
| 20 | Qatar | | 77.01 |
| 21 | Saudi Arabia | | 76.99 |
| 22 | Spain | | 76.62 |
| 23 | Kazakhstan | | 71.84 |
| 24 | Portugal | | 69.78 |
| 25 | Slovenia | | 69.14 |
| 26 | Bahrain | | 69.06 |
| 27 | Poland | | 66.53 |
| 28 | Latvia | | 66.36 |
| 29 | Kuwait | | 65.14 |
| 30 | Italy | | 64.39 |
| 31 | Croatia | | 62.01 |
| 32 | Slovak Republic | | 58.31 |
| 33 | Hungary | | 58.25 |
| 34 | Romania | | 58.25 |
| 35 | Jordan | | 56.88 |
| 36 | Cyprus | | 54.77 |
| 37 | Greece | | 54.70 |
| 38 | Turkey | | 54.27 |
| 39 | Bulgaria | | 50.66 |
| 40 | South Africa | | 48.61 |
| 41 | Botswana | | 47.51 |

Selected Breakdowns

Asia - Pacific

| | | | Score |
|----|---------------|--------------------------------------------------------------------------------------|-------|
| 01 | Singapore |  | 97.40 |
| 02 | Korea Rep. |  | 94.80 |
| 03 | Taiwan, China |  | 93.73 |
| 04 | Hong Kong SAR |  | 93.64 |
| 05 | Australia |  | 85.28 |
| 06 | China |  | 84.41 |
| 07 | New Zealand |  | 79.08 |
| 08 | Japan |  | 75.43 |
| 09 | Malaysia |  | 75.31 |
| 10 | Thailand |  | 70.53 |
| 11 | Indonesia |  | 60.36 |
| 12 | India |  | 57.74 |
| 13 | Philippines |  | 48.31 |
| 14 | Mongolia |  | 43.03 |

The Americas

| | | | Score |
|----|-----------|--------------------------------------------------------------------------------------|--------|
| 01 | USA |  | 100.00 |
| 02 | Canada |  | 91.98 |
| 03 | Chile |  | 64.84 |
| 04 | Mexico |  | 51.26 |
| 05 | Peru |  | 50.17 |
| 06 | Brazil |  | 49.70 |
| 07 | Argentina |  | 46.33 |
| 08 | Colombia |  | 45.09 |
| 09 | Venezuela |  | 22.55 |

The 2023 IMD World Digital Competitiveness Rankings

KNOWLEDGE

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

| | | | Score | |
|----|-----------------|--|-------|-----|
| 01 | Switzerland | | 92.90 | - |
| 02 | USA | | 92.56 | ↗ 2 |
| 03 | Singapore | | 92.11 | ↗ 2 |
| 04 | Canada | | 91.89 | ↗ 1 |
| 05 | Sweden | | 90.55 | ↗ 3 |
| 06 | Hong Kong SAR | | 89.81 | ↗ 1 |
| 07 | Netherlands | | 88.96 | ↗ 1 |
| 08 | Israel | | 86.58 | ↗ 2 |
| 09 | Denmark | | 86.19 | ↗ 3 |
| 10 | Korea Rep. | | 83.99 | ↗ 6 |
| 11 | Finland | | 83.91 | ↗ 2 |
| 12 | Belgium | | 81.93 | ↗ 9 |
| 13 | United Kingdom | | 81.17 | ↗ 1 |
| 14 | Germany | | 80.74 | ↗ 3 |
| 15 | Australia | | 80.72 | ↗ 1 |
| 16 | Austria | | 80.08 | ↗ 3 |
| 17 | UAE | | 80.02 | ↗ 2 |
| 18 | Taiwan, China | | 78.35 | - |
| 19 | Ireland | | 77.61 | ↗ 3 |
| 20 | Norway | | 77.30 | ↗ 1 |
| 21 | China | | 75.59 | ↗ 4 |
| 22 | France | | 75.48 | ↗ 2 |
| 23 | Lithuania | | 72.19 | ↗ 1 |
| 24 | Czech Republic | | 72.01 | ↗ 8 |
| 25 | Estonia | | 70.71 | ↗ 2 |
| 26 | Spain | | 70.48 | ↗ 1 |
| 27 | Slovenia | | 70.36 | ↗ 1 |
| 28 | Japan | | 69.58 | - |
| 29 | Malaysia | | 69.17 | ↗ 4 |
| 30 | Kazakhstan | | 69.10 | - |
| 31 | Portugal | | 67.21 | ↗ 2 |
| 32 | Iceland | | 66.18 | ↗ 1 |
| 33 | Luxembourg | | 65.67 | ↗ 2 |
| 34 | New Zealand | | 65.55 | ↗ 1 |
| 35 | Saudi Arabia | | 63.40 | ↗ 2 |
| 36 | Bahrain | | 62.86 | ↗ 2 |
| 37 | Poland | | 62.50 | ↗ 5 |
| 38 | Qatar | | 57.83 | - |
| 39 | Latvia | | 57.82 | ↗ 3 |
| 40 | Croatia | | 57.68 | - |
| 41 | Thailand | | 55.99 | ↗ 4 |
| 42 | Slovak Republic | | 55.66 | ↗ 2 |
| 43 | Italy | | 55.39 | ↗ 2 |
| 44 | Kuwait | | 54.63 | - |
| 45 | India | | 54.62 | ↗ 1 |
| 46 | Hungary | | 52.89 | ↗ 3 |
| 47 | Chile | | 51.24 | ↗ 3 |
| 48 | Cyprus | | 51.01 | ↗ 9 |
| 49 | Romania | | 49.37 | - |
| 50 | Mexico | | 48.44 | ↗ 2 |
| 51 | Greece | | 48.09 | ↗ 4 |
| 52 | Botswana | | 47.76 | ↗ 3 |
| 53 | Bulgaria | | 47.76 | ↗ 5 |
| 54 | Colombia | | 45.73 | ↗ 3 |
| 55 | Peru | | 45.40 | ↗ 1 |
| 56 | Mongolia | | 44.78 | ↗ 5 |
| 57 | Brazil | | 44.77 | ↗ 6 |
| 58 | South Africa | | 44.45 | ↗ 4 |
| 59 | Jordan | | 44.16 | ↗ 6 |
| 60 | Indonesia | | 43.97 | - |
| 61 | Turkey | | 42.73 | ↗ 2 |
| 62 | Argentina | | 40.76 | ↗ 4 |
| 63 | Philippines | | 36.95 | ↗ 1 |
| 64 | Venezuela | | 33.65 | ↗ 1 |

Selected Breakdowns

TECHNOLOGY

Overall context that enables the development of digital technologies

| | | | Score | |
|----|-----------------|--|-------|-----|
| 01 | Singapore | | 94.67 | - |
| 02 | Hong Kong SAR | | 94.32 | - |
| 03 | Taiwan, China | | 93.31 | ↗ 3 |
| 04 | UAE | | 92.28 | ✓ 1 |
| 05 | Netherlands | | 91.70 | ✓ 1 |
| 06 | USA | | 91.00 | ↗ 3 |
| 07 | Denmark | | 89.39 | - |
| 08 | Iceland | | 89.36 | ↗ 3 |
| 09 | Finland | | 87.95 | ✓ 1 |
| 10 | Switzerland | | 86.25 | ↗ 2 |
| 11 | Sweden | | 85.83 | ✓ 6 |
| 12 | Korea Rep. | | 82.10 | ↗ 1 |
| 13 | Canada | | 81.95 | ↗ 1 |
| 14 | Norway | | 81.58 | ✓ 4 |
| 15 | Thailand | | 80.06 | ↗ 5 |
| 16 | Qatar | | 79.91 | ↗ 1 |
| 17 | Saudi Arabia | | 79.59 | ↗ 9 |
| 18 | Australia | | 79.06 | ✓ 3 |
| 19 | Belgium | | 78.54 | ↗ 5 |
| 20 | France | | 78.50 | ✓ 4 |
| 21 | New Zealand | | 78.30 | ↗ 7 |
| 22 | China | | 78.25 | ✓ 4 |
| 23 | Estonia | | 77.84 | ✓ 2 |
| 24 | Israel | | 76.07 | ✓ 2 |
| 25 | Luxembourg | | 75.14 | ✓ 6 |
| 26 | Czech Republic | | 74.49 | ↗ 9 |
| 27 | Malaysia | | 73.85 | ↗ 2 |
| 28 | Ireland | | 72.26 | ↗ 9 |
| 29 | United Kingdom | | 71.82 | ✓ 4 |
| 30 | Bahrain | | 71.25 | ✓ 7 |
| 31 | Spain | | 71.21 | ↗ 2 |
| 32 | Japan | | 70.91 | ✓ 2 |
| 33 | Lithuania | | 68.93 | ✓ 1 |
| 34 | Germany | | 68.07 | ✓ 7 |
| 35 | Austria | | 66.99 | ↗ 1 |
| 36 | Hungary | | 64.85 | ✓ 5 |
| 37 | Kuwait | | 64.31 | - |
| 38 | Chile | | 63.61 | ↗ 3 |
| 39 | Indonesia | | 61.76 | ↗ 6 |
| 40 | Portugal | | 60.79 | ✓ 1 |
| 41 | Kazakhstan | | 59.41 | ✓ 1 |
| 42 | Croatia | | 59.21 | - |
| 43 | Latvia | | 59.16 | ✓ 9 |
| 44 | Poland | | 59.12 | ↗ 2 |
| 45 | Slovenia | | 58.75 | ✓ 7 |
| 46 | Italy | | 57.07 | ✓ 2 |
| 47 | Greece | | 54.87 | - |
| 48 | Jordan | | 53.25 | ↗ 2 |
| 49 | Romania | | 53.11 | ↗ 1 |
| 50 | India | | 50.93 | ✓ 7 |
| 51 | Philippines | | 49.57 | ✓ 2 |
| 52 | Botswana | | 48.39 | ↗ 7 |
| 53 | Cyprus | | 47.38 | ↗ 1 |
| 54 | Slovak Republic | | 47.29 | ✓ 1 |
| 55 | Turkey | | 46.62 | ✓ 1 |
| 56 | Bulgaria | | 43.80 | ✓ 5 |
| 57 | Peru | | 42.44 | - |
| 58 | Mexico | | 39.95 | ✓ 2 |
| 59 | South Africa | | 39.55 | ✓ 1 |
| 60 | Brazil | | 38.34 | ✓ 5 |
| 61 | Mongolia | | 31.90 | ✓ 1 |
| 62 | Colombia | | 31.53 | ✓ 1 |
| 63 | Argentina | | 28.74 | ✓ 1 |
| 64 | Venezuela | | 0.00 | ✓ 1 |

FUTURE READINESS

Level of country preparedness to exploit digital transformation

| | | | Score | | |
|----|-----------------|--|--------|---|----|
| 01 | Korea Rep. | | 100.00 | ↗ | 1 |
| 02 | USA | | 98.14 | ↗ | 1 |
| 03 | Denmark | | 96.90 | ↘ | 2 |
| 04 | Netherlands | | 95.35 | ↗ | 1 |
| 05 | Finland | | 92.01 | ↗ | 1 |
| 06 | Switzerland | | 91.28 | ↗ | 1 |
| 07 | Taiwan, China | | 91.23 | ↗ | 1 |
| 08 | Sweden | | 87.68 | ↘ | 4 |
| 09 | Estonia | | 87.46 | ↗ | 3 |
| 10 | Singapore | | 87.11 | - | - |
| 11 | Canada | | 83.80 | - | - |
| 12 | Israel | | 82.15 | ↗ | 2 |
| 13 | China | | 81.10 | ↗ | 2 |
| 14 | Iceland | | 80.99 | ↗ | 7 |
| 15 | Norway | | 80.70 | ↘ | 6 |
| 16 | Belgium | | 79.10 | ↗ | 9 |
| 17 | Hong Kong SAR | | 78.51 | ↗ | 1 |
| 18 | United Kingdom | | 78.09 | ↘ | 2 |
| 19 | Austria | | 77.95 | ↘ | 6 |
| 20 | Australia | | 77.78 | ↘ | 3 |
| 21 | Luxembourg | | 77.08 | ↗ | 14 |
| 22 | Ireland | | 76.28 | - | - |
| 23 | UAE | | 75.99 | ↘ | 3 |
| 24 | Germany | | 75.46 | ↘ | 5 |
| 25 | New Zealand | | 75.10 | ↗ | 1 |
| 26 | Qatar | | 75.00 | ↘ | 3 |
| 27 | Czech Republic | | 73.47 | ↗ | 2 |
| 28 | Lithuania | | 72.27 | ↘ | 4 |
| 29 | Spain | | 69.89 | ↘ | 2 |
| 30 | Saudi Arabia | | 69.70 | ↗ | 7 |
| 31 | Kazakhstan | | 68.73 | ↘ | 1 |
| 32 | Japan | | 67.49 | ↘ | 4 |
| 33 | Malaysia | | 64.60 | ↘ | 2 |
| 34 | Latvia | | 63.81 | ↘ | 2 |
| 35 | France | | 63.68 | ↘ | 1 |
| 36 | Portugal | | 63.04 | ↗ | 4 |
| 37 | Italy | | 62.40 | ↗ | 1 |
| 38 | Chile | | 61.37 | ↘ | 5 |
| 39 | Slovenia | | 60.03 | ↗ | 2 |
| 40 | Poland | | 59.67 | ↗ | 3 |
| 41 | Kuwait | | 58.20 | - | - |
| 42 | Thailand | | 57.23 | ↗ | 7 |
| 43 | Indonesia | | 57.05 | ↗ | 9 |
| 44 | Turkey | | 55.17 | - | - |
| 45 | Jordan | | 54.95 | ↗ | 10 |
| 46 | Bahrain | | 54.77 | ↘ | 10 |
| 47 | Romania | | 53.96 | ↗ | 4 |
| 48 | Slovak Republic | | 53.70 | ↘ | 3 |
| 49 | Argentina | | 51.19 | ↘ | 3 |
| 50 | Croatia | | 50.86 | ↘ | 2 |
| 51 | India | | 49.37 | ↘ | 9 |
| 52 | Brazil | | 47.71 | ↘ | 5 |
| 53 | Cyprus | | 47.64 | ↗ | 14 |
| 54 | Mexico | | 47.10 | ↘ | 1 |
| 55 | Peru | | 44.38 | ↘ | 1 |
| 56 | South Africa | | 43.55 | ↗ | 3 |
| 57 | Greece | | 42.86 | ↗ | 3 |
| 58 | Bulgaria | | 42.11 | ↘ | 8 |
| 59 | Philippines | | 40.10 | ↘ | 1 |
| 60 | Colombia | | 39.71 | ↘ | 4 |
| 61 | Hungary | | 38.71 | ↘ | 4 |
| 62 | Mongolia | | 34.12 | - | - |
| 63 | Botswana | | 28.07 | ↘ | 2 |
| 64 | Venezuela | | 15.72 | ↘ | 1 |

FACTOR RANKINGS

OVERALL

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|-----------------|------|------|------|------|------|
| Argentina | 59 | 59 | 61 | 59 | 61 |
| Australia | 14 | 15 | 20 | 14 | 16 |
| Austria | 20 | 17 | 16 | 18 | 22 |
| Bahrain | - | - | - | 32 | 38 |
| Belgium | 25 | 25 | 26 | 23 | 15 |
| Botswana | - | - | 63 | 61 | 60 |
| Brazil | 57 | 51 | 51 | 52 | 57 |
| Bulgaria | 45 | 45 | 52 | 48 | 55 |
| Canada | 11 | 12 | 13 | 10 | 11 |
| Chile | 42 | 41 | 39 | 41 | 42 |
| China | 22 | 16 | 15 | 17 | 19 |
| Colombia | 58 | 61 | 59 | 60 | 62 |
| Croatia | 51 | 52 | 55 | 43 | 44 |
| Cyprus | 54 | 40 | 43 | 45 | 51 |
| Czech Republic | 37 | 35 | 33 | 33 | 24 |
| Denmark | 04 | 03 | 04 | 01 | 04 |
| Estonia | 29 | 21 | 25 | 20 | 18 |
| Finland | 07 | 10 | 11 | 07 | 08 |
| France | 24 | 24 | 24 | 22 | 27 |
| Germany | 17 | 18 | 18 | 19 | 23 |
| Greece | 53 | 46 | 44 | 50 | 52 |
| Hong Kong SAR | 08 | 05 | 02 | 09 | 10 |
| Hungary | 43 | 47 | 45 | 42 | 47 |
| Iceland | 27 | 23 | 21 | 21 | 17 |
| India | 44 | 48 | 46 | 44 | 49 |
| Indonesia | 56 | 56 | 53 | 51 | 45 |
| Ireland | 19 | 20 | 19 | 24 | 21 |
| Israel | 16 | 19 | 17 | 15 | 13 |
| Italy | 41 | 42 | 40 | 39 | 43 |
| Japan | 23 | 27 | 28 | 29 | 32 |
| Jordan | 50 | 53 | 49 | 53 | 50 |
| Kazakhstan | 35 | 36 | 32 | 36 | 34 |
| Korea Rep. | 10 | 08 | 12 | 08 | 06 |
| Kuwait | - | - | - | - | 41 |
| Latvia | 36 | 38 | 37 | 34 | 40 |
| Lithuania | 30 | 29 | 30 | 25 | 28 |
| Luxembourg | 21 | 28 | 22 | 30 | 26 |
| Malaysia | 26 | 26 | 27 | 31 | 33 |
| Mexico | 49 | 54 | 56 | 55 | 54 |
| Mongolia | 62 | 62 | 62 | 62 | 63 |
| Netherlands | 06 | 07 | 07 | 06 | 02 |
| New Zealand | 18 | 22 | 23 | 27 | 25 |
| Norway | 09 | 09 | 09 | 12 | 14 |
| Peru | 61 | 55 | 57 | 57 | 56 |
| Philippines | 55 | 57 | 58 | 56 | 59 |
| Poland | 33 | 32 | 41 | 46 | 39 |
| Portugal | 34 | 37 | 34 | 38 | 36 |
| Qatar | 31 | 30 | 29 | 26 | 29 |
| Romania | 46 | 49 | 50 | 49 | 48 |
| Saudi Arabia | 39 | 34 | 36 | 35 | 30 |
| Singapore | 02 | 02 | 05 | 04 | 03 |
| Slovak Republic | 47 | 50 | 47 | 47 | 46 |
| Slovenia | 32 | 31 | 35 | 37 | 37 |
| South Africa | 48 | 60 | 60 | 58 | 58 |
| Spain | 28 | 33 | 31 | 28 | 31 |
| Sweden | 03 | 04 | 03 | 03 | 07 |
| Switzerland | 05 | 06 | 06 | 05 | 05 |
| Taiwan, China | 13 | 11 | 08 | 11 | 09 |
| Thailand | 40 | 39 | 38 | 40 | 35 |
| Turkey | 52 | 44 | 48 | 54 | 53 |
| UAE | 12 | 14 | 10 | 13 | 12 |
| United Kingdom | 15 | 13 | 14 | 16 | 20 |
| USA | 01 | 01 | 01 | 02 | 01 |
| Venezuela | 63 | 63 | 64 | 63 | 64 |

KNOWLEDGE

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|----|------|------|------|------|------|
| 58 | 50 | 55 | 58 | 62 | |
| 15 | 17 | 19 | 14 | 15 | |
| 10 | 11 | 10 | 13 | 16 | |
| - | - | - | 34 | 36 | |
| 23 | 21 | 21 | 21 | 12 | |
| - | - | 64 | 55 | 52 | |
| 59 | 57 | 51 | 51 | 57 | |
| 46 | 47 | 53 | 48 | 53 | |
| 05 | 05 | 07 | 03 | 04 | |
| 50 | 49 | 49 | 50 | 47 | |
| 18 | 08 | 06 | 17 | 21 | |
| 57 | 59 | 56 | 57 | 54 | |
| 42 | 41 | 47 | 40 | 40 | |
| 55 | 40 | 39 | 39 | 48 | |
| 37 | 37 | 35 | 32 | 24 | |
| 06 | 06 | 08 | 06 | 09 | |
| 30 | 23 | 27 | 23 | 25 | |
| 09 | 15 | 09 | 09 | 11 | |
| 20 | 20 | 20 | 20 | 22 | |
| 12 | 12 | 14 | 11 | 14 | |
| 53 | 48 | 45 | 47 | 51 | |
| 07 | 07 | 05 | 07 | 06 | |
| 44 | 44 | 43 | 43 | 46 | |
| 29 | 27 | 33 | 31 | 32 | |
| 38 | 39 | 41 | 46 | 45 | |
| 56 | 63 | 60 | 60 | 60 | |
| 24 | 24 | 23 | 22 | 19 | |
| 08 | 09 | 12 | 10 | 08 | |
| 41 | 42 | 40 | 41 | 43 | |
| 25 | 22 | 25 | 28 | 28 | |
| 49 | 54 | 48 | 53 | 59 | |
| 32 | 34 | 36 | 30 | 30 | |
| 11 | 10 | 15 | 16 | 10 | |
| - | - | - | - | 44 | |
| 36 | 36 | 34 | 36 | 39 | |
| 26 | 25 | 26 | 24 | 23 | |
| 34 | 35 | 29 | 35 | 33 | |
| 19 | 19 | 22 | 25 | 29 | |
| 52 | 52 | 54 | 52 | 50 | |
| 62 | 58 | 58 | 61 | 56 | |
| 13 | 14 | 11 | 08 | 07 | |
| 21 | 28 | 28 | 33 | 34 | |
| 16 | 16 | 17 | 19 | 20 | |
| 61 | 55 | 59 | 56 | 55 | |
| 51 | 62 | 63 | 62 | 63 | |
| 33 | 30 | 38 | 42 | 37 | |
| 31 | 33 | 32 | 29 | 31 | |
| 45 | 45 | 44 | 38 | 38 | |
| 47 | 53 | 52 | 49 | 49 | |
| 39 | 46 | 50 | 37 | 35 | |
| 03 | 02 | 04 | 05 | 03 | |
| 48 | 51 | 46 | 44 | 42 | |
| 27 | 29 | 30 | 26 | 27 | |
| 54 | 60 | 62 | 54 | 58 | |
| 28 | 32 | 31 | 27 | 26 | |
| 04 | 04 | 02 | 02 | 05 | |
| 02 | 03 | 01 | 01 | 01 | |
| 17 | 18 | 16 | 18 | 18 | |
| 43 | 43 | 42 | 45 | 41 | |
| 60 | 56 | 57 | 59 | 61 | |
| 35 | 31 | 18 | 15 | 17 | |
| 14 | 13 | 13 | 12 | 13 | |
| 01 | 01 | 03 | 04 | 02 | |
| 63 | 61 | 61 | 63 | 64 | |

TECHNOLOGY

| 2019 | 2020 | 2021 | 2022 | 2023 |
|------|------|------|------|------|
| 56 | 62 | 62 | 62 | 63 |
| 14 | 14 | 18 | 15 | 18 |
| 32 | 28 | 32 | 36 | 35 |
| - | - | - | 23 | 30 |
| 21 | 19 | 23 | 24 | 19 |
| - | - | 63 | 59 | 52 |
| 57 | 57 | 55 | 55 | 60 |
| 42 | 45 | 51 | 51 | 56 |
| 13 | 13 | 15 | 14 | 13 |
| 41 | 40 | 35 | 41 | 38 |
| 26 | 27 | 20 | 18 | 22 |
| 60 | 61 | 60 | 61 | 62 |
| 50 | 49 | 50 | 42 | 42 |
| 59 | 52 | 53 | 52 | 53 |
| 34 | 36 | 37 | 35 | 26 |
| 11 | 09 | 09 | 07 | 07 |
| 22 | 23 | 25 | 21 | 23 |
| 08 | 10 | 12 | 08 | 09 |
| 16 | 15 | 16 | 16 | 20 |
| 31 | 31 | 31 | 27 | 34 |
| 54 | 43 | 46 | 47 | 47 |
| 04 | 02 | 01 | 02 | 02 |
| 36 | 39 | 36 | 31 | 36 |
| 20 | 21 | 10 | 11 | 08 |
| 49 | 50 | 44 | 43 | 50 |
| 47 | 54 | 49 | 45 | 39 |
| 28 | 30 | 28 | 37 | 28 |
| 30 | 32 | 27 | 22 | 24 |
| 46 | 46 | 42 | 44 | 46 |
| 24 | 26 | 30 | 30 | 32 |
| 53 | 44 | 43 | 50 | 48 |
| 39 | 41 | 40 | 40 | 41 |
| 17 | 12 | 13 | 13 | 12 |
| - | - | - | - | 37 |
| 23 | 34 | 34 | 34 | 43 |
| 25 | 29 | 29 | 32 | 33 |
| 12 | 17 | 14 | 19 | 25 |
| 19 | 20 | 26 | 29 | 27 |
| 52 | 56 | 57 | 56 | 58 |
| 62 | 60 | 61 | 60 | 61 |
| 06 | 08 | 07 | 04 | 05 |
| 15 | 18 | 21 | 28 | 21 |
| 03 | 03 | 06 | 10 | 14 |
| 58 | 58 | 56 | 57 | 57 |
| 55 | 53 | 54 | 49 | 51 |
| 37 | 37 | 41 | 46 | 44 |
| 38 | 38 | 38 | 39 | 40 |
| 33 | 25 | 19 | 17 | 16 |
| 45 | 48 | 47 | 48 | 49 |
| 40 | 24 | 24 | 26 | 17 |
| 01 | 01 | 03 | 01 | 01 |
| 44 | 51 | 45 | 53 | 54 |
| 35 | 35 | 39 | 38 | 45 |
| 51 | 55 | 59 | 58 | 59 |
| 29 | 33 | 33 | 33 | 31 |
| 07 | 06 | 08 | 05 | 11 |
| 10 | 11 | 11 | 12 | 10 |
| 09 | 05 | 02 | 06 | 03 |
| 27 | 22 | 22 | 20 | 15 |
| 48 | 42 | 52 | 54 | 55 |
| 02 | 04 | 05 | 03 | 04 |
| 18 | 16 | 17 | 25 | 29 |
| 05 | 07 | 04 | 09 | 06 |
| 63 | 63 | 64 | 63 | 64 |

FUTURE READINESS

| 2019 | 2020 | 2021 | 2022 | 2023 | |
|------|------|------|------|------|-----------------|
| 56 | 47 | 52 | 46 | 49 | Argentina |
| 14 | 17 | 22 | 17 | 20 | Australia |
| 23 | 16 | 16 | 13 | 19 | Austria |
| - | - | - | 36 | 46 | Bahrain |
| 25 | 25 | 26 | 25 | 16 | Belgium |
| - | - | 63 | 61 | 63 | Botswana |
| 43 | 43 | 45 | 47 | 52 | Brazil |
| 48 | 44 | 55 | 50 | 58 | Bulgaria |
| 18 | 15 | 15 | 11 | 11 | Canada |
| 37 | 39 | 36 | 33 | 38 | Chile |
| 21 | 18 | 17 | 15 | 13 | China |
| 55 | 50 | 53 | 56 | 60 | Colombia |
| 60 | 62 | 60 | 48 | 50 | Croatia |
| 40 | 29 | 34 | 39 | 53 | Cyprus |
| 39 | 36 | 37 | 29 | 27 | Czech Republic |
| 02 | 01 | 02 | 01 | 03 | Denmark |
| 30 | 20 | 20 | 12 | 09 | Estonia |
| 07 | 09 | 09 | 06 | 05 | Finland |
| 29 | 31 | 31 | 34 | 35 | France |
| 16 | 19 | 18 | 19 | 24 | Germany |
| 53 | 46 | 43 | 60 | 57 | Greece |
| 15 | 10 | 10 | 18 | 17 | Hong Kong SAR |
| 57 | 60 | 61 | 57 | 61 | Hungary |
| 26 | 22 | 25 | 21 | 14 | Iceland |
| 46 | 56 | 50 | 42 | 51 | India |
| 58 | 48 | 48 | 52 | 43 | Indonesia |
| 05 | 14 | 14 | 22 | 22 | Ireland |
| 19 | 23 | 21 | 14 | 12 | Israel |
| 31 | 38 | 30 | 38 | 37 | Italy |
| 24 | 26 | 27 | 28 | 32 | Japan |
| 52 | 58 | 56 | 55 | 45 | Jordan |
| 35 | 33 | 28 | 30 | 31 | Kazakhstan |
| 04 | 03 | 05 | 02 | 01 | Korea Rep. |
| - | - | - | - | 41 | Kuwait |
| 45 | 42 | 42 | 32 | 34 | Latvia |
| 32 | 30 | 33 | 24 | 28 | Lithuania |
| 17 | 27 | 24 | 35 | 21 | Luxembourg |
| 28 | 32 | 29 | 31 | 33 | Malaysia |
| 49 | 52 | 51 | 53 | 54 | Mexico |
| 61 | 59 | 62 | 62 | 62 | Mongolia |
| 03 | 04 | 04 | 05 | 04 | Netherlands |
| 20 | 21 | 19 | 26 | 25 | New Zealand |
| 08 | 06 | 08 | 09 | 15 | Norway |
| 59 | 55 | 54 | 54 | 55 | Peru |
| 54 | 54 | 57 | 58 | 59 | Philippines |
| 33 | 35 | 39 | 43 | 40 | Poland |
| 34 | 41 | 38 | 40 | 36 | Portugal |
| 22 | 24 | 23 | 23 | 26 | Qatar |
| 51 | 49 | 49 | 51 | 47 | Romania |
| 38 | 28 | 32 | 37 | 30 | Saudi Arabia |
| 11 | 12 | 11 | 10 | 10 | Singapore |
| 47 | 51 | 46 | 45 | 48 | Slovak Republic |
| 36 | 37 | 40 | 41 | 39 | Slovenia |
| 44 | 57 | 59 | 59 | 56 | South Africa |
| 27 | 40 | 35 | 27 | 29 | Spain |
| 06 | 07 | 06 | 04 | 08 | Sweden |
| 10 | 05 | 03 | 07 | 06 | Switzerland |
| 12 | 08 | 07 | 08 | 07 | Taiwan, China |
| 50 | 45 | 44 | 49 | 42 | Thailand |
| 41 | 34 | 41 | 44 | 44 | Turkey |
| 09 | 11 | 12 | 20 | 23 | UAE |
| 13 | 13 | 13 | 16 | 18 | United Kingdom |
| 01 | 02 | 01 | 03 | 02 | USA |
| 63 | 63 | 64 | 63 | 64 | Venezuela |

SUB-FACTOR RANKINGS

KNOWLEDGE

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

TECHNOLOGY

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

FUTURE READINESS

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

IMD World Digital Competitiveness Country Profiles

The statistical tables are available for subscribers of the

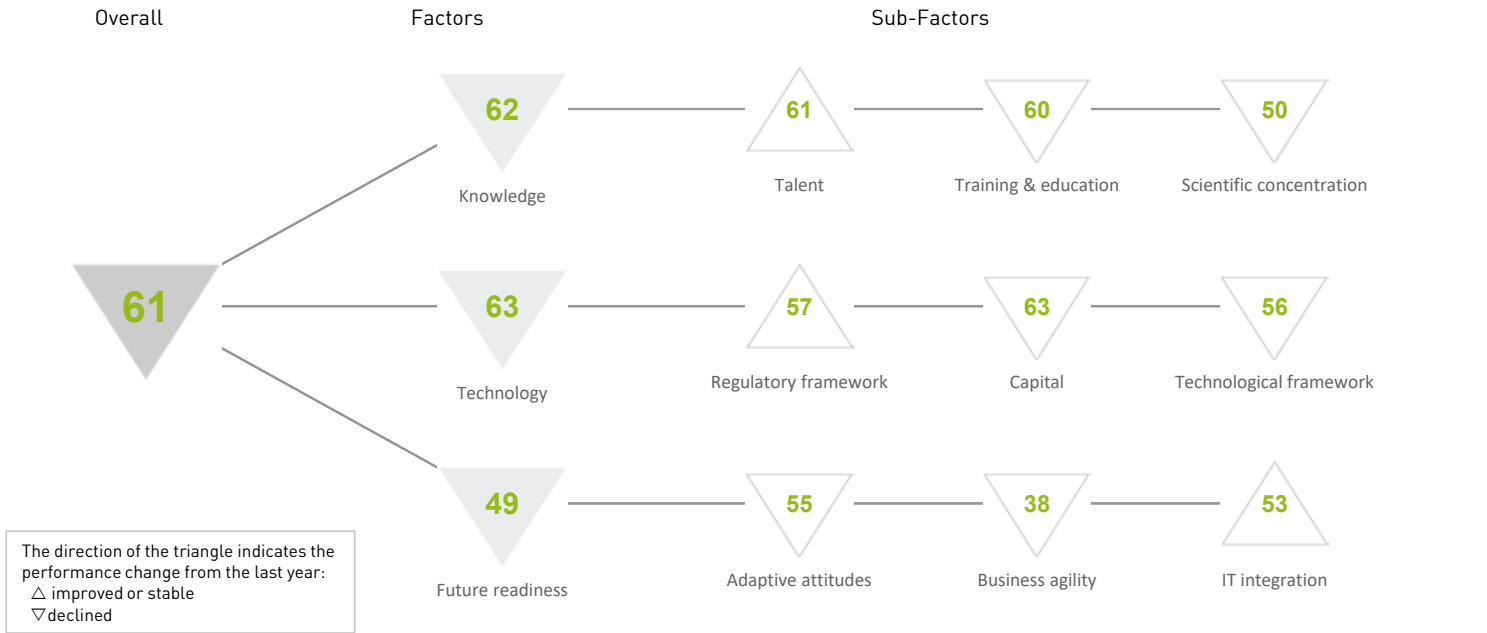
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ARGENTINA

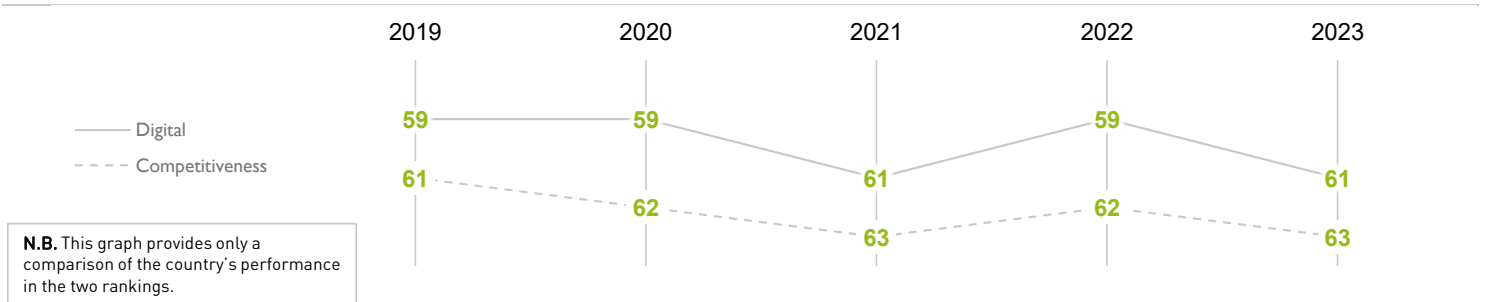
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

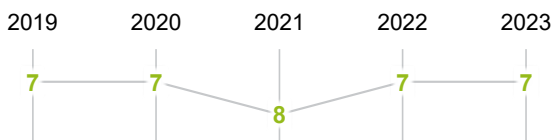
| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 59 | 59 | 61 | 59 | 61 |
| Knowledge | 58 | 50 | 55 | 58 | 62 |
| Technology | 56 | 62 | 62 | 62 | 63 |
| Future readiness | 56 | 47 | 52 | 46 | 49 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



ARGENTINA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 51 | 56 | 62 | 61 | 61 |
| Training & education | 62 | 43 | 46 | 49 | 60 |
| Scientific concentration | 50 | 55 | 48 | 48 | 50 |

Talent Rank

| | |
|--------------------------------------|----|
| Educational assessment PISA - Math | 54 |
| International experience | 50 |
| Foreign highly skilled personnel | 62 |
| Management of cities | 59 |
| Digital/Technological skills | 56 |
| ▶ Net flow of international students | 18 |

Training & education Rank

| | |
|------------------------------------------|----|
| ▷ Employee training | 64 |
| Total public expenditure on education | 29 |
| Higher education achievement | 58 |
| Pupil-teacher ratio (tertiary education) | 22 |
| Graduates in Sciences | 60 |
| Women with degrees | 44 |

Scientific concentration Rank

| | |
|-------------------------------------|----|
| Total expenditure on R&D (%) | 49 |
| Total R&D personnel per capita | 46 |
| ▶ Female researchers | 04 |
| R&D productivity by publication | 24 |
| Scientific and technical employment | 50 |
| High-tech patent grants | 57 |
| Robots in Education and R&D | 38 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 49 | 57 | 57 | 61 | 57 |
| Capital | 51 | 62 | 63 | 62 | 63 |
| Technological framework | 57 | 56 | 56 | 55 | 56 |

Regulatory framework Rank

| | |
|------------------------------------|----|
| Starting a business | 61 |
| Enforcing contracts | 49 |
| ▶ Immigration laws | 02 |
| Development & application of tech. | 62 |
| Scientific research legislation | 60 |
| Intellectual property rights | 62 |

Capital Rank

| | |
|-----------------------------------------|----|
| IT & media stock market capitalization | 41 |
| ▷ Funding for technological development | 63 |
| ▷ Banking and financial services | 63 |
| ▷ Country credit rating | 63 |
| ▷ Venture capital | 63 |
| Investment in Telecommunications | 37 |

Technological framework Rank

| | |
|------------------------------|----|
| Communications technology | 62 |
| Mobile broadband subscribers | 51 |
| Wireless broadband | 58 |
| Internet users | 26 |
| Internet bandwidth speed | 54 |
| High-tech exports (%) | 57 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 57 | 49 | 50 | 49 | 55 |
| Business agility | 48 | 39 | 43 | 37 | 38 |
| IT integration | 52 | 52 | 59 | 53 | 53 |

Adaptive attitudes Rank

| | |
|--------------------------------|----|
| E-Participation | 44 |
| Internet retailing | 38 |
| Tablet possession | 39 |
| Smartphone possession | 50 |
| Attitudes toward globalization | 61 |

Business agility Rank

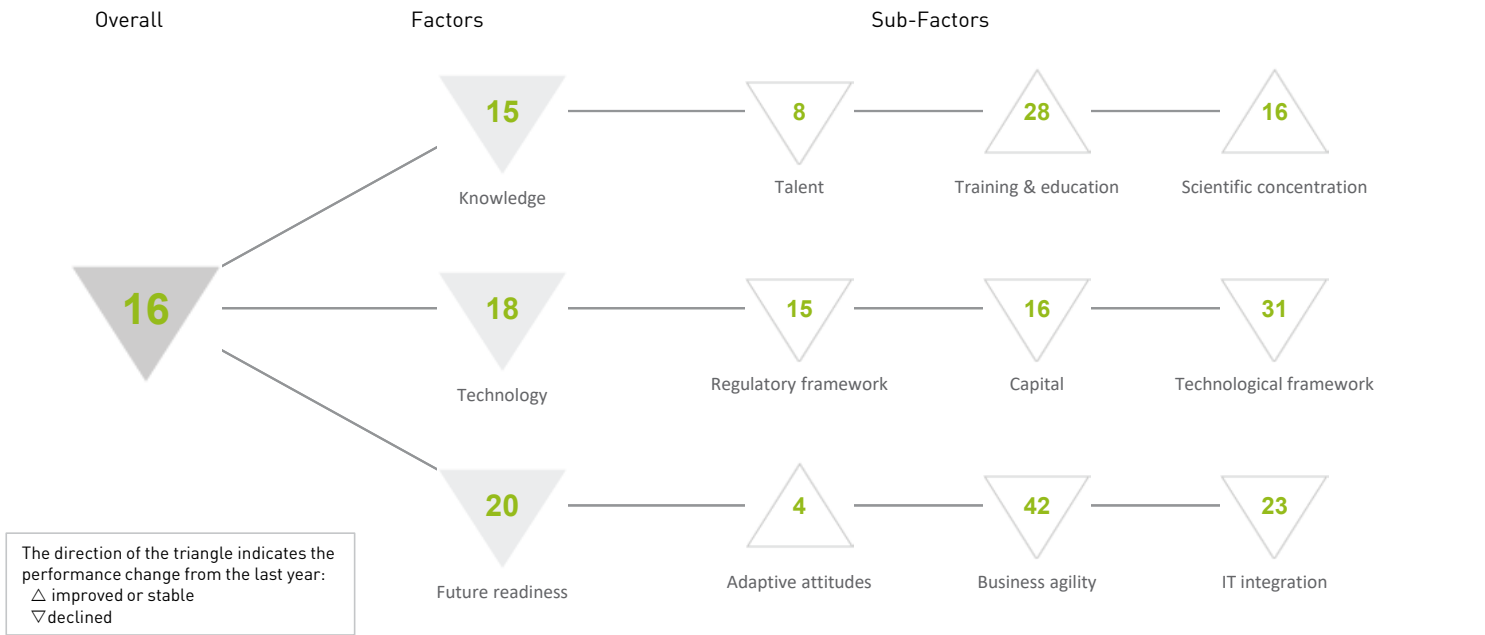
| | |
|-----------------------------------|----|
| ▶ Opportunities and threats | 12 |
| World robots distribution | 36 |
| Agility of companies | 53 |
| Use of big data and analytics | 50 |
| Knowledge transfer | 55 |
| ▶ Entrepreneurial fear of failure | 08 |

IT integration Rank

| | |
|------------------------------------|----|
| E-Government | 37 |
| Public-private partnerships | 54 |
| Cyber security | 59 |
| Software piracy | 58 |
| Government cyber security capacity | 34 |
| Privacy protection by law content | 31 |

AUSTRALIA

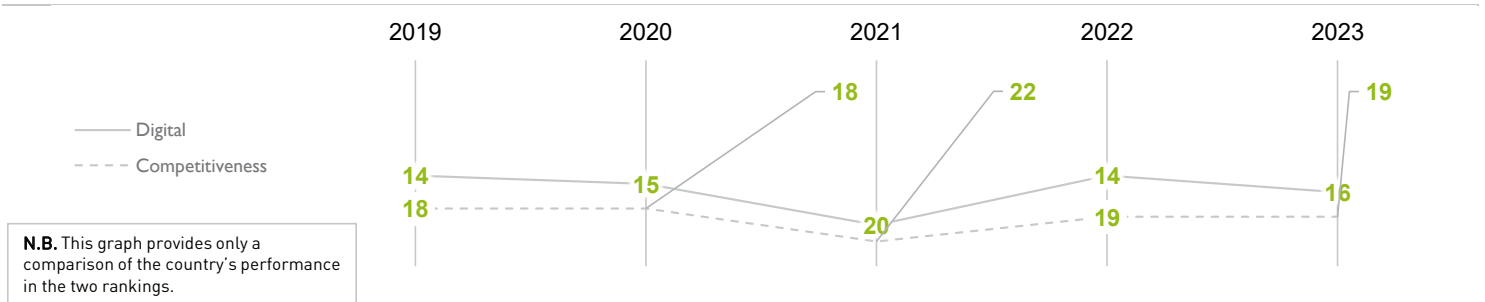
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 14 | 15 | 20 | 14 | 16 |
| Knowledge | 15 | 17 | 19 | 14 | 15 |
| Technology | 14 | 14 | 18 | 15 | 18 |
| Future readiness | 14 | 17 | 22 | 17 | 20 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



AUSTRALIA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 07 | 06 | 08 | 07 | 08 |
| Training & education | 29 | 28 | 37 | 29 | 28 |
| Scientific concentration | 13 | 19 | 18 | 16 | 16 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 28 | ▷ Employee training | 47 | Total expenditure on R&D (%) | 22 |
| International experience | 46 | Total public expenditure on education | 18 | Total R&D personnel per capita | - |
| Foreign highly skilled personnel | 12 | Higher education achievement | 18 | Female researchers | - |
| Management of cities | 22 | Pupil-teacher ratio (tertiary education) | - | R&D productivity by publication | 15 |
| Digital/Technological skills | 39 | Graduates in Sciences | 44 | Scientific and technical employment | 13 |
| ▶ Net flow of international students | 02 | Women with degrees | 07 | High-tech patent grants | 33 |
| | | | | Robots in Education and R&D | 20 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 07 | 06 | 17 | 10 | 15 |
| Capital | 19 | 13 | 17 | 13 | 16 |
| Technological framework | 17 | 20 | 27 | 26 | 31 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 05 | IT & media stock market capitalization | 38 | ▷ Communications technology | 49 |
| Enforcing contracts | 06 | Funding for technological development | 35 | Mobile broadband subscribers | 09 |
| Immigration laws | 42 | Banking and financial services | 29 | Wireless broadband | 14 |
| Development & application of tech. | 26 | ▶ Country credit rating | 01 | Internet users | 34 |
| Scientific research legislation | 24 | Venture capital | 34 | ▷ Internet bandwidth speed | 49 |
| Intellectual property rights | 16 | Investment in Telecommunications | 07 | High-tech exports (%) | 14 |

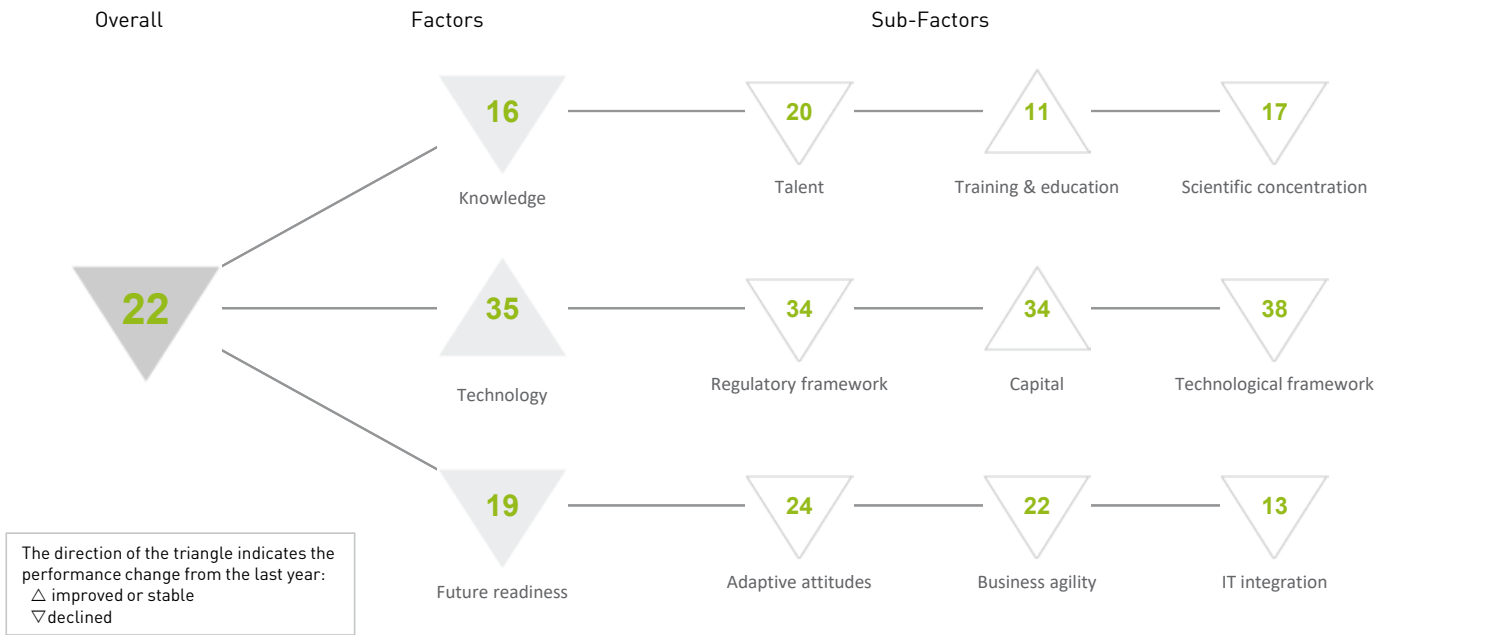
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 07 | 05 | 14 | 08 | 04 |
| Business agility | 35 | 43 | 55 | 40 | 42 |
| IT integration | 11 | 12 | 21 | 15 | 23 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| ▶ E-Participation | 02 | ▷ Opportunities and threats | 50 | E-Government | 07 |
| ▶ Internet retailing | 04 | World robots distribution | 30 | Public-private partnerships | 30 |
| ▶ Tablet possession | 03 | Agility of companies | 45 | ▷ Cyber security | 53 |
| Smartphone possession | 15 | Use of big data and analytics | 35 | Software piracy | 05 |
| Attitudes toward globalization | 28 | Knowledge transfer | 27 | Government cyber security capacity | 39 |
| | | Entrepreneurial fear of failure | 33 | Privacy protection by law content | 23 |

AUSTRIA

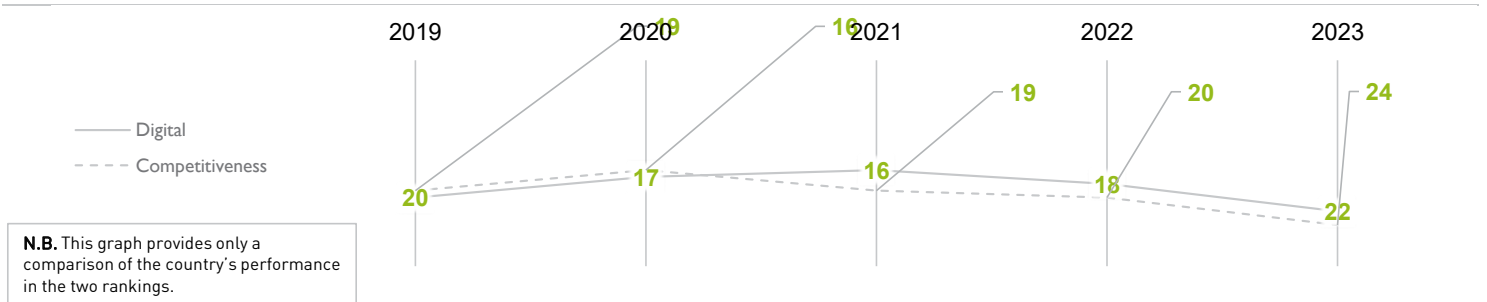
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 20 | 17 | 16 | 18 | 22 |
| Knowledge | 10 | 11 | 10 | 13 | 16 |
| Technology | 32 | 28 | 32 | 36 | 35 |
| Future readiness | 23 | 16 | 16 | 13 | 19 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



AUSTRIA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 12 | 12 | 15 | 16 | 20 |
| Training & education | 08 | 12 | 05 | 12 | 11 |
| Scientific concentration | 14 | 14 | 15 | 15 | 17 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 22 | ▶ Employee training | 01 | Total expenditure on R&D (%) | 09 |
| International experience | 20 | Total public expenditure on education | 32 | Total R&D personnel per capita | 10 |
| Foreign highly skilled personnel | 34 | Higher education achievement | 35 | Female researchers | 46 |
| Management of cities | 15 | ▶ Pupil-teacher ratio (tertiary education) | 02 | ▷ R&D productivity by publication | 47 |
| ▷ Digital/Technological skills | 50 | ▶ Graduates in Sciences | 08 | Scientific and technical employment | 19 |
| Net flow of international students | 08 | Women with degrees | 37 | High-tech patent grants | 22 |
| | | | | Robots in Education and R&D | 11 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 25 | 24 | 26 | 29 | 34 |
| Capital | 34 | 30 | 32 | 36 | 34 |
| Technological framework | 31 | 33 | 38 | 37 | 38 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| ▷ Starting a business | 53 | IT & media stock market capitalization | 47 | Communications technology | 28 |
| Enforcing contracts | 10 | Funding for technological development | 20 | Mobile broadband subscribers | 34 |
| ▷ Immigration laws | 57 | Banking and financial services | 24 | Wireless broadband | 32 |
| Development & application of tech. | 37 | Country credit rating | 14 | Internet users | 31 |
| Scientific research legislation | 22 | Venture capital | 41 | Internet bandwidth speed | 41 |
| Intellectual property rights | 11 | Investment in Telecommunications | 47 | High-tech exports (%) | 33 |

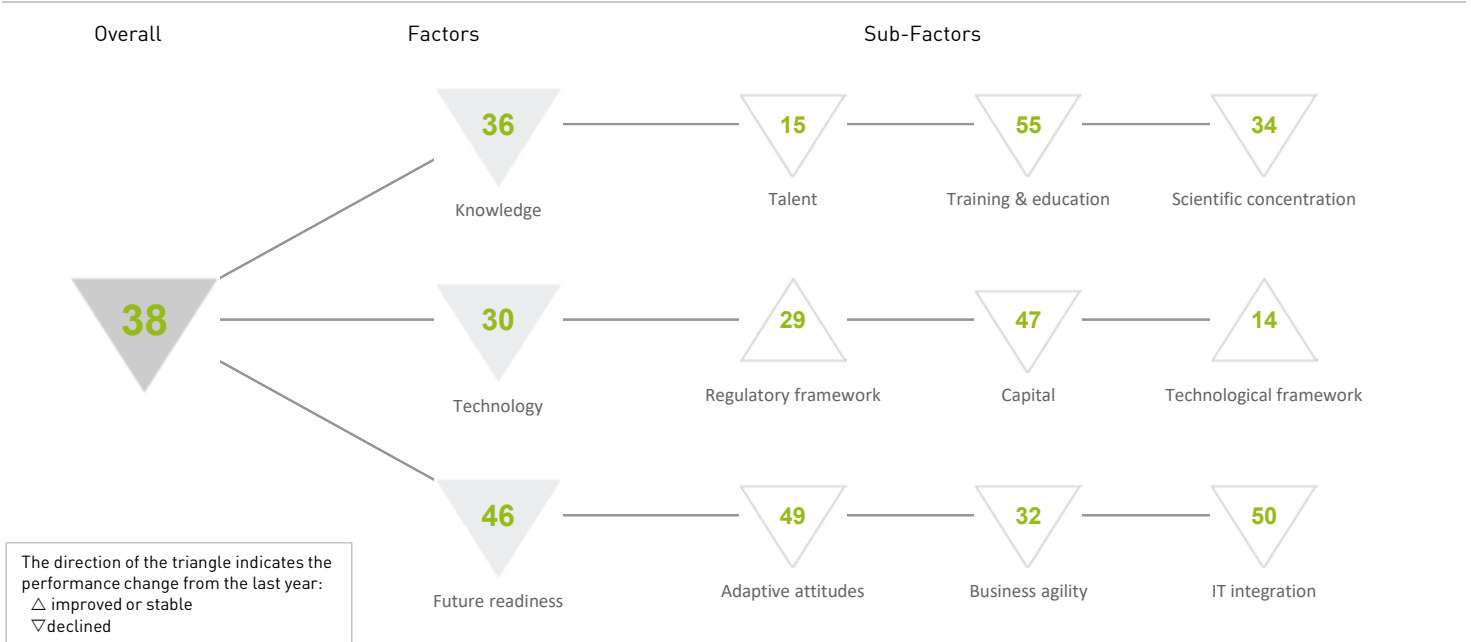
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 29 | 21 | 21 | 19 | 24 |
| Business agility | 25 | 21 | 18 | 21 | 22 |
| IT integration | 15 | 09 | 11 | 11 | 13 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|----------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 20 | Opportunities and threats | 18 | E-Government | 19 |
| Internet retailing | 16 | World robots distribution | 23 | Public-private partnerships | 45 |
| Tablet possession | 27 | Agility of companies | 12 | ▶ Cyber security | 04 |
| Smartphone possession | 17 | Use of big data and analytics | 43 | ▶ Software piracy | 06 |
| ▷ Attitudes toward globalization | 54 | Knowledge transfer | 20 | Government cyber security capacity | 27 |
| | | Entrepreneurial fear of failure | 10 | Privacy protection by law content | 16 |

BAHRAIN

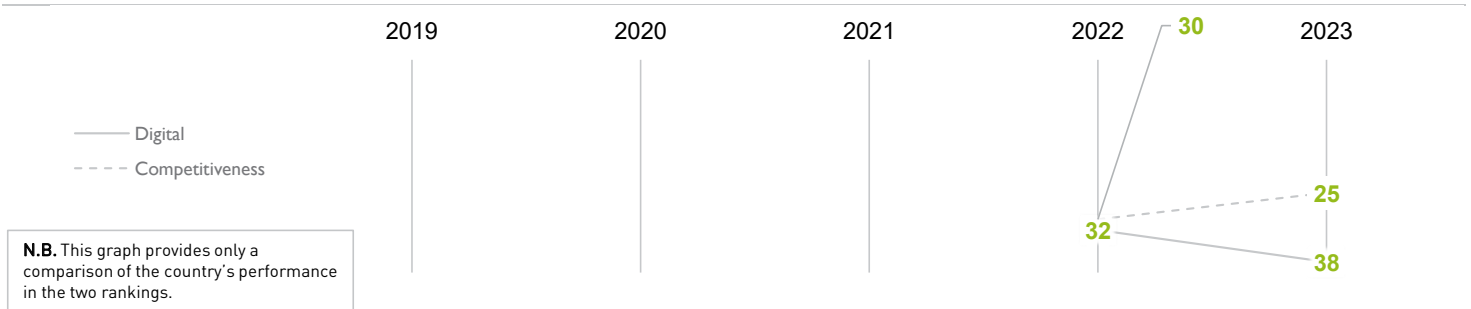
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | - | - | - | 32 | 38 |
| Knowledge | - | - | - | 34 | 36 |
| Technology | - | - | - | 23 | 30 |
| Future readiness | - | - | - | 36 | 46 |

COMPETITIVENESS & DIGITAL RANKINGS

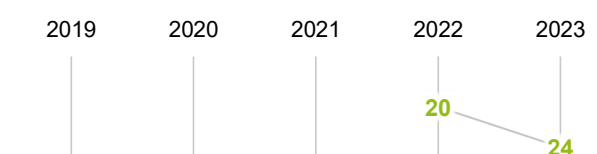


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



BAHRAIN

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | - | - | - | 13 | 15 |
| Training & education | - | - | - | 48 | 55 |
| Scientific concentration | - | - | - | 31 | 34 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | - | Employee training | 19 | Total expenditure on R&D (%) | - |
| International experience | 13 | ▷ Total public expenditure on education | 63 | Total R&D personnel per capita | - |
| Foreign highly skilled personnel | 07 | Higher education achievement | 53 | Female researchers | 21 |
| Management of cities | 13 | Pupil-teacher ratio (tertiary education) | 55 | R&D productivity by publication | - |
| ► Digital/Technological skills | 03 | ▷ Graduates in Sciences | 58 | Scientific and technical employment | - |
| Net flow of international students | 34 | ► Women with degrees | 03 | High-tech patent grants | 45 |
| | | | | Robots in Education and R&D | - |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | - | - | - | 32 | 29 |
| Capital | - | - | - | 34 | 47 |
| Technological framework | - | - | - | 17 | 14 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 33 | IT & media stock market capitalization | 30 | Communications technology | 06 |
| Enforcing contracts | 42 | Funding for technological development | 27 | ► Mobile broadband subscribers | 05 |
| ► Immigration laws | 01 | Banking and financial services | 22 | Wireless broadband | 12 |
| Development & application of tech. | 12 | ▷ Country credit rating | 60 | ► Internet users | 05 |
| Scientific research legislation | 37 | Venture capital | 30 | Internet bandwidth speed | 27 |
| Intellectual property rights | 46 | Investment in Telecommunications | 51 | High-tech exports (%) | 56 |

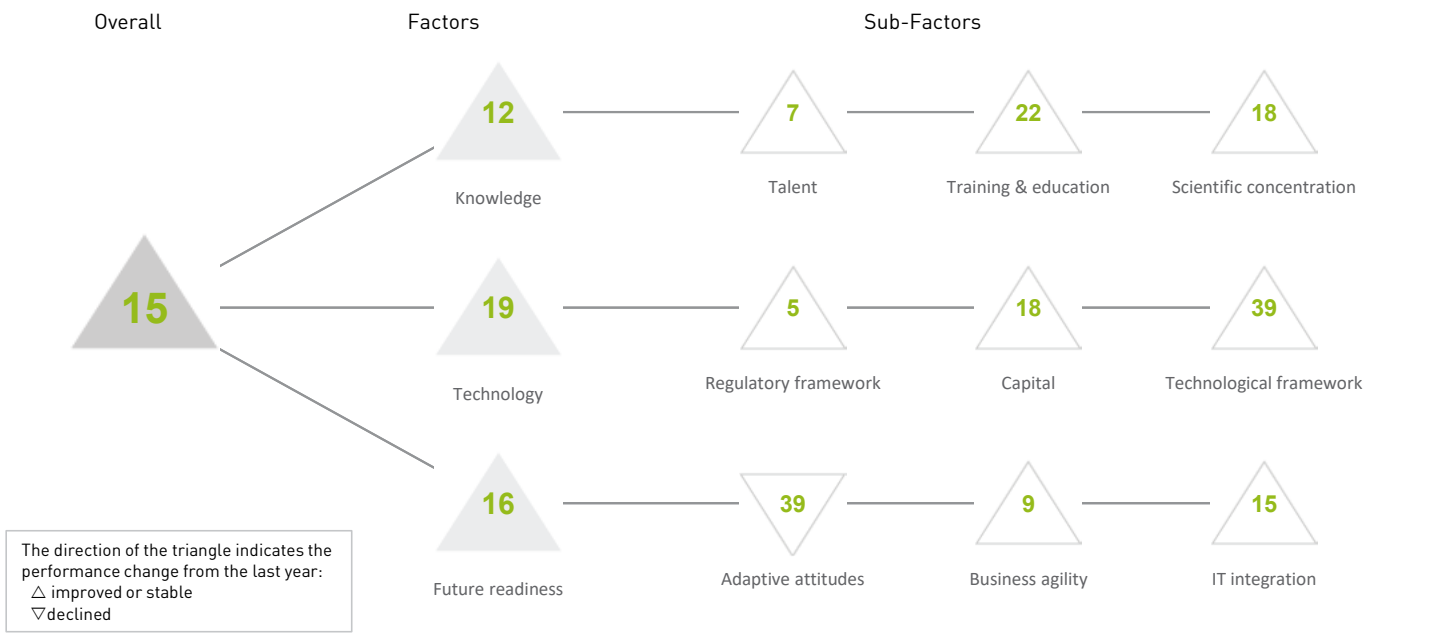
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | - | - | - | 23 | 49 |
| Business agility | - | - | - | 29 | 32 |
| IT integration | - | - | - | 46 | 50 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|-------------------------------------|------|
| ▷ E-Participation | 59 | Opportunities and threats | 37 | E-Government | 47 |
| Internet retailing | 49 | World robots distribution | - | Public-private partnerships | 10 |
| Tablet possession | 44 | Agility of companies | 31 | Cyber security | 05 |
| Smartphone possession | 28 | Use of big data and analytics | 36 | Software piracy | 46 |
| Attitudes toward globalization | 16 | Knowledge transfer | 30 | Government cyber security capacity | 52 |
| | | Entrepreneurial fear of failure | - | ▷ Privacy protection by law content | 61 |

BELGIUM

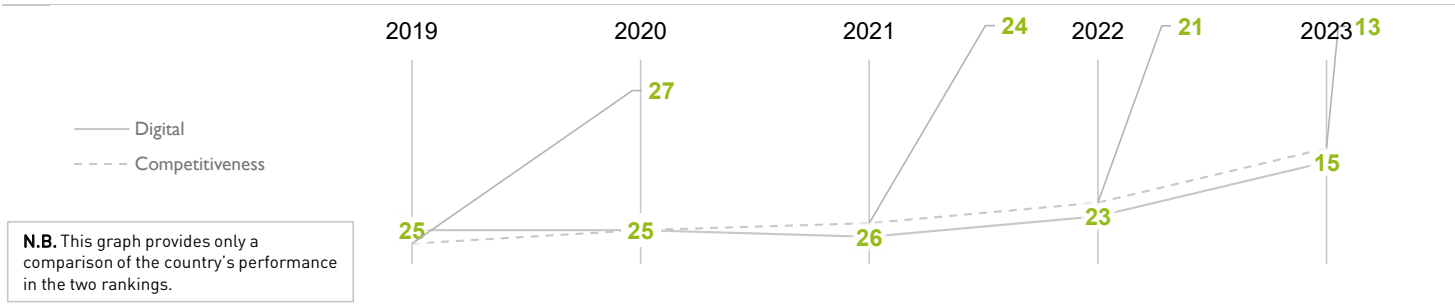
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

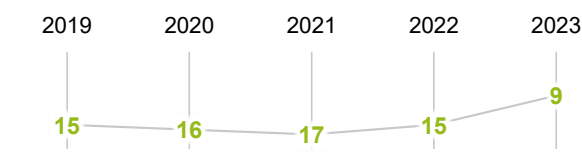
| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 25 | 25 | 26 | 23 | 15 |
| Knowledge | 23 | 21 | 21 | 21 | 12 |
| Technology | 21 | 19 | 23 | 24 | 19 |
| Future readiness | 25 | 25 | 26 | 25 | 16 |

COMPETITIVENESS & DIGITAL RANKINGS

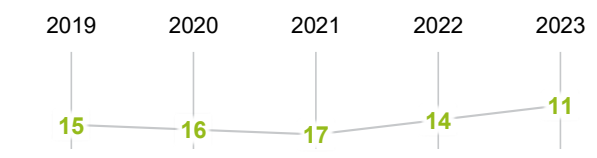


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



BELGIUM

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 18 | 20 | 20 | 17 | 07 |
| Training & education | 26 | 31 | 31 | 30 | 22 |
| Scientific concentration | 24 | 21 | 20 | 19 | 18 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 14 | Employee training | 10 | Total expenditure on R&D (%) | 07 |
| ► International experience | 02 | Total public expenditure on education | 07 | Total R&D personnel per capita | 06 |
| Foreign highly skilled personnel | 15 | Higher education achievement | 22 | Female researchers | 42 |
| Management of cities | 23 | Pupil-teacher ratio (tertiary education) | 31 | R&D productivity by publication | 44 |
| Digital/Technological skills | 17 | ▷ Graduates in Sciences | 54 | Scientific and technical employment | 15 |
| Net flow of international students | 12 | Women with degrees | 23 | High-tech patent grants | 32 |
| | | | | Robots in Education and R&D | 18 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 22 | 19 | 18 | 17 | 05 |
| Capital | 25 | 21 | 20 | 23 | 18 |
| Technological framework | 26 | 29 | 37 | 39 | 39 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 27 | IT & media stock market capitalization | 44 | Communications technology | 27 |
| Enforcing contracts | 39 | Funding for technological development | 07 | Mobile broadband subscribers | 41 |
| Immigration laws | 05 | Banking and financial services | 04 | ▷ Wireless broadband | 59 |
| Development & application of tech. | 06 | Country credit rating | 20 | Internet users | 19 |
| ► Scientific research legislation | 02 | ► Venture capital | 01 | Internet bandwidth speed | 29 |
| Intellectual property rights | 18 | Investment in Telecommunications | 38 | High-tech exports (%) | 23 |

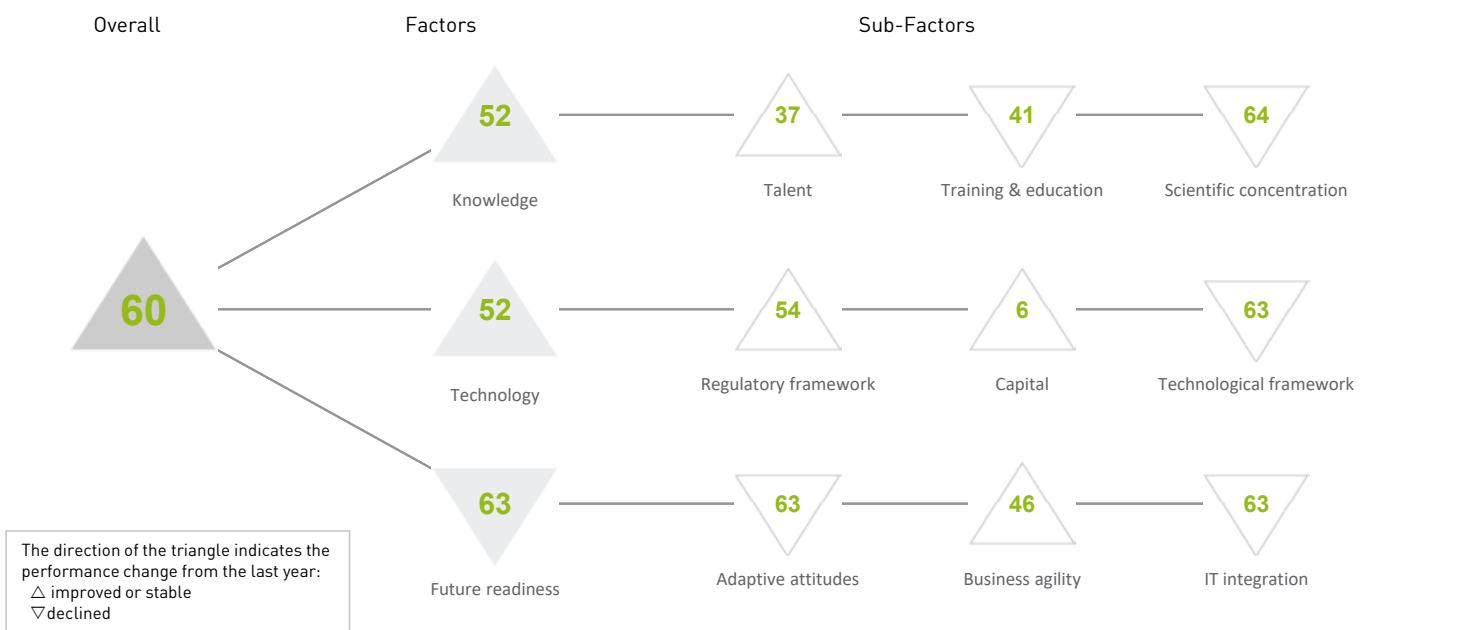
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 23 | 24 | 22 | 28 | 39 |
| Business agility | 33 | 35 | 38 | 27 | 09 |
| IT integration | 23 | 26 | 26 | 22 | 15 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| ▷ E-Participation | 58 | Opportunities and threats | 07 | E-Government | 36 |
| Internet retailing | 12 | World robots distribution | 26 | Public-private partnerships | 06 |
| Tablet possession | 41 | Agility of companies | 17 | Cyber security | 07 |
| ▷ Smartphone possession | 45 | ► Use of big data and analytics | 02 | Software piracy | 13 |
| Attitudes toward globalization | 35 | ► Knowledge transfer | 02 | ▷ Government cyber security capacity | 44 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 10 |

BOTSWANA

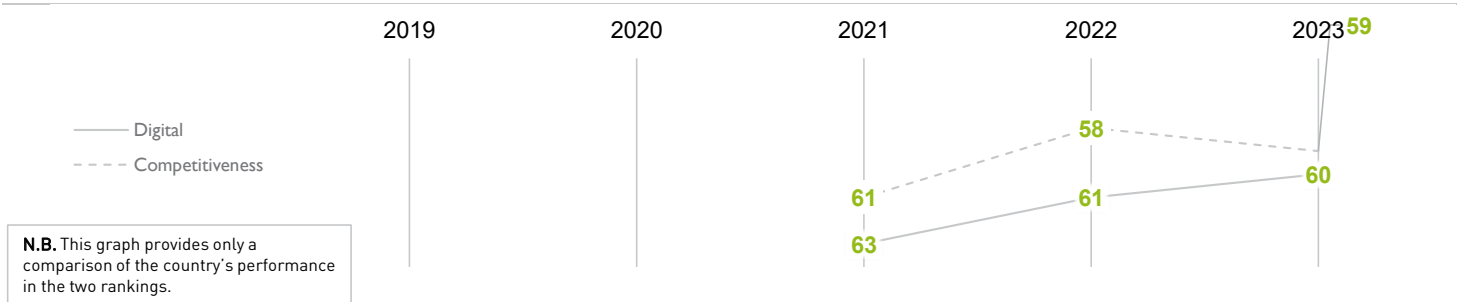
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | - | - | 63 | 61 | 60 |
| Knowledge | - | - | 64 | 55 | 52 |
| Technology | - | - | 63 | 59 | 52 |
| Future readiness | - | - | 63 | 61 | 63 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



BOTSWANA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | - | - | 53 | 42 | 37 |
| Training & education | - | - | 48 | 39 | 41 |
| Scientific concentration | - | - | 63 | 63 | 64 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | - | Employee training | 55 | Total expenditure on R&D (%) | - |
| ► International experience | 19 | ► Total public expenditure on education | 01 | Total R&D personnel per capita | - |
| ► Foreign highly skilled personnel | 17 | ▷ Higher education achievement | 62 | Female researchers | - |
| Management of cities | 42 | Pupil-teacher ratio (tertiary education) | 36 | R&D productivity by publication | - |
| Digital/Technological skills | 54 | Graduates in Sciences | 52 | Scientific and technical employment | 54 |
| Net flow of international students | 47 | Women with degrees | - | High-tech patent grants | 61 |
| | | | | Robots in Education and R&D | - |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | - | - | 63 | 54 | 54 |
| Capital | - | - | 56 | 47 | 06 |
| Technological framework | - | - | 64 | 62 | 63 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 62 | IT & media stock market capitalization | - | Communications technology | 58 |
| Enforcing contracts | 57 | Funding for technological development | 50 | ▷ Mobile broadband subscribers | 64 |
| ► Immigration laws | 24 | Banking and financial services | 38 | Wireless broadband | 55 |
| Development & application of tech. | 36 | Country credit rating | 40 | ▷ Internet users | 63 |
| Scientific research legislation | 45 | Venture capital | 36 | ▷ Internet bandwidth speed | 64 |
| Intellectual property rights | 49 | ► Investment in Telecommunications | 01 | ▷ High-tech exports (%) | 63 |

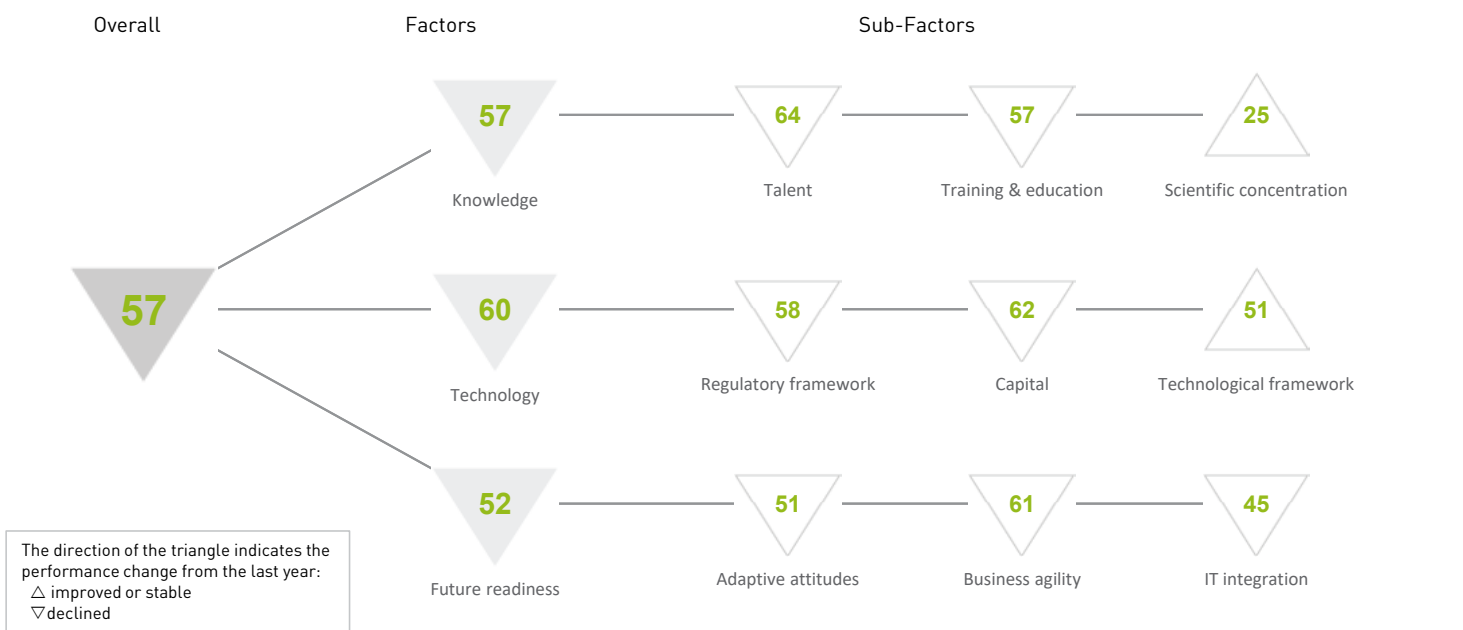
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | - | - | 63 | 59 | 63 |
| Business agility | - | - | 46 | 51 | 46 |
| IT integration | - | - | 63 | 61 | 63 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 61 | Opportunities and threats | 58 | E-Government | 61 |
| Internet retailing | - | World robots distribution | - | Public-private partnerships | 31 |
| Tablet possession | - | Agility of companies | 59 | Cyber security | 51 |
| Smartphone possession | - | Use of big data and analytics | 41 | Software piracy | 60 |
| Attitudes toward globalization | 53 | Knowledge transfer | 45 | Government cyber security capacity | 62 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 27 |

BRAZIL

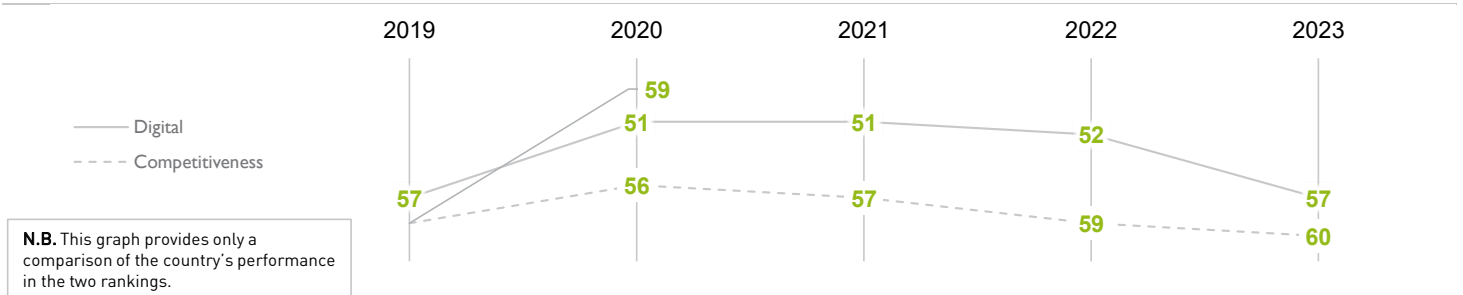
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 57 | 51 | 51 | 52 | 57 |
| Knowledge | 59 | 57 | 51 | 51 | 57 |
| Technology | 57 | 57 | 55 | 55 | 60 |
| Future readiness | 43 | 43 | 45 | 47 | 52 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



BRAZIL

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 61 | 62 | 63 | 62 | 64 |
| Training & education | 59 | 61 | 58 | 51 | 57 |
| Scientific concentration | 44 | 27 | 21 | 25 | 25 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 53 | Employee training | 56 | Total expenditure on R&D (%) | 35 |
| ▷ International experience | 63 | ▶ Total public expenditure on education | 12 | Total R&D personnel per capita | 19 |
| ▷ Foreign highly skilled personnel | 61 | Higher education achievement | 54 | ▶ Female researchers | 17 |
| ▷ Management of cities | 61 | Pupil-teacher ratio (tertiary education) | 47 | ▶ R&D productivity by publication | 07 |
| ▷ Digital/Technological skills | 62 | Graduates in Sciences | 55 | Scientific and technical employment | 37 |
| Net flow of international students | 44 | Women with degrees | 50 | High-tech patent grants | 44 |
| | | | | ▶ Robots in Education and R&D | 17 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 57 | 52 | 51 | 55 | 58 |
| Capital | 61 | 58 | 59 | 57 | 62 |
| Technological framework | 47 | 50 | 51 | 51 | 51 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 58 | IT & media stock market capitalization | 48 | Communications technology | 55 |
| Enforcing contracts | 41 | Funding for technological development | 60 | Mobile broadband subscribers | 37 |
| Immigration laws | 28 | Banking and financial services | 60 | Wireless broadband | 51 |
| Development & application of tech. | 59 | Country credit rating | 57 | Internet users | 50 |
| Scientific research legislation | 59 | Venture capital | 60 | Internet bandwidth speed | 37 |
| Intellectual property rights | 60 | Investment in Telecommunications | 36 | High-tech exports (%) | 45 |

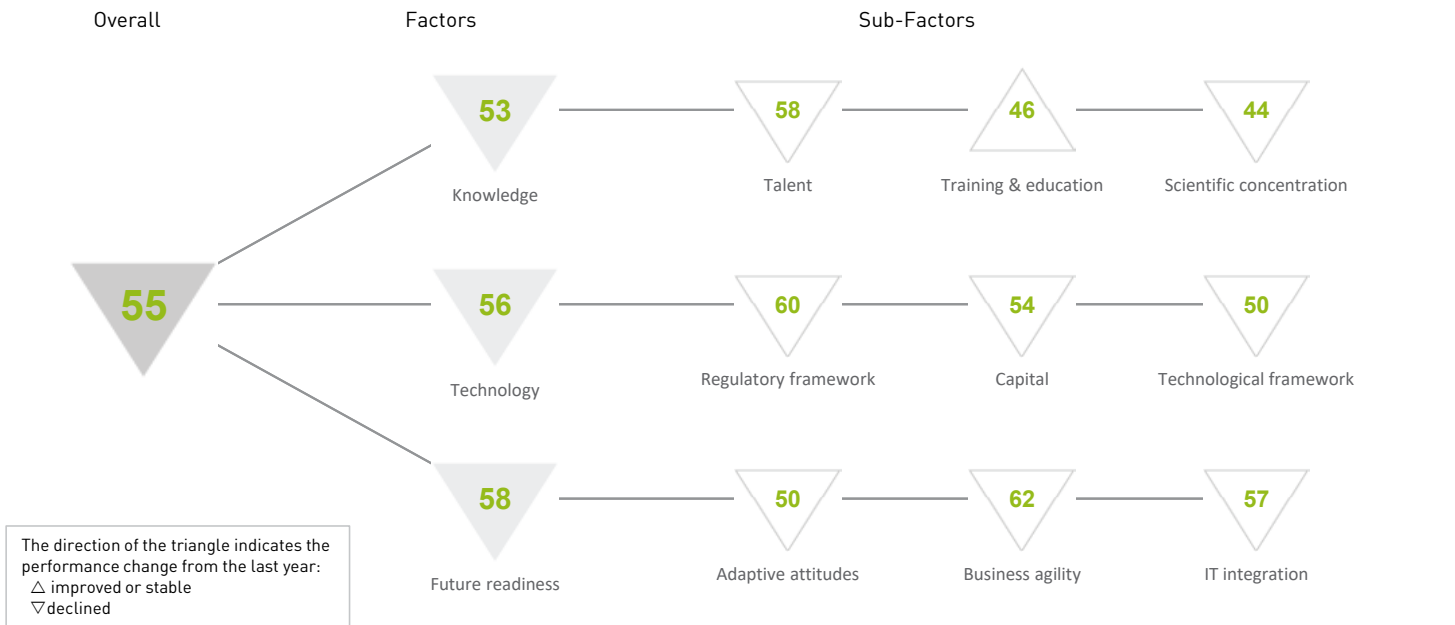
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 33 | 39 | 40 | 43 | 51 |
| Business agility | 58 | 41 | 42 | 52 | 61 |
| IT integration | 49 | 48 | 49 | 43 | 45 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| ▶ E-Participation | 11 | Opportunities and threats | 52 | E-Government | 43 |
| Internet retailing | 44 | World robots distribution | 19 | Public-private partnerships | 60 |
| Tablet possession | 56 | Agility of companies | 54 | Cyber security | 57 |
| Smartphone possession | 38 | ▷ Use of big data and analytics | 61 | Software piracy | 36 |
| Attitudes toward globalization | 52 | Knowledge transfer | 61 | Government cyber security capacity | 26 |
| | | Entrepreneurial fear of failure | 27 | Privacy protection by law content | 29 |

BULGARIA

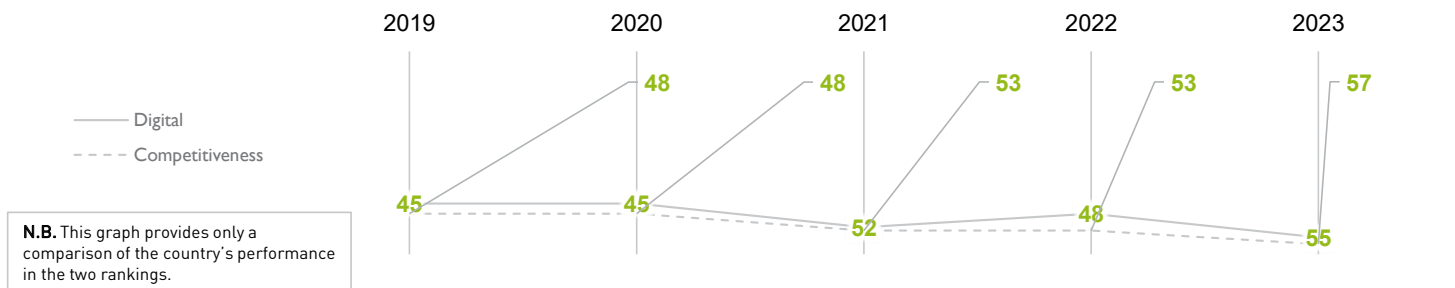
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 45 | 45 | 52 | 48 | 55 |
| Knowledge | 46 | 47 | 53 | 48 | 53 |
| Technology | 42 | 45 | 51 | 51 | 56 |
| Future readiness | 48 | 44 | 55 | 50 | 58 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



BULGARIA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 50 | 48 | 54 | 56 | 58 |
| Training & education | 46 | 50 | 53 | 52 | 46 |
| Scientific concentration | 37 | 42 | 46 | 40 | 44 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 42 | Employee training | 61 | Total expenditure on R&D (%) | 44 |
| International experience | 61 | Total public expenditure on education | 41 | Total R&D personnel per capita | 39 |
| ▷ Foreign highly skilled personnel | 63 | Higher education achievement | 47 | ▶ Female researchers | 12 |
| Management of cities | 48 | ▶ Pupil-teacher ratio (tertiary education) | 14 | R&D productivity by publication | 45 |
| Digital/Technological skills | 43 | Graduates in Sciences | 47 | Scientific and technical employment | 41 |
| Net flow of international students | 52 | Women with degrees | 36 | ▶ High-tech patent grants | 14 |
| | | | | Robots in Education and R&D | 48 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 46 | 55 | 55 | 52 | 60 |
| Capital | 42 | 48 | 53 | 52 | 54 |
| Technological framework | 44 | 39 | 42 | 46 | 50 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 47 | IT & media stock market capitalization | 43 | Communications technology | 48 |
| Enforcing contracts | 31 | Funding for technological development | 54 | Mobile broadband subscribers | 39 |
| ▷ Immigration laws | 63 | Banking and financial services | 54 | Wireless broadband | 22 |
| Development & application of tech. | 57 | Country credit rating | 44 | Internet users | 56 |
| Scientific research legislation | 61 | Venture capital | 46 | Internet bandwidth speed | 48 |
| Intellectual property rights | 61 | Investment in Telecommunications | 39 | High-tech exports (%) | 37 |

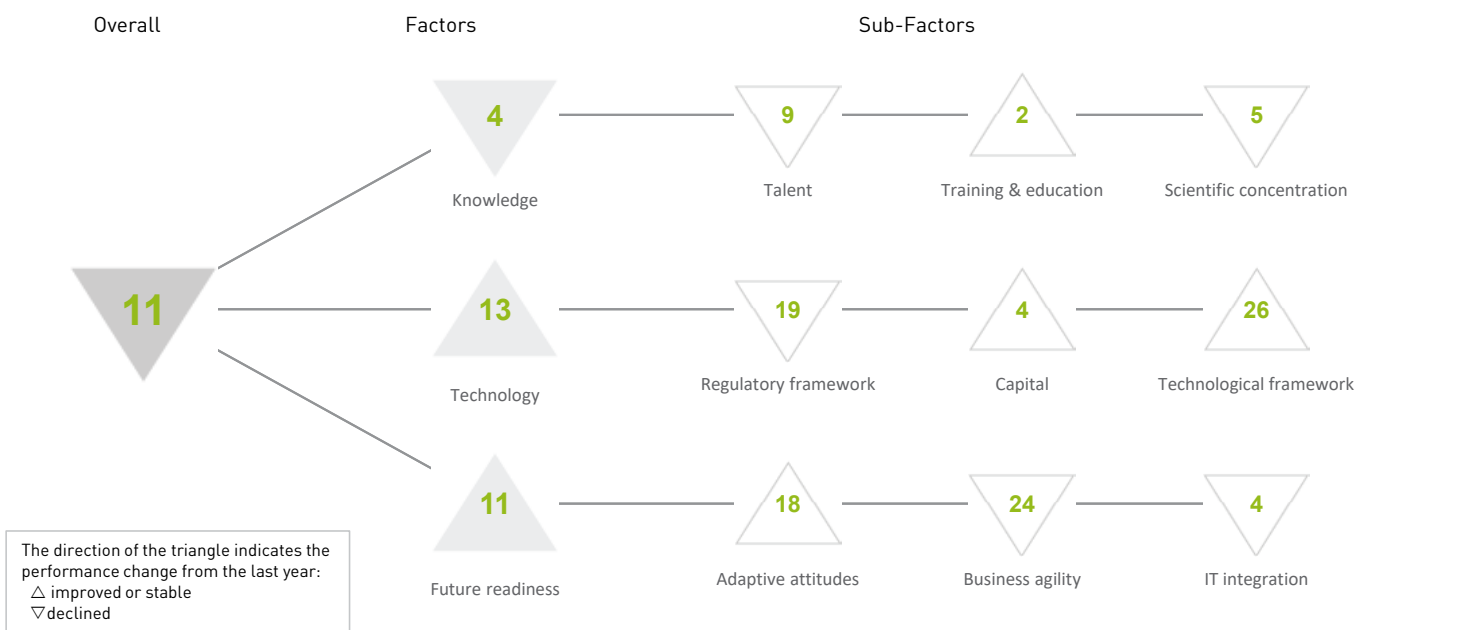
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 43 | 41 | 45 | 39 | 50 |
| Business agility | 56 | 40 | 61 | 56 | 62 |
| IT integration | 47 | 47 | 53 | 49 | 57 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|----------------------------------|------|-----------------------------------|------|-------------------------------------|------|
| E-Participation | 26 | ▷ Opportunities and threats | 63 | E-Government | 45 |
| Internet retailing | 50 | World robots distribution | 43 | Public-private partnerships | 56 |
| Tablet possession | 42 | Agility of companies | 62 | ▷ Cyber security | 62 |
| Smartphone possession | 30 | Use of big data and analytics | 55 | Software piracy | 51 |
| ▷ Attitudes toward globalization | 62 | Knowledge transfer | 60 | Government cyber security capacity | 60 |
| | | ▶ Entrepreneurial fear of failure | 06 | ▶ Privacy protection by law content | 20 |

CANADA

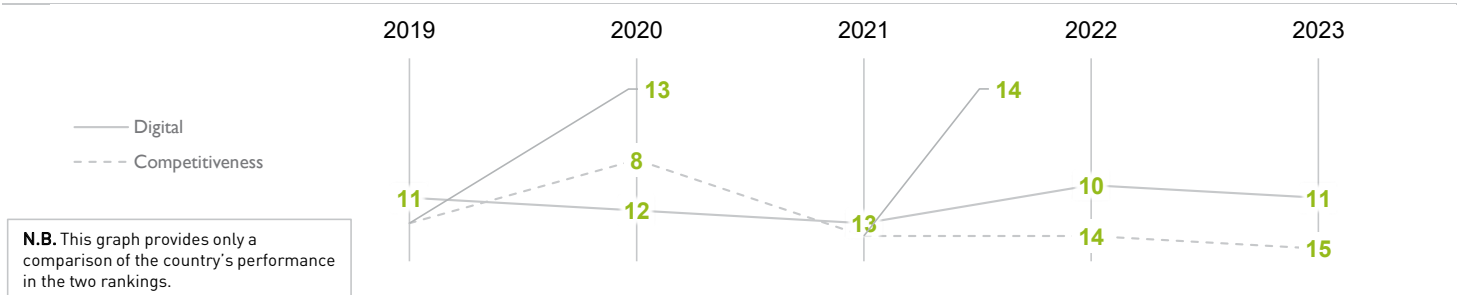
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 11 | 12 | 13 | 10 | 11 |
| Knowledge | 05 | 05 | 07 | 03 | 04 |
| Technology | 13 | 13 | 15 | 14 | 13 |
| Future readiness | 18 | 15 | 15 | 11 | 11 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



CANADA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 13 | 08 | 09 | 08 | 09 |
| Training & education | 07 | 06 | 10 | 03 | 02 |
| Scientific concentration | 02 | 07 | 05 | 04 | 05 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 11 |
| International experience | 28 |
| Foreign highly skilled personnel | 10 |
| Management of cities | 18 |
| Digital/Technological skills | 18 |
| Net flow of international students | 05 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 15 |
| ▷ Total public expenditure on education | 42 |
| ▶ Higher education achievement | 05 |
| Pupil-teacher ratio (tertiary education) | 09 |
| Graduates in Sciences | 26 |
| ▶ Women with degrees | 02 |

| Scientific concentration | Rank |
|---------------------------------------|------|
| Total expenditure on R&D (%) | 26 |
| Total R&D personnel per capita | 24 |
| Female researchers | 21 |
| R&D productivity by publication | 10 |
| ▶ Scientific and technical employment | 02 |
| High-tech patent grants | 13 |
| Robots in Education and R&D | 09 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 17 | 12 | 13 | 13 | 19 |
| Capital | 10 | 03 | 09 | 06 | 04 |
| Technological framework | 27 | 26 | 29 | 31 | 26 |

| Regulatory framework | Rank |
|------------------------------------|------|
| ▶ Starting a business | 02 |
| ▷ Enforcing contracts | 50 |
| Immigration laws | 11 |
| Development & application of tech. | 21 |
| Scientific research legislation | 14 |
| Intellectual property rights | 26 |

| Capital | Rank |
|----------------------------------------|------|
| IT & media stock market capitalization | 23 |
| Funding for technological development | 16 |
| Banking and financial services | 17 |
| Country credit rating | 10 |
| Venture capital | 12 |
| Investment in Telecommunications | 14 |

| Technological framework | Rank |
|------------------------------|------|
| Communications technology | 30 |
| Mobile broadband subscribers | 33 |
| ▷ Wireless broadband | 53 |
| Internet users | 15 |
| Internet bandwidth speed | 12 |
| High-tech exports (%) | 29 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 17 | 16 | 17 | 18 | 18 |
| Business agility | 16 | 16 | 20 | 19 | 24 |
| IT integration | 13 | 13 | 14 | 02 | 04 |

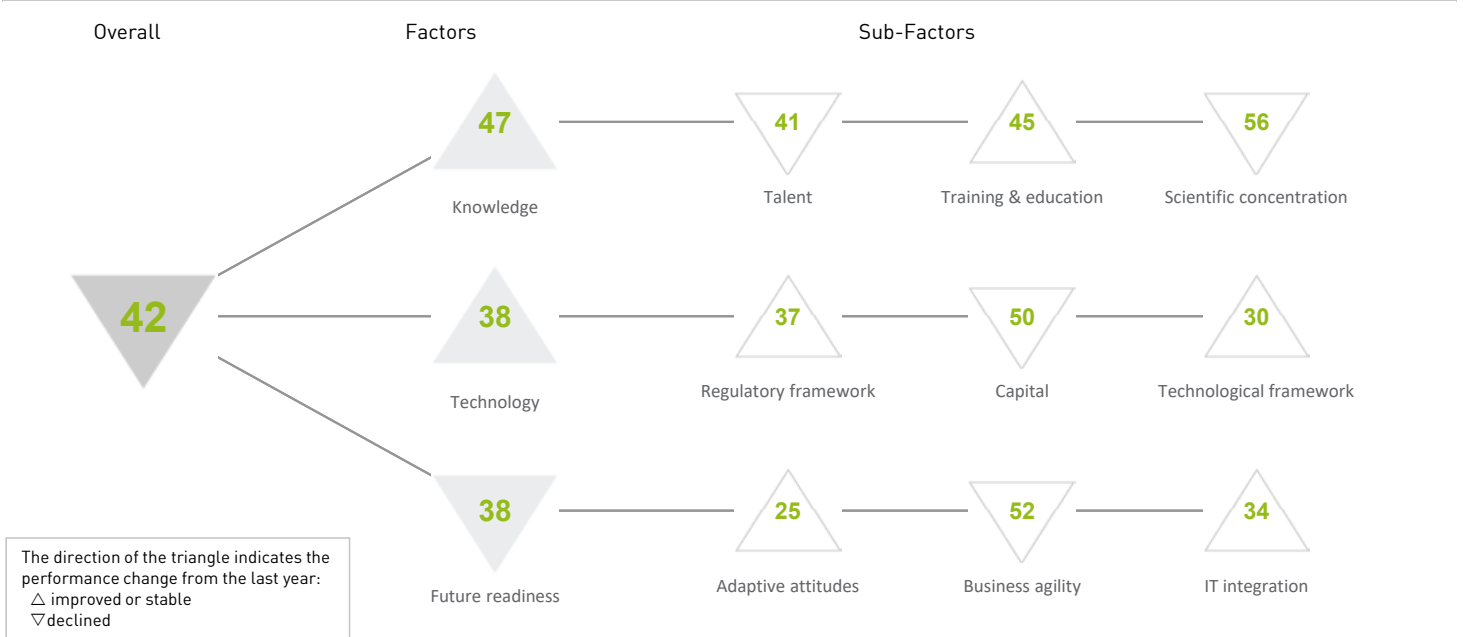
| Adaptive attitudes | Rank |
|--------------------------------|------|
| E-Participation | 14 |
| Internet retailing | 10 |
| Tablet possession | 17 |
| ▷ Smartphone possession | 53 |
| Attitudes toward globalization | 20 |

| Business agility | Rank |
|-----------------------------------|------|
| Opportunities and threats | 30 |
| World robots distribution | 13 |
| Agility of companies | 21 |
| Use of big data and analytics | 17 |
| Knowledge transfer | 10 |
| ▷ Entrepreneurial fear of failure | 48 |

| IT integration | Rank |
|--------------------------------------|------|
| E-Government | 30 |
| Public-private partnerships | 14 |
| Cyber security | 17 |
| Software piracy | 13 |
| ▶ Government cyber security capacity | 04 |
| Privacy protection by law content | 15 |

CHILE

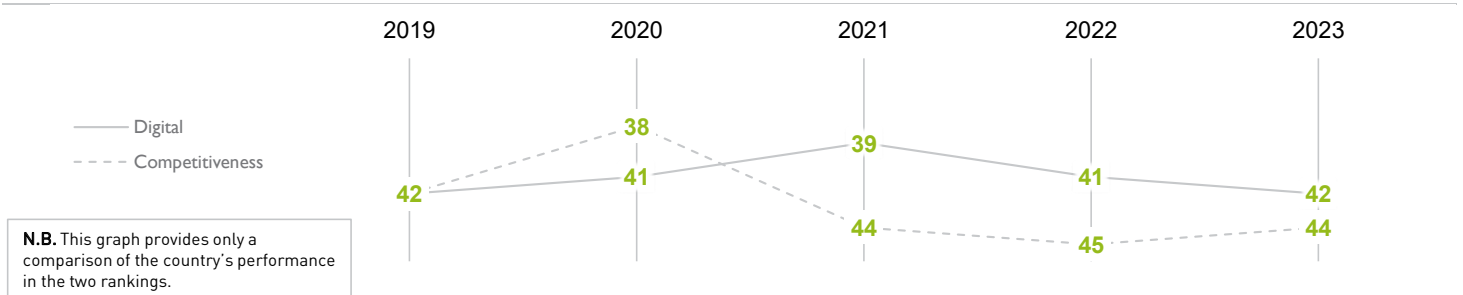
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 42 | 41 | 39 | 41 | 42 |
| Knowledge | 50 | 49 | 49 | 50 | 47 |
| Technology | 41 | 40 | 35 | 41 | 38 |
| Future readiness | 37 | 39 | 36 | 33 | 38 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS < 20 MILLION (37 countries)



► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 36 | 37 | 36 | 39 | 41 |
| Training & education | 55 | 49 | 51 | 54 | 45 |
| Scientific concentration | 57 | 58 | 57 | 55 | 56 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 47 | ▷ Employee training | 63 | Total expenditure on R&D (%) | 52 |
| International experience | 26 | ► Total public expenditure on education | 17 | Total R&D personnel per capita | 52 |
| ► Foreign highly skilled personnel | 13 | Higher education achievement | 39 | Female researchers | 35 |
| ▷ Management of cities | 55 | Pupil-teacher ratio (tertiary education) | - | R&D productivity by publication | 18 |
| Digital/Technological skills | 28 | Graduates in Sciences | 40 | Scientific and technical employment | 38 |
| Net flow of international students | 43 | Women with degrees | 41 | ▷ High-tech patent grants | 58 |
| | | | | Robots in Education and R&D | 42 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 36 | 33 | 33 | 41 | 37 |
| Capital | 44 | 40 | 38 | 43 | 50 |
| Technological framework | 42 | 44 | 36 | 36 | 30 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|------------------------------------------|------|------------------------------|------|
| Starting a business | 30 | ▷ IT & media stock market capitalization | 54 | Communications technology | 21 |
| Enforcing contracts | 37 | Funding for technological development | 51 | Mobile broadband subscribers | 35 |
| Immigration laws | 19 | Banking and financial services | 36 | Wireless broadband | 43 |
| Development & application of tech. | 39 | Country credit rating | 35 | Internet users | 42 |
| Scientific research legislation | 49 | ▷ Venture capital | 55 | ► Internet bandwidth speed | 08 |
| Intellectual property rights | 31 | ► Investment in Telecommunications | 17 | High-tech exports (%) | 34 |

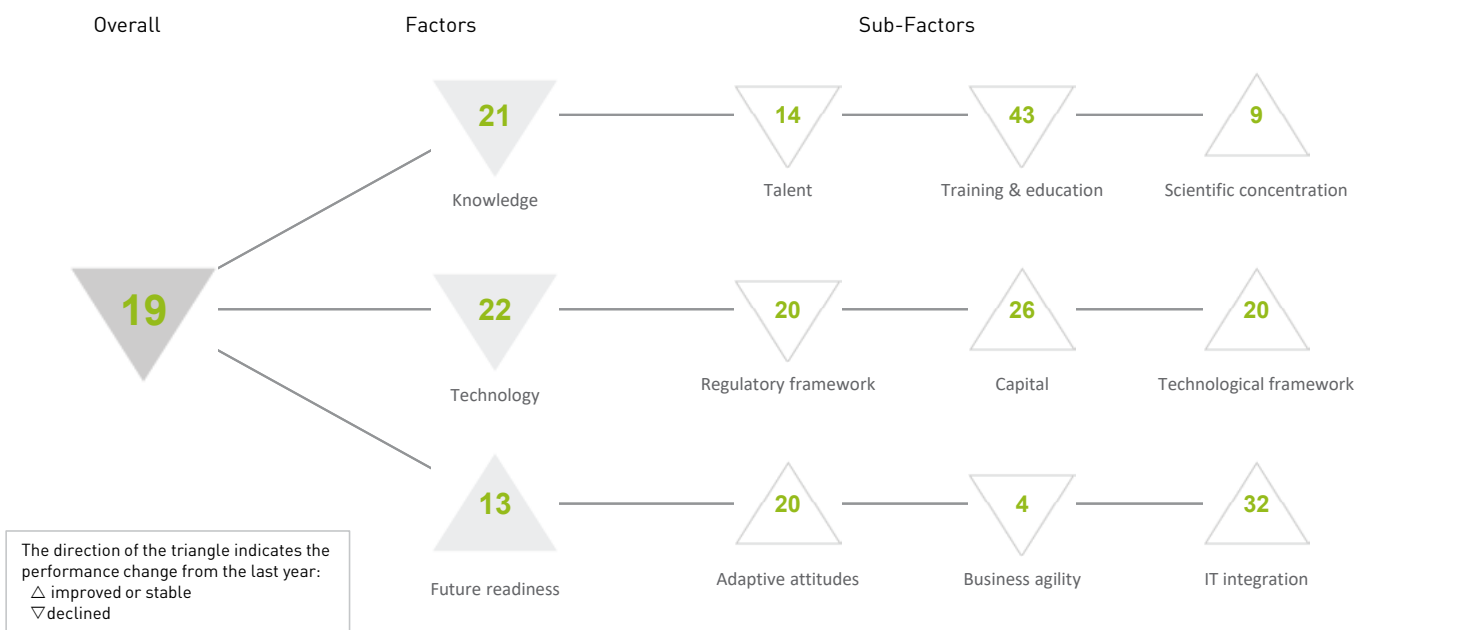
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 27 | 22 | 24 | 26 | 25 |
| Business agility | 50 | 54 | 54 | 43 | 52 |
| IT integration | 39 | 40 | 39 | 34 | 34 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 39 | Opportunities and threats | 38 | E-Government | 33 |
| Internet retailing | 32 | World robots distribution | 47 | Public-private partnerships | 21 |
| Tablet possession | 28 | Agility of companies | 44 | Cyber security | 49 |
| ► Smartphone possession | 11 | Use of big data and analytics | 46 | Software piracy | 47 |
| Attitudes toward globalization | 25 | Knowledge transfer | 49 | Government cyber security capacity | 19 |
| | | Entrepreneurial fear of failure | 32 | Privacy protection by law content | 36 |

CHINA

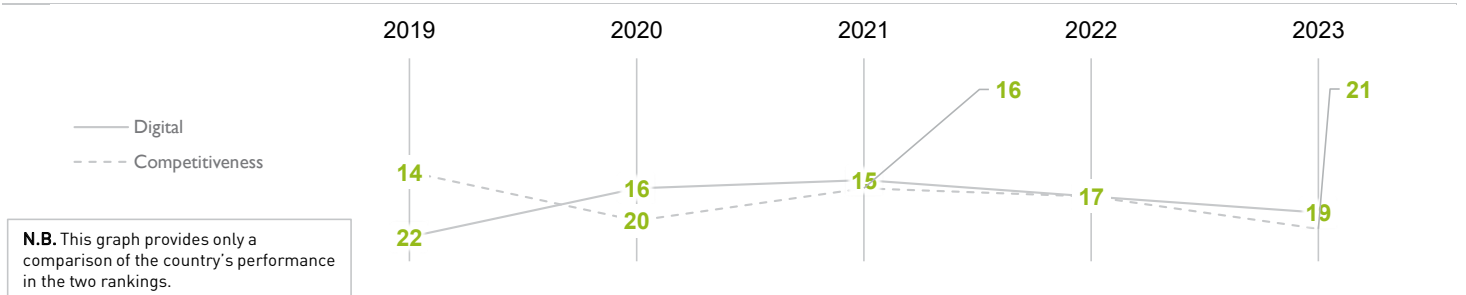
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 22 | 16 | 15 | 17 | 19 |
| Knowledge | 18 | 08 | 06 | 17 | 21 |
| Technology | 26 | 27 | 20 | 18 | 22 |
| Future readiness | 21 | 18 | 17 | 15 | 13 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



CHINA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 19 | 13 | 12 | 12 | 14 |
| Training & education | 37 | 40 | 35 | 33 | 43 |
| Scientific concentration | 09 | 02 | 01 | 09 | 09 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| ► Educational assessment PISA - Math | 01 | Employee training | 18 | Total expenditure on R&D (%) | 15 |
| International experience | 39 | ▷ Total public expenditure on education | 54 | Total R&D personnel per capita | 40 |
| Foreign highly skilled personnel | 39 | Higher education achievement | 12 | Female researchers | 53 |
| Management of cities | 07 | Pupil-teacher ratio (tertiary education) | 45 | ► R&D productivity by publication | 01 |
| Digital/Technological skills | 13 | Graduates in Sciences | - | Scientific and technical employment | 52 |
| Net flow of international students | 50 | ▷ Women with degrees | 54 | High-tech patent grants | 05 |
| | | | | ► Robots in Education and R&D | 01 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 20 | 18 | 15 | 16 | 20 |
| Capital | 32 | 31 | 27 | 27 | 26 |
| Technological framework | 32 | 32 | 28 | 24 | 20 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 16 | IT & media stock market capitalization | 22 | Communications technology | 14 |
| Enforcing contracts | 05 | Funding for technological development | 17 | Mobile broadband subscribers | 08 |
| Immigration laws | 40 | Banking and financial services | 37 | Wireless broadband | 18 |
| Development & application of tech. | 24 | Country credit rating | 29 | ▷ Internet users | 54 |
| Scientific research legislation | 20 | Venture capital | 29 | Internet bandwidth speed | 18 |
| Intellectual property rights | 36 | Investment in Telecommunications | 29 | High-tech exports (%) | 09 |

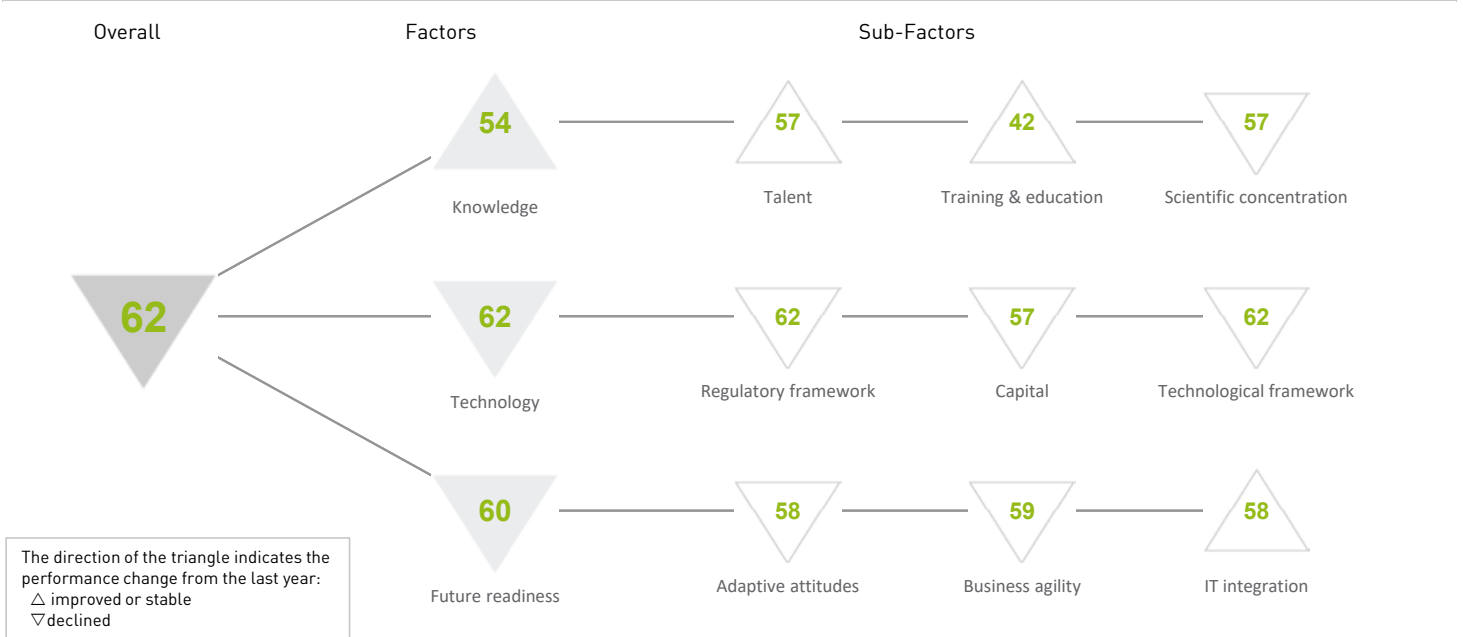
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 24 | 17 | 19 | 22 | 20 |
| Business agility | 01 | 04 | 03 | 03 | 04 |
| IT integration | 41 | 35 | 32 | 32 | 32 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | 13 | Opportunities and threats | 25 | E-Government | 38 |
| Internet retailing | 22 | ► World robots distribution | 01 | Public-private partnerships | 12 |
| Tablet possession | 38 | Agility of companies | 29 | Cyber security | 09 |
| Smartphone possession | 46 | Use of big data and analytics | 16 | ▷ Software piracy | 56 |
| Attitudes toward globalization | 08 | Knowledge transfer | 28 | ► Government cyber security capacity | 03 |
| | | Entrepreneurial fear of failure | 25 | ▷ Privacy protection by law content | 60 |

COLOMBIA

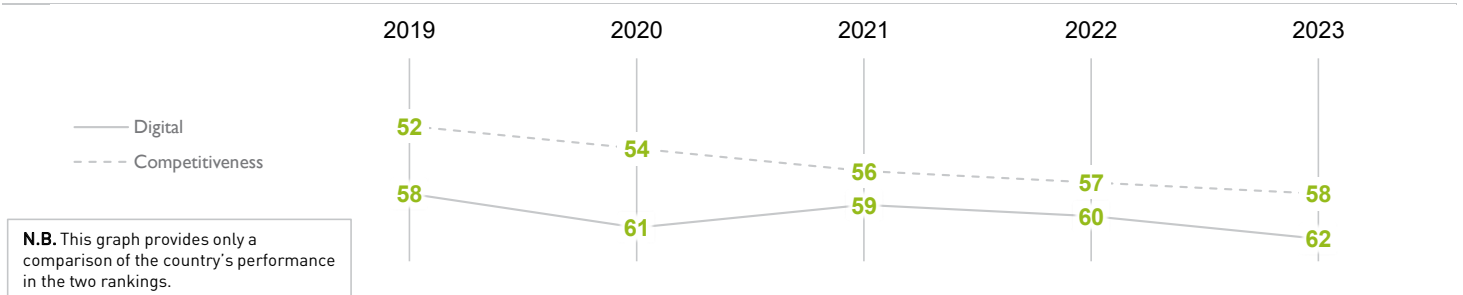
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 58 | 61 | 59 | 60 | 62 |
| Knowledge | 57 | 59 | 56 | 57 | 54 |
| Technology | 60 | 61 | 60 | 61 | 62 |
| Future readiness | 55 | 50 | 53 | 56 | 60 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



COLOMBIA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 56 | 54 | 57 | 58 | 57 |
| Training & education | 49 | 48 | 50 | 46 | 42 |
| Scientific concentration | 58 | 57 | 58 | 56 | 57 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 52 | Employee training | 38 | Total expenditure on R&D (%) | 55 |
| International experience | 42 | ▶ Total public expenditure on education | 23 | Total R&D personnel per capita | 49 |
| Foreign highly skilled personnel | 45 | Higher education achievement | 49 | Female researchers | 28 |
| Management of cities | 57 | ▶ Pupil-teacher ratio (tertiary education) | 32 | ▶ R&D productivity by publication | 14 |
| Digital/Technological skills | 55 | Graduates in Sciences | 30 | Scientific and technical employment | 45 |
| Net flow of international students | 51 | Women with degrees | 47 | High-tech patent grants | 60 |
| | | | | Robots in Education and R&D | 48 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 61 | 60 | 61 | 59 | 62 |
| Capital | 55 | 56 | 49 | 56 | 57 |
| Technological framework | 52 | 61 | 59 | 61 | 62 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 40 | IT & media stock market capitalization | 58 | ▷ Communications technology | 61 |
| ▷ Enforcing contracts | 64 | Funding for technological development | 53 | ▷ Mobile broadband subscribers | 61 |
| Immigration laws | 54 | Banking and financial services | 59 | ▷ Wireless broadband | 63 |
| Development & application of tech. | 54 | Country credit rating | 55 | Internet users | 57 |
| Scientific research legislation | 50 | Venture capital | 47 | Internet bandwidth speed | 46 |
| Intellectual property rights | 50 | ▶ Investment in Telecommunications | 04 | High-tech exports (%) | 47 |

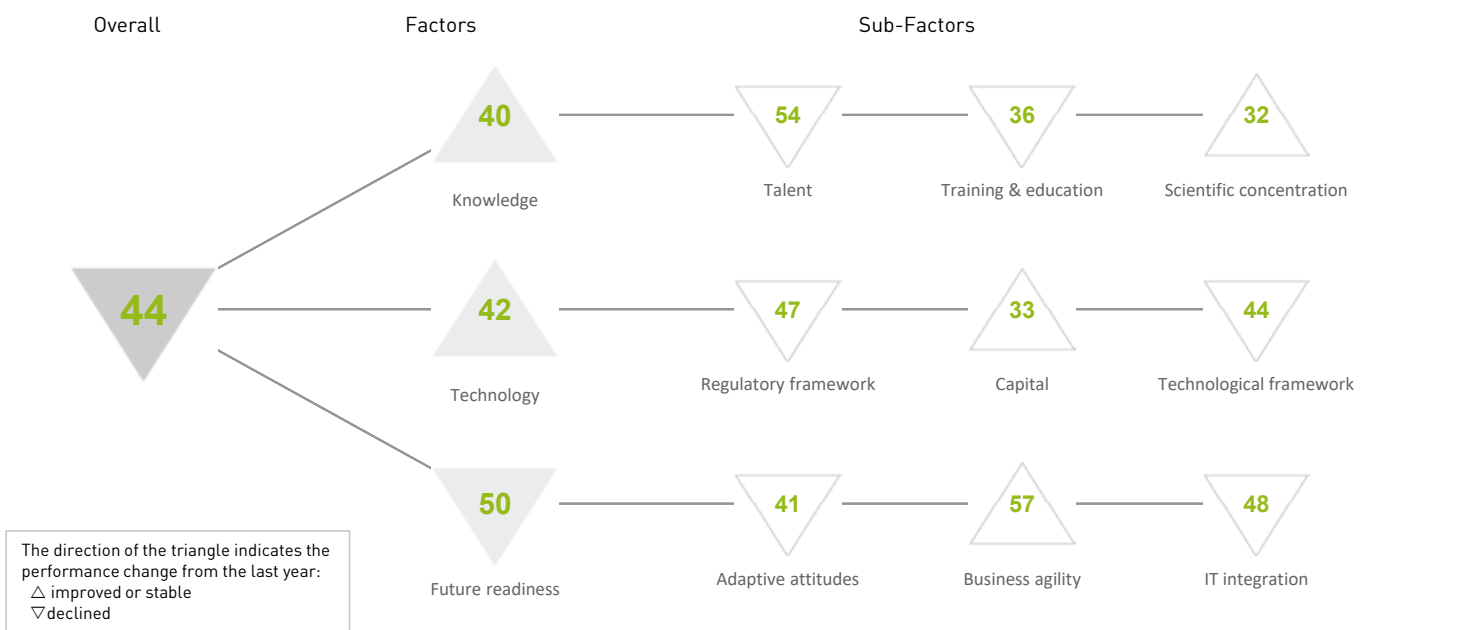
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 56 | 60 | 58 | 48 | 58 |
| Business agility | 55 | 38 | 47 | 54 | 59 |
| IT integration | 45 | 49 | 46 | 58 | 58 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | 34 | Opportunities and threats | 61 | E-Government | 54 |
| Internet retailing | 55 | World robots distribution | 49 | Public-private partnerships | 34 |
| Tablet possession | 60 | Agility of companies | 52 | Cyber security | 52 |
| ▶ Smartphone possession | 30 | Use of big data and analytics | 45 | Software piracy | 40 |
| Attitudes toward globalization | 49 | Knowledge transfer | 41 | ▷ Government cyber security capacity | 64 |
| | | Entrepreneurial fear of failure | 38 | Privacy protection by law content | 52 |

CROATIA

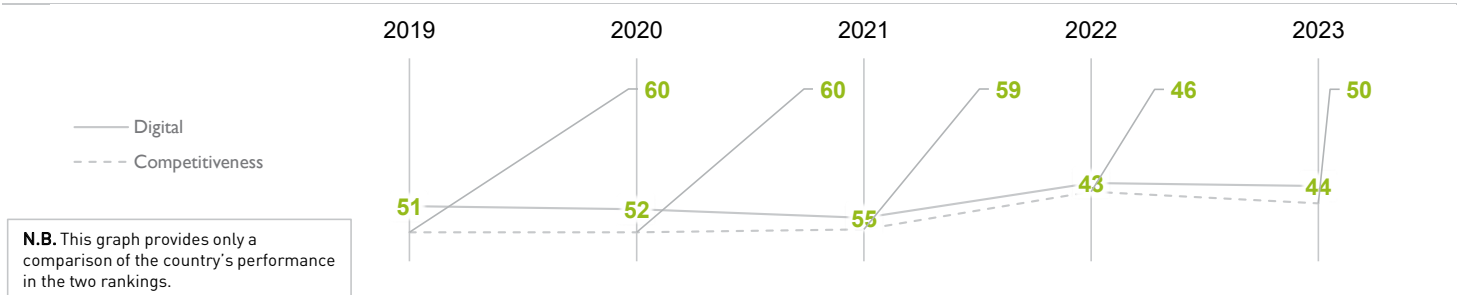
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 51 | 52 | 55 | 43 | 44 |
| Knowledge | 42 | 41 | 47 | 40 | 40 |
| Technology | 50 | 49 | 50 | 42 | 42 |
| Future readiness | 60 | 62 | 60 | 48 | 50 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



CROATIA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 58 | 61 | 61 | 52 | 54 |
| Training & education | 31 | 26 | 42 | 34 | 36 |
| Scientific concentration | 33 | 32 | 34 | 34 | 32 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 36 | Employee training | 49 | Total expenditure on R&D (%) | 33 |
| ▷ International experience | 59 | Total public expenditure on education | 25 | Total R&D personnel per capita | 35 |
| Foreign highly skilled personnel | 56 | Higher education achievement | 44 | ▶ Female researchers | 09 |
| Management of cities | 56 | ▶ Pupil-teacher ratio (tertiary education) | 08 | R&D productivity by publication | 49 |
| Digital/Technological skills | 28 | ▶ Graduates in Sciences | 13 | Scientific and technical employment | 34 |
| Net flow of international students | 53 | Women with degrees | 45 | High-tech patent grants | 21 |
| | | | | Robots in Education and R&D | 39 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 59 | 59 | 56 | 46 | 47 |
| Capital | 50 | 43 | 50 | 35 | 33 |
| Technological framework | 41 | 40 | 41 | 42 | 44 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|--------------------------------------|------|------------------------------------------|------|------------------------------|------|
| Starting a business | 48 | ▶ IT & media stock market capitalization | 18 | Communications technology | 31 |
| Enforcing contracts | 23 | Funding for technological development | 47 | Mobile broadband subscribers | 24 |
| Immigration laws | 21 | Banking and financial services | 45 | Wireless broadband | 50 |
| ▷ Development & application of tech. | 61 | Country credit rating | 43 | Internet users | 39 |
| Scientific research legislation | 52 | Venture capital | 42 | Internet bandwidth speed | 57 |
| Intellectual property rights | 51 | ▶ Investment in Telecommunications | 06 | High-tech exports (%) | 41 |

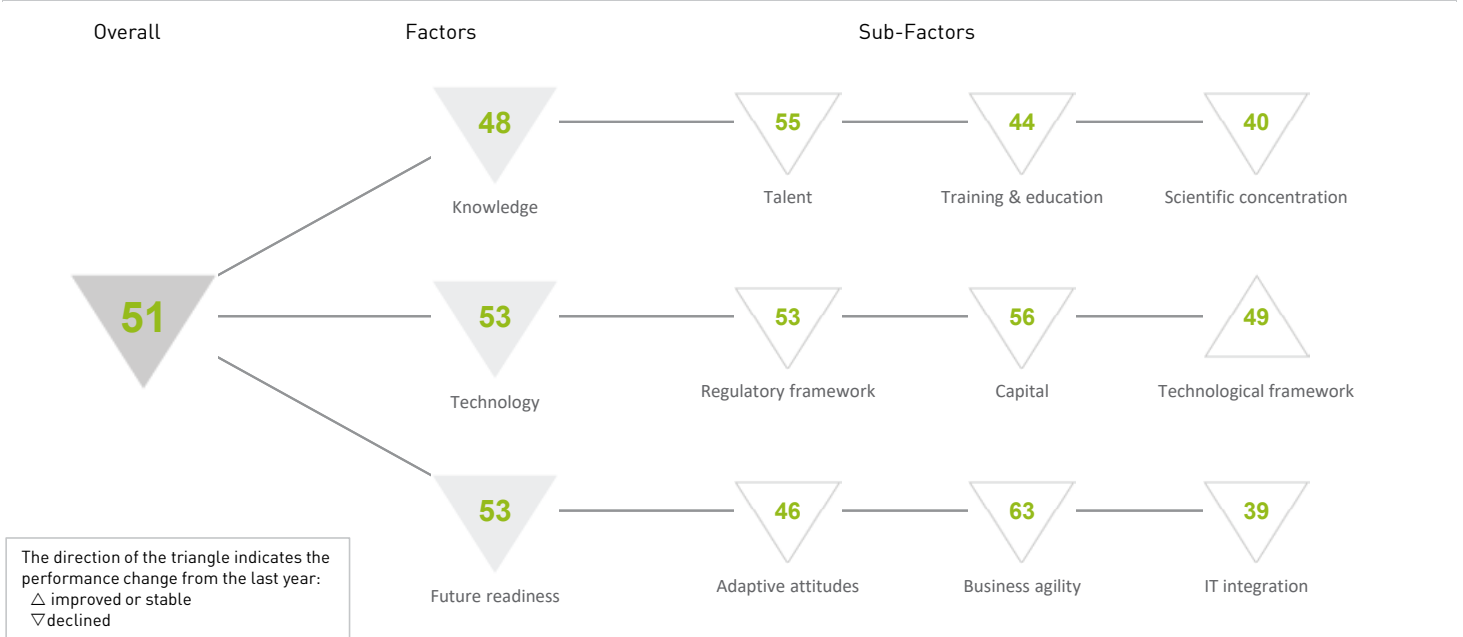
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 51 | 46 | 39 | 40 | 41 |
| Business agility | 62 | 63 | 64 | 58 | 57 |
| IT integration | 57 | 59 | 58 | 44 | 48 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|----------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 26 | Opportunities and threats | 49 | E-Government | 39 |
| Internet retailing | 47 | World robots distribution | 48 | ▷ Public-private partnerships | 61 |
| Tablet possession | 31 | Agility of companies | 40 | Cyber security | 45 |
| Smartphone possession | 18 | Use of big data and analytics | 53 | Software piracy | 43 |
| ▷ Attitudes toward globalization | 59 | ▷ Knowledge transfer | 58 | Government cyber security capacity | 46 |
| | | Entrepreneurial fear of failure | 29 | Privacy protection by law content | 25 |

CYPRUS

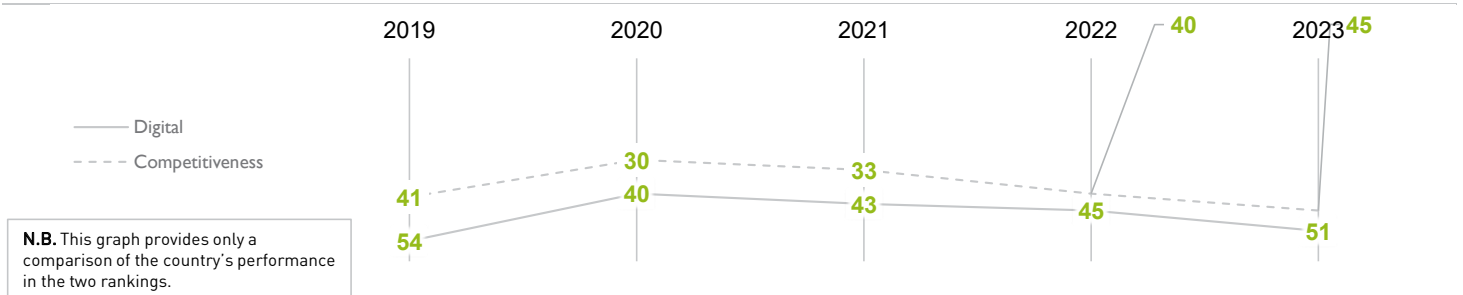
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 54 | 40 | 43 | 45 | 51 |
| Knowledge | 55 | 40 | 39 | 39 | 48 |
| Technology | 59 | 52 | 53 | 52 | 53 |
| Future readiness | 40 | 29 | 34 | 39 | 53 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



CYPRUS

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 62 | 57 | 56 | 53 | 55 |
| Training & education | 33 | 30 | 29 | 40 | 44 |
| Scientific concentration | 53 | 35 | 29 | 26 | 40 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|---------------------------------------|------|
| Educational assessment PISA - Math | 40 | Employee training | 57 | Total expenditure on R&D (%) | 43 |
| International experience | 47 | ▶ Total public expenditure on education | 20 | Total R&D personnel per capita | 42 |
| Foreign highly skilled personnel | 24 | ▶ Higher education achievement | 11 | Female researchers | 30 |
| Management of cities | 43 | Pupil-teacher ratio (tertiary education) | 56 | R&D productivity by publication | 56 |
| Digital/Technological skills | 40 | ▷ Graduates in Sciences | 61 | ▶ Scientific and technical employment | 05 |
| Net flow of international students | 60 | ▶ Women with degrees | 19 | High-tech patent grants | 28 |
| | | | | Robots in Education and R&D | - |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 56 | 47 | 47 | 50 | 53 |
| Capital | 60 | 52 | 54 | 54 | 56 |
| Technological framework | 48 | 52 | 52 | 49 | 49 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 28 | IT & media stock market capitalization | 39 | Communications technology | 24 |
| Enforcing contracts | 59 | Funding for technological development | 59 | Mobile broadband subscribers | 60 |
| Immigration laws | 48 | Banking and financial services | 56 | Wireless broadband | 44 |
| Development & application of tech. | 48 | Country credit rating | 54 | Internet users | 30 |
| Scientific research legislation | 55 | ▷ Venture capital | 61 | Internet bandwidth speed | 52 |
| Intellectual property rights | 42 | ▶ Investment in Telecommunications | 22 | High-tech exports (%) | 27 |

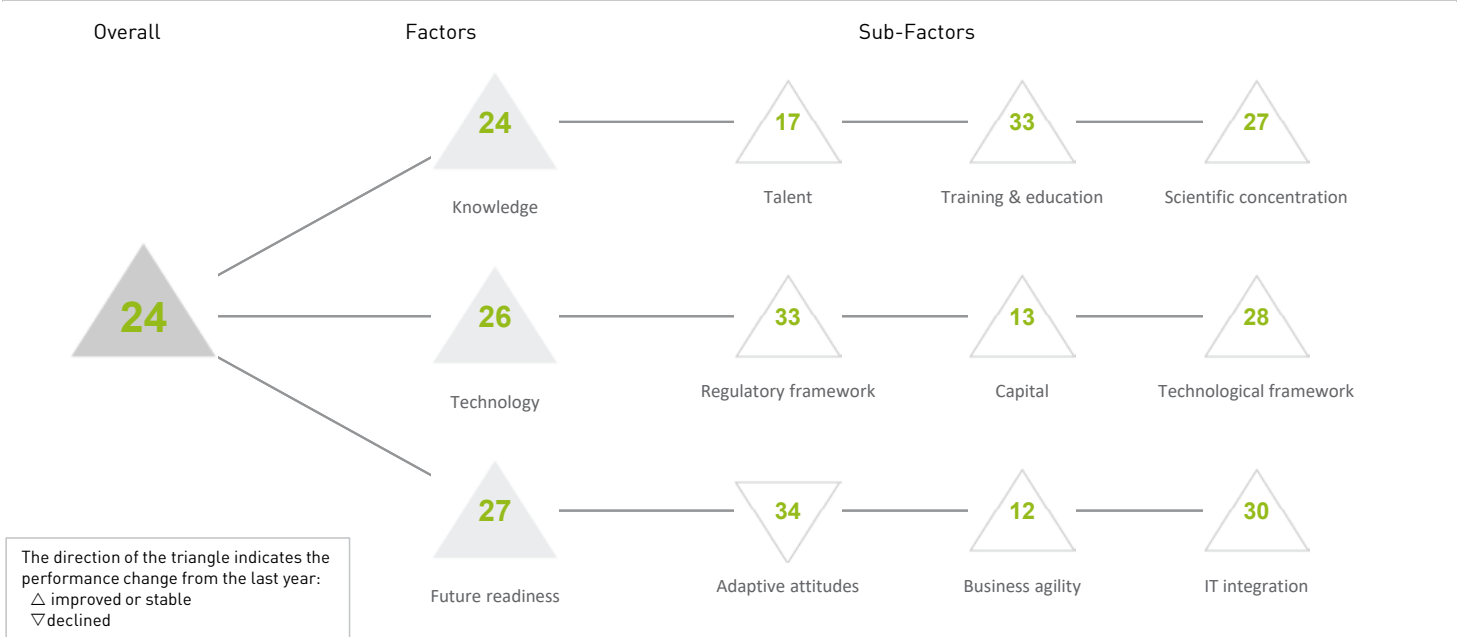
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 34 | 28 | 27 | 36 | 46 |
| Business agility | 57 | 42 | 50 | 53 | 63 |
| IT integration | 38 | 29 | 33 | 29 | 39 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 22 | Opportunities and threats | 59 | E-Government | 25 |
| Internet retailing | - | World robots distribution | - | Public-private partnerships | 59 |
| Tablet possession | 43 | ▷ Agility of companies | 61 | Cyber security | 60 |
| Smartphone possession | - | ▷ Use of big data and analytics | 63 | Software piracy | 34 |
| Attitudes toward globalization | 58 | ▷ Knowledge transfer | 62 | Government cyber security capacity | 31 |
| | | Entrepreneurial fear of failure | 41 | Privacy protection by law content | 24 |

CZECH REPUBLIC

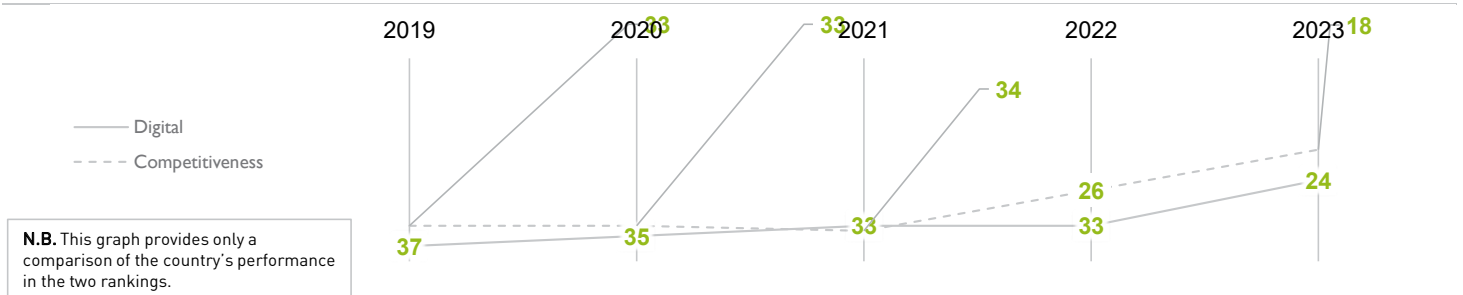
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 37 | 35 | 33 | 33 | 24 |
| Knowledge | 37 | 37 | 35 | 32 | 24 |
| Technology | 34 | 36 | 37 | 35 | 26 |
| Future readiness | 39 | 36 | 37 | 29 | 27 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



CZECH REPUBLIC

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 35 | 26 | 28 | 22 | 17 |
| Training & education | 44 | 46 | 45 | 38 | 33 |
| Scientific concentration | 30 | 31 | 30 | 29 | 27 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 21 | Employee training | 11 | Total expenditure on R&D (%) | 20 |
| ▶ International experience | 09 | Total public expenditure on education | 28 | Total R&D personnel per capita | 17 |
| Foreign highly skilled personnel | 21 | Higher education achievement | 45 | ▷ Female researchers | 51 |
| Management of cities | 27 | Pupil-teacher ratio (tertiary education) | 30 | R&D productivity by publication | 34 |
| Digital/Technological skills | 23 | Graduates in Sciences | 24 | Scientific and technical employment | 29 |
| Net flow of international students | 11 | Women with degrees | 42 | High-tech patent grants | 29 |
| | | | | Robots in Education and R&D | 15 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 43 | 45 | 44 | 37 | 33 |
| Capital | 28 | 27 | 29 | 26 | 13 |
| Technological framework | 28 | 28 | 32 | 30 | 28 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| ▷ Starting a business | 56 | IT & media stock market capitalization | 19 | Communications technology | 18 |
| ▷ Enforcing contracts | 52 | Funding for technological development | 14 | ▶ Mobile broadband subscribers | 10 |
| Immigration laws | 13 | ▶ Banking and financial services | 07 | Wireless broadband | 26 |
| Development & application of tech. | 32 | Country credit rating | 25 | Internet users | 40 |
| Scientific research legislation | 17 | Venture capital | 11 | Internet bandwidth speed | 47 |
| Intellectual property rights | 15 | Investment in Telecommunications | 41 | High-tech exports (%) | 19 |

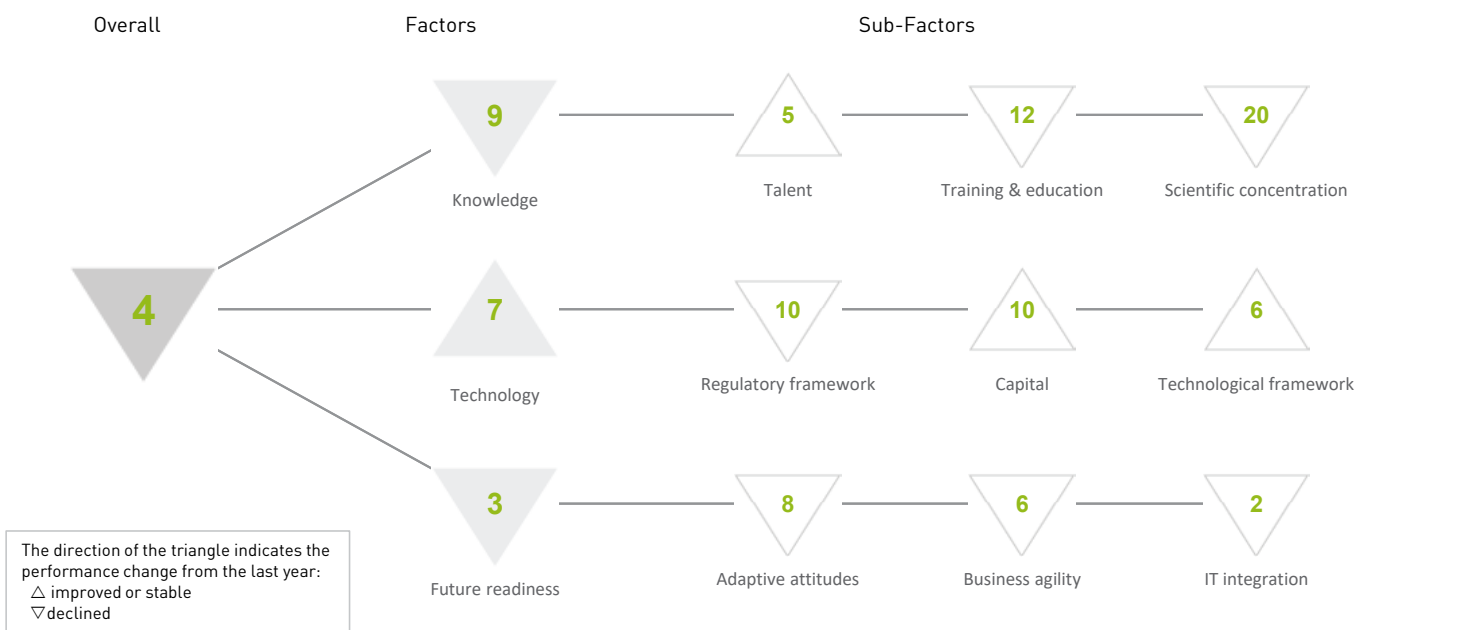
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 46 | 34 | 35 | 31 | 34 |
| Business agility | 37 | 27 | 32 | 24 | 12 |
| IT integration | 35 | 36 | 36 | 36 | 30 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| ▷ E-Participation | 48 | ▶ Opportunities and threats | 08 | E-Government | 40 |
| Internet retailing | 25 | World robots distribution | 16 | Public-private partnerships | 39 |
| Tablet possession | 46 | ▶ Agility of companies | 08 | Cyber security | 18 |
| Smartphone possession | 13 | Use of big data and analytics | 19 | Software piracy | 20 |
| Attitudes toward globalization | 14 | Knowledge transfer | 19 | ▷ Government cyber security capacity | 51 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 12 |

DENMARK

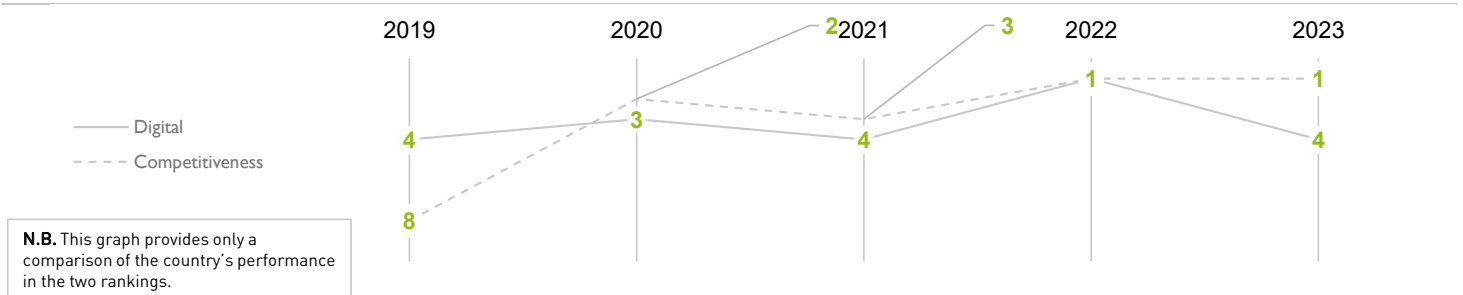
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 04 | 03 | 04 | 01 | 04 |
| Knowledge | 06 | 06 | 08 | 06 | 09 |
| Technology | 11 | 09 | 09 | 07 | 07 |
| Future readiness | 02 | 01 | 02 | 01 | 03 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



DENMARK

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 06 | 04 | 05 | 05 | 05 |
| Training & education | 06 | 09 | 04 | 07 | 12 |
| Scientific concentration | 17 | 15 | 17 | 17 | 20 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 12 | ► Employee training | 02 | Total expenditure on R&D (%) | 13 |
| International experience | 12 | Total public expenditure on education | 08 | Total R&D personnel per capita | 05 |
| Foreign highly skilled personnel | 14 | Higher education achievement | 25 | ▷ Female researchers | 34 |
| Management of cities | 02 | Pupil-teacher ratio (tertiary education) | 19 | ▷ R&D productivity by publication | 43 |
| Digital/Technological skills | 04 | ▷ Graduates in Sciences | 33 | Scientific and technical employment | 21 |
| Net flow of international students | 10 | Women with degrees | 26 | High-tech patent grants | 30 |
| | | | | Robots in Education and R&D | 24 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 10 | 04 | 04 | 06 | 10 |
| Capital | 27 | 23 | 13 | 14 | 10 |
| Technological framework | 08 | 06 | 06 | 06 | 06 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|------------------------------------------|------|------------------------------|------|
| Starting a business | 25 | ▷ IT & media stock market capitalization | 55 | ► Communications technology | 01 |
| Enforcing contracts | 13 | Funding for technological development | 02 | Mobile broadband subscribers | 06 |
| ▷ Immigration laws | 51 | ► Banking and financial services | 01 | Wireless broadband | 11 |
| Development & application of tech. | 03 | ► Country credit rating | 01 | Internet users | 08 |
| Scientific research legislation | 09 | Venture capital | 09 | Internet bandwidth speed | 09 |
| Intellectual property rights | 04 | Investment in Telecommunications | 16 | High-tech exports (%) | 32 |

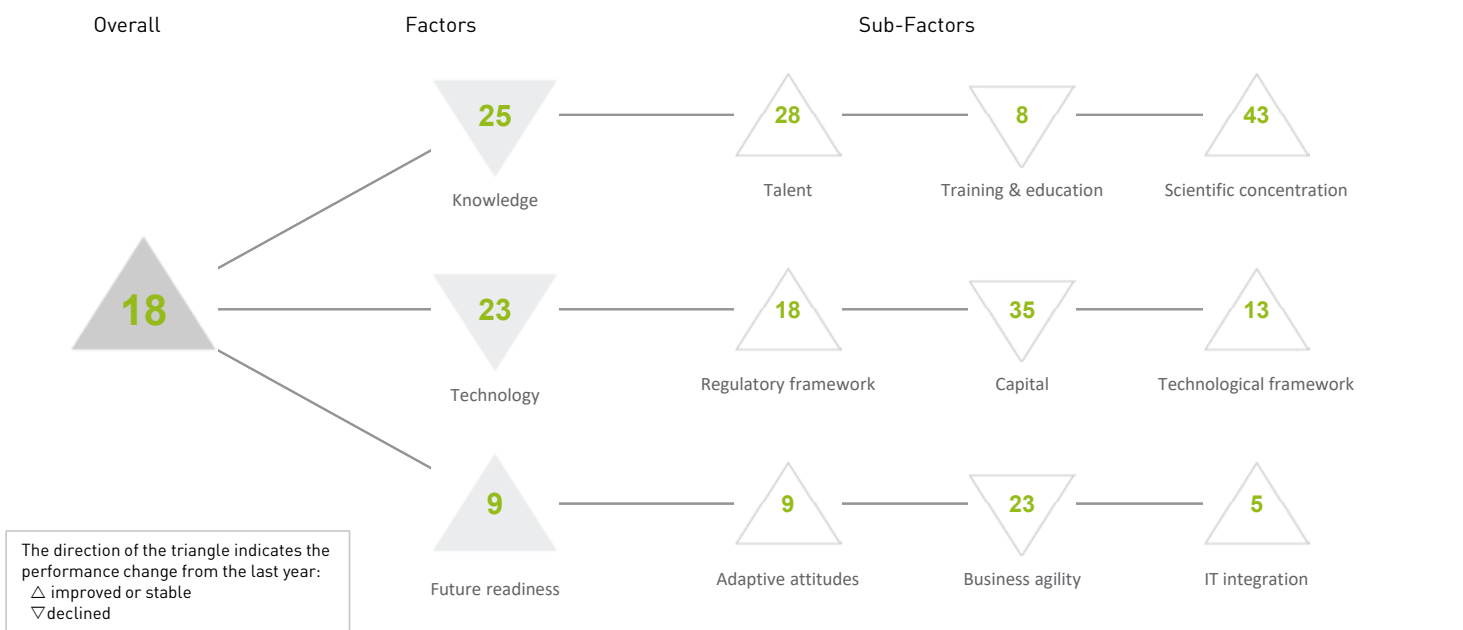
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 01 | 02 | 04 | 05 | 08 |
| Business agility | 10 | 05 | 07 | 01 | 06 |
| IT integration | 01 | 01 | 01 | 01 | 02 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 12 | Opportunities and threats | 06 | ► E-Government | 01 |
| Internet retailing | 05 | World robots distribution | 29 | Public-private partnerships | 04 |
| Tablet possession | 33 | Agility of companies | 03 | Cyber security | 11 |
| Smartphone possession | 33 | Use of big data and analytics | 06 | Software piracy | 08 |
| Attitudes toward globalization | 03 | Knowledge transfer | 04 | Government cyber security capacity | 08 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 26 |

ESTONIA

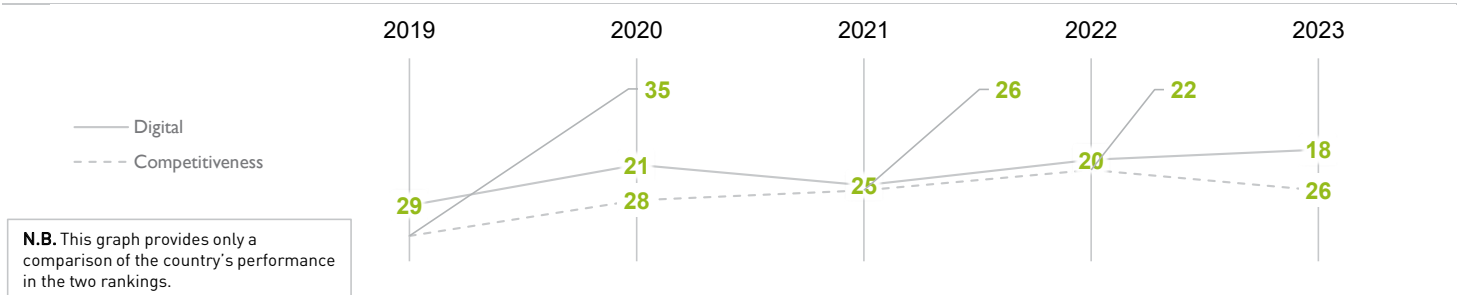
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 29 | 21 | 25 | 20 | 18 |
| Knowledge | 30 | 23 | 27 | 23 | 25 |
| Technology | 22 | 23 | 25 | 21 | 23 |
| Future readiness | 30 | 20 | 20 | 12 | 09 |

COMPETITIVENESS & DIGITAL RANKINGS

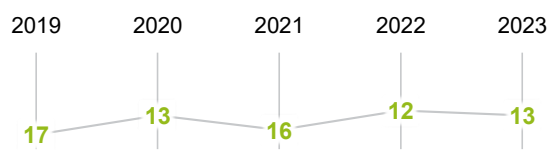


PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



ESTONIA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 37 | 31 | 29 | 30 | 28 |
| Training & education | 10 | 03 | 08 | 05 | 08 |
| Scientific concentration | 46 | 47 | 45 | 43 | 43 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 07 |
| International experience | 45 |
| Foreign highly skilled personnel | 32 |
| Management of cities | 37 |
| Digital/Technological skills | 38 |
| Net flow of international students | 28 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 12 |
| Total public expenditure on education | 10 |
| Higher education achievement | 34 |
| Pupil-teacher ratio (tertiary education) | 13 |
| Graduates in Sciences | 17 |
| Women with degrees | 16 |

| Scientific concentration | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 23 |
| Total R&D personnel per capita | 32 |
| Female researchers | 20 |
| ▷ R&D productivity by publication | 58 |
| Scientific and technical employment | 36 |
| High-tech patent grants | 11 |
| ▷ Robots in Education and R&D | 48 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 31 | 30 | 28 | 30 | 18 |
| Capital | 24 | 29 | 33 | 29 | 35 |
| Technological framework | 16 | 17 | 20 | 21 | 13 |

| Regulatory framework | Rank |
|------------------------------------|------|
| Starting a business | 07 |
| Enforcing contracts | 08 |
| Immigration laws | 36 |
| Development & application of tech. | 17 |
| Scientific research legislation | 28 |
| Intellectual property rights | 23 |

| Capital | Rank |
|------------------------------------------|------|
| ▷ IT & media stock market capitalization | 51 |
| Funding for technological development | 30 |
| Banking and financial services | 27 |
| Country credit rating | 26 |
| Venture capital | 24 |
| Investment in Telecommunications | 43 |

| Technological framework | Rank |
|------------------------------|------|
| ▷ Communications technology | 46 |
| Mobile broadband subscribers | 07 |
| ▶ Wireless broadband | 05 |
| Internet users | 13 |
| Internet bandwidth speed | 35 |
| High-tech exports (%) | 22 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 26 | 18 | 20 | 14 | 09 |
| Business agility | 43 | 26 | 25 | 20 | 23 |
| IT integration | 26 | 22 | 25 | 07 | 05 |

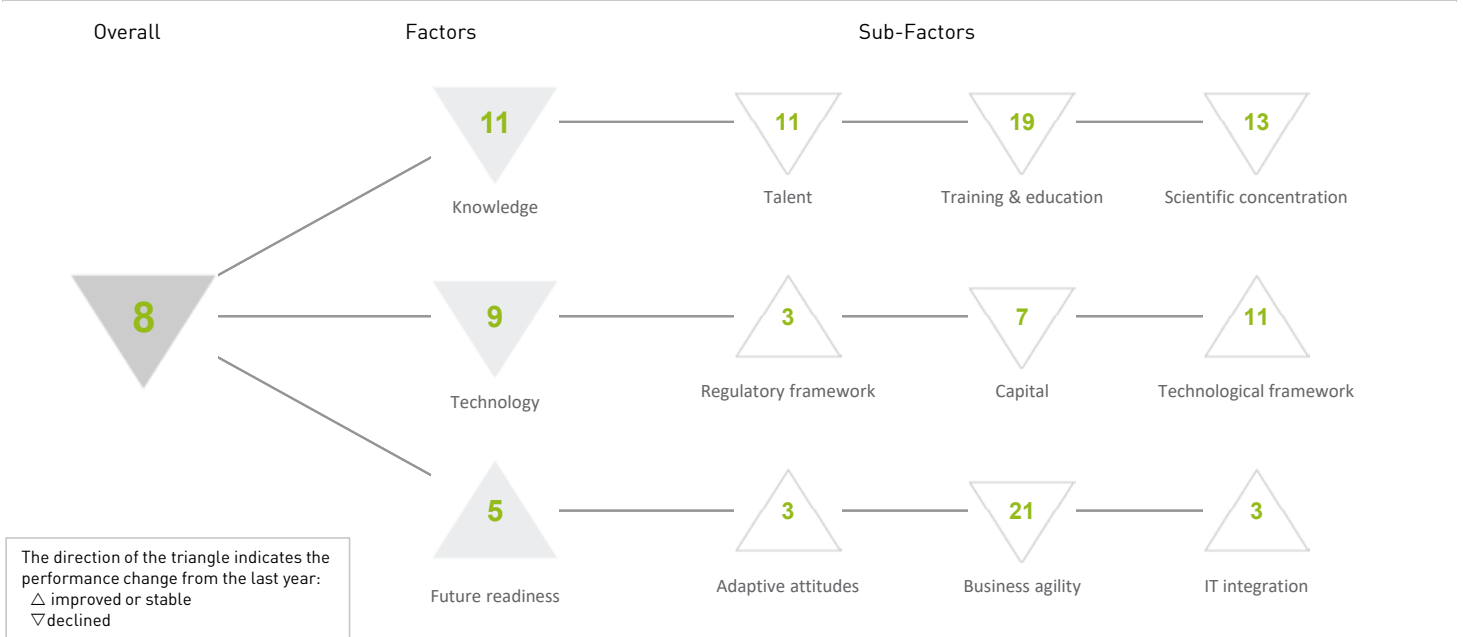
| Adaptive attitudes | Rank |
|--------------------------------|------|
| ▶ E-Participation | 03 |
| Internet retailing | 19 |
| ▶ Tablet possession | 04 |
| Smartphone possession | 19 |
| Attitudes toward globalization | 24 |

| Business agility | Rank |
|-----------------------------------|------|
| Opportunities and threats | 22 |
| ▷ World robots distribution | 46 |
| Agility of companies | 09 |
| Use of big data and analytics | 34 |
| Knowledge transfer | 35 |
| ▶ Entrepreneurial fear of failure | 07 |

| IT integration | Rank |
|--------------------------------------|------|
| E-Government | 08 |
| Public-private partnerships | 44 |
| Cyber security | 15 |
| Software piracy | 30 |
| ▶ Government cyber security capacity | 02 |
| Privacy protection by law content | 09 |

FINLAND

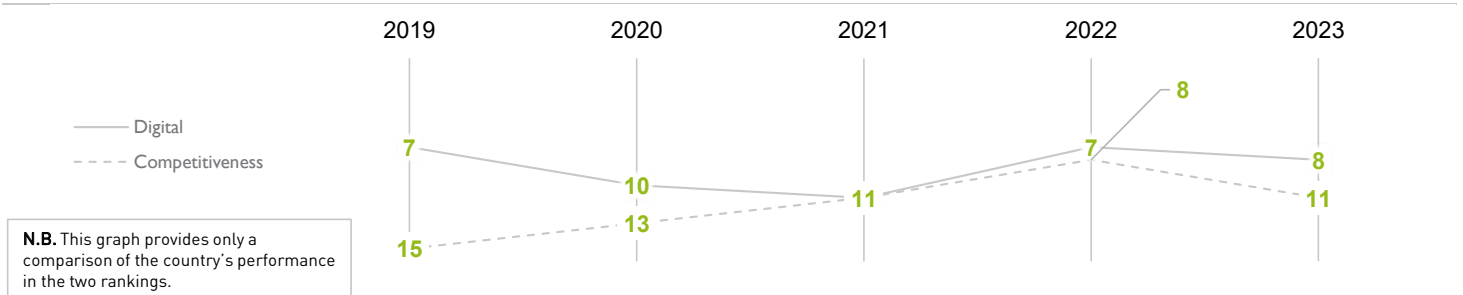
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 07 | 10 | 11 | 07 | 08 |
| Knowledge | 09 | 15 | 09 | 09 | 11 |
| Technology | 08 | 10 | 12 | 08 | 09 |
| Future readiness | 07 | 09 | 09 | 06 | 05 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



FINLAND

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 09 | 11 | 10 | 09 | 11 |
| Training & education | 16 | 20 | 19 | 17 | 19 |
| Scientific concentration | 10 | 12 | 10 | 10 | 13 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 15 | Employee training | 05 | Total expenditure on R&D (%) | 11 |
| International experience | 22 | Total public expenditure on education | 13 | Total R&D personnel per capita | 07 |
| Foreign highly skilled personnel | 38 | ▷ Higher education achievement | 40 | ▷ Female researchers | 40 |
| Management of cities | 04 | ▷ Pupil-teacher ratio (tertiary education) | 44 | ▷ R&D productivity by publication | 48 |
| ▶ Digital/Technological skills | 02 | Graduates in Sciences | 15 | Scientific and technical employment | 11 |
| Net flow of international students | 19 | Women with degrees | 20 | High-tech patent grants | 09 |
| | | | | Robots in Education and R&D | 25 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 09 | 13 | 11 | 05 | 03 |
| Capital | 11 | 06 | 10 | 05 | 07 |
| Technological framework | 13 | 10 | 14 | 12 | 11 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|--------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 18 | IT & media stock market capitalization | 15 | Communications technology | 03 |
| Enforcing contracts | 33 | Funding for technological development | 03 | Mobile broadband subscribers | 15 |
| Immigration laws | 37 | ▶ Banking and financial services | 02 | Wireless broadband | 07 |
| ▶ Development & application of tech. | 01 | Country credit rating | 12 | Internet users | 16 |
| Scientific research legislation | 03 | Venture capital | 08 | Internet bandwidth speed | 32 |
| Intellectual property rights | 03 | ▷ Investment in Telecommunications | 56 | High-tech exports (%) | 38 |

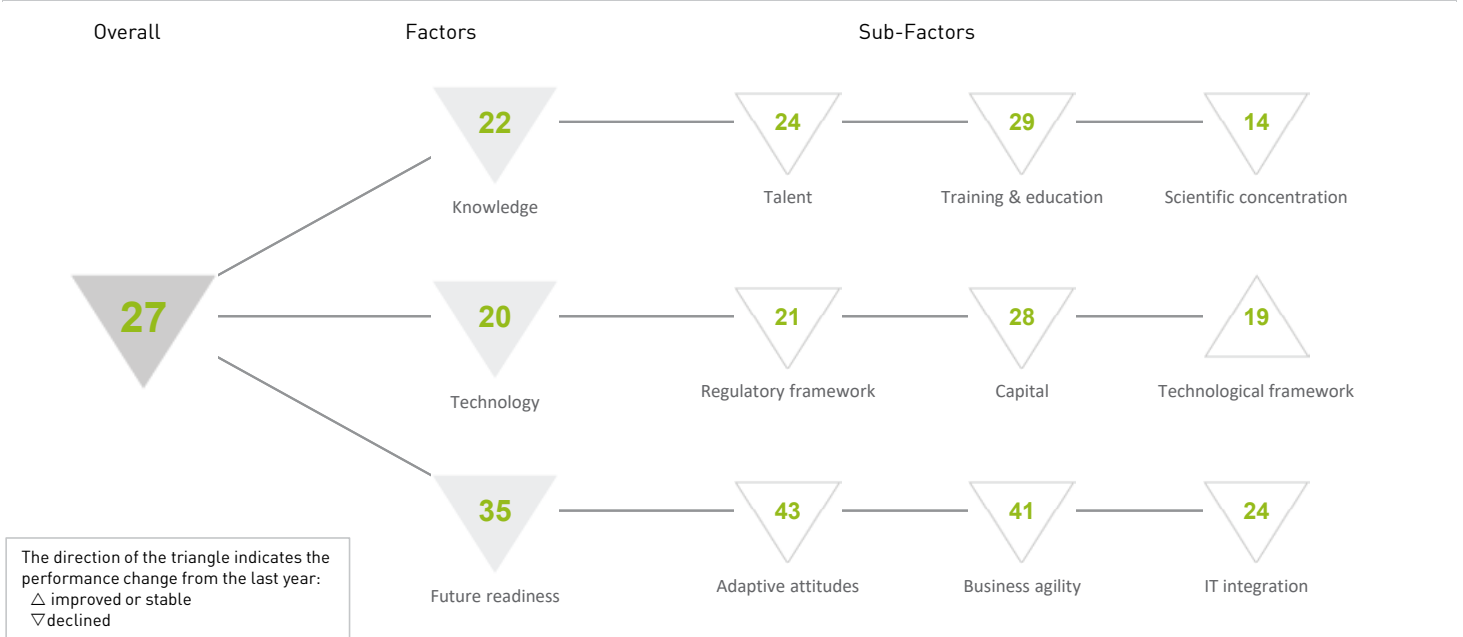
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 06 | 10 | 07 | 03 | 03 |
| Business agility | 27 | 22 | 21 | 16 | 21 |
| IT integration | 02 | 02 | 02 | 03 | 03 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 06 | Opportunities and threats | 27 | ▶ E-Government | 02 |
| Internet retailing | 13 | World robots distribution | 34 | Public-private partnerships | 03 |
| Tablet possession | 05 | Agility of companies | 23 | ▶ Cyber security | 03 |
| Smartphone possession | 21 | Use of big data and analytics | 18 | Software piracy | 13 |
| Attitudes toward globalization | 04 | Knowledge transfer | 07 | Government cyber security capacity | 35 |
| | | Entrepreneurial fear of failure | 24 | Privacy protection by law content | 14 |

FRANCE

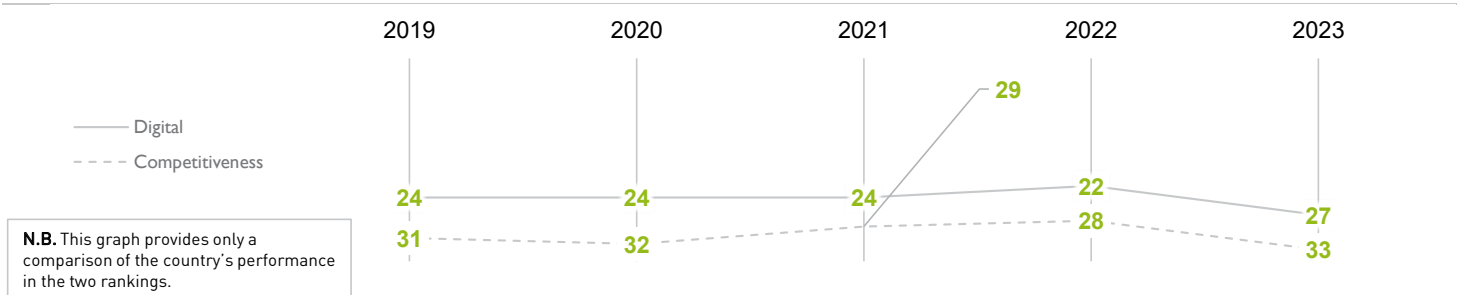
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 24 | 24 | 24 | 22 | 27 |
| Knowledge | 20 | 20 | 20 | 20 | 22 |
| Technology | 16 | 15 | 16 | 16 | 20 |
| Future readiness | 29 | 31 | 31 | 34 | 35 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (27 countries)



FRANCE

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 24 | 25 | 23 | 23 | 24 |
| Training & education | 28 | 36 | 27 | 27 | 29 |
| Scientific concentration | 12 | 13 | 12 | 13 | 14 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 24 |
| International experience | 33 |
| Foreign highly skilled personnel | 22 |
| Management of cities | 26 |
| Digital/Technological skills | 31 |
| Net flow of international students | 20 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 36 |
| Total public expenditure on education | 24 |
| Higher education achievement | 23 |
| Pupil-teacher ratio (tertiary education) | 39 |
| Graduates in Sciences | 23 |
| Women with degrees | 30 |

| Scientific concentration | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 17 |
| Total R&D personnel per capita | 21 |
| ▷ Female researchers | 49 |
| R&D productivity by publication | 17 |
| Scientific and technical employment | 17 |
| High-tech patent grants | 15 |
| ► Robots in Education and R&D | 05 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 08 | 09 | 10 | 15 | 21 |
| Capital | 18 | 20 | 21 | 19 | 28 |
| Technological framework | 22 | 19 | 17 | 20 | 19 |

| Regulatory framework | Rank |
|------------------------------------|------|
| Starting a business | 21 |
| ► Enforcing contracts | 15 |
| Immigration laws | 25 |
| Development & application of tech. | 38 |
| Scientific research legislation | 25 |
| ► Intellectual property rights | 13 |

| Capital | Rank |
|----------------------------------------|------|
| IT & media stock market capitalization | 32 |
| Funding for technological development | 29 |
| Banking and financial services | 47 |
| Country credit rating | 16 |
| Venture capital | 27 |
| Investment in Telecommunications | 20 |

| Technological framework | Rank |
|------------------------------|------|
| Communications technology | 17 |
| Mobile broadband subscribers | 31 |
| Wireless broadband | 38 |
| Internet users | 28 |
| ► Internet bandwidth speed | 06 |
| High-tech exports (%) | 17 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 36 | 36 | 48 | 41 | 43 |
| Business agility | 39 | 36 | 33 | 38 | 41 |
| IT integration | 19 | 21 | 22 | 21 | 24 |

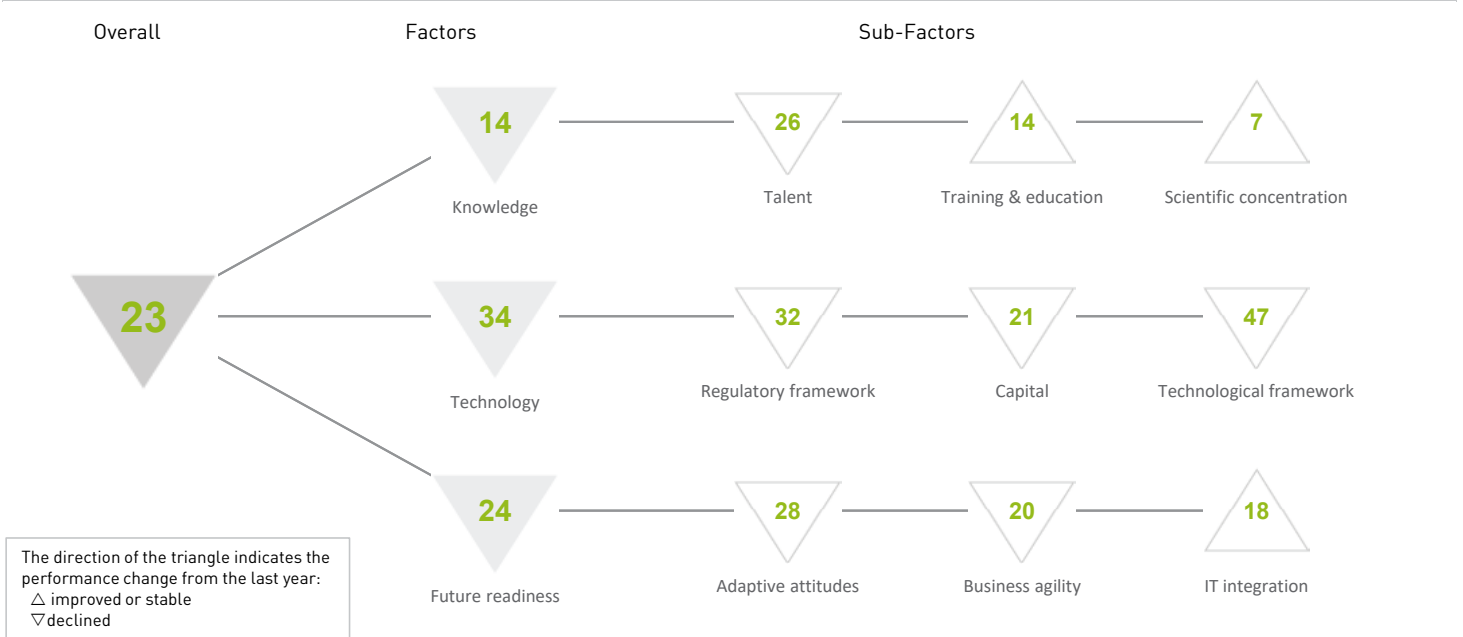
| Adaptive attitudes | Rank |
|----------------------------------|------|
| E-Participation | 34 |
| Internet retailing | 23 |
| Tablet possession | 25 |
| Smartphone possession | 25 |
| ▷ Attitudes toward globalization | 64 |

| Business agility | Rank |
|---------------------------------|------|
| ▷ Opportunities and threats | 55 |
| ► World robots distribution | 08 |
| ▷ Agility of companies | 50 |
| ▷ Use of big data and analytics | 47 |
| Knowledge transfer | 33 |
| Entrepreneurial fear of failure | 23 |

| IT integration | Rank |
|------------------------------------|------|
| E-Government | 18 |
| Public-private partnerships | 35 |
| Cyber security | 27 |
| Software piracy | 20 |
| Government cyber security capacity | 21 |
| Privacy protection by law content | 30 |

GERMANY

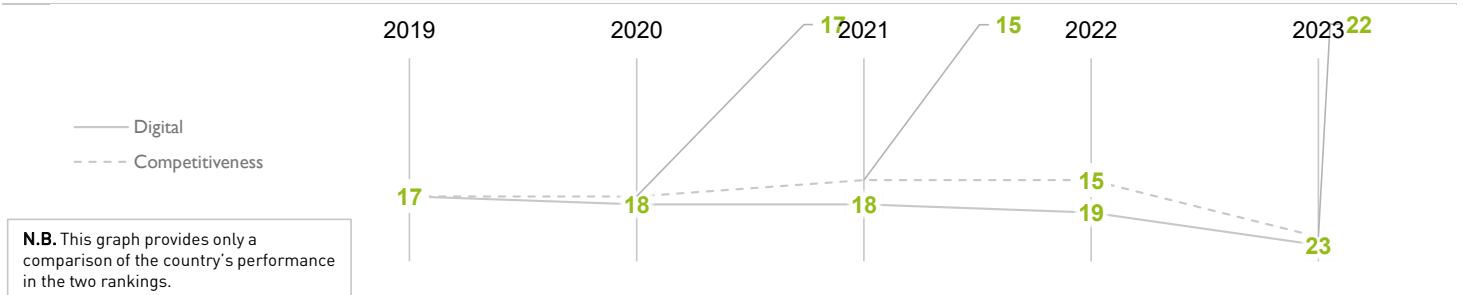
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 17 | 18 | 18 | 19 | 23 |
| Knowledge | 12 | 12 | 14 | 11 | 14 |
| Technology | 31 | 31 | 31 | 27 | 34 |
| Future readiness | 16 | 19 | 18 | 19 | 24 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (27 countries)



GERMANY

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 25 | 22 | 21 | 20 | 26 |
| Training & education | 14 | 17 | 17 | 15 | 14 |
| Scientific concentration | 04 | 05 | 06 | 07 | 07 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 19 | ▶ Employee training | 03 | Total expenditure on R&D (%) | 10 |
| International experience | 16 | Total public expenditure on education | 40 | Total R&D personnel per capita | 14 |
| Foreign highly skilled personnel | 25 | Higher education achievement | 43 | Female researchers | 50 |
| Management of cities | 28 | ▶ Pupil-teacher ratio (tertiary education) | 04 | R&D productivity by publication | 12 |
| ▷ Digital/Technological skills | 58 | ▶ Graduates in Sciences | 04 | Scientific and technical employment | 25 |
| Net flow of international students | 14 | Women with degrees | 43 | High-tech patent grants | 18 |
| | | | | ▶ Robots in Education and R&D | 02 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 27 | 28 | 25 | 20 | 32 |
| Capital | 17 | 16 | 23 | 16 | 21 |
| Technological framework | 40 | 45 | 43 | 43 | 47 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 51 | IT & media stock market capitalization | 09 | ▷ Communications technology | 54 |
| Enforcing contracts | 12 | Funding for technological development | 34 | ▷ Mobile broadband subscribers | 57 |
| Immigration laws | 45 | Banking and financial services | 30 | Wireless broadband | 44 |
| Development & application of tech. | 42 | ▶ Country credit rating | 01 | Internet users | 17 |
| Scientific research legislation | 27 | Venture capital | 33 | Internet bandwidth speed | 30 |
| Intellectual property rights | 05 | Investment in Telecommunications | 34 | High-tech exports (%) | 28 |

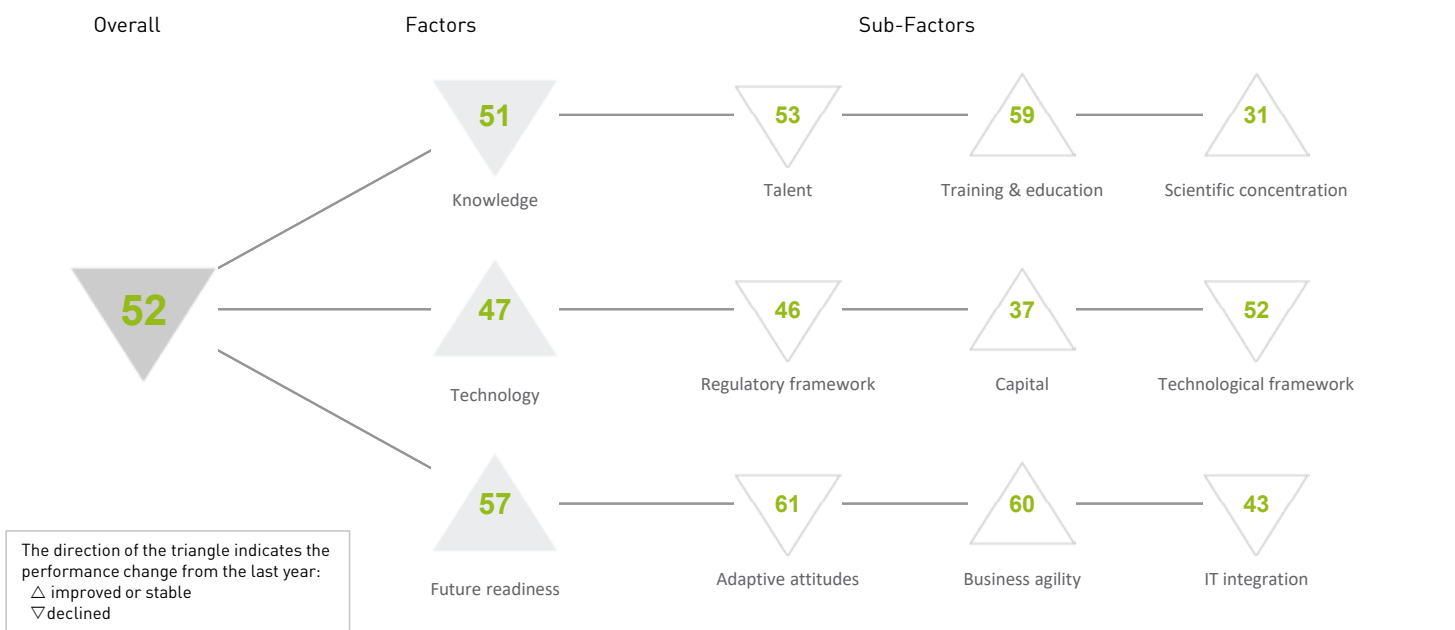
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 16 | 23 | 23 | 27 | 28 |
| Business agility | 11 | 15 | 15 | 15 | 20 |
| IT integration | 17 | 20 | 20 | 19 | 18 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 29 | ▷ Opportunities and threats | 51 | E-Government | 21 |
| Internet retailing | 14 | World robots distribution | 05 | Public-private partnerships | 36 |
| Tablet possession | 35 | Agility of companies | 42 | Cyber security | 37 |
| ▷ Smartphone possession | 51 | Use of big data and analytics | 49 | Software piracy | 08 |
| Attitudes toward globalization | 40 | Knowledge transfer | 11 | Government cyber security capacity | 30 |
| | | Entrepreneurial fear of failure | 13 | Privacy protection by law content | 18 |

GREECE

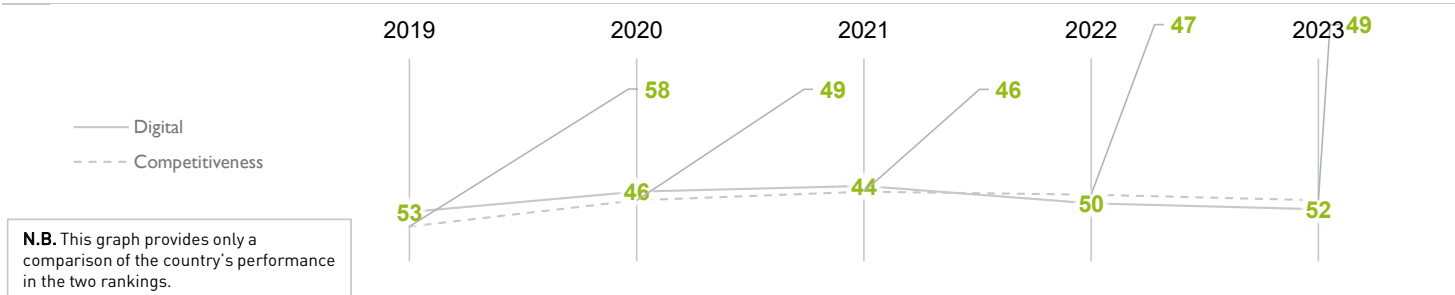
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 53 | 46 | 44 | 50 | 52 |
| Knowledge | 53 | 48 | 45 | 47 | 51 |
| Technology | 54 | 43 | 46 | 47 | 47 |
| Future readiness | 53 | 46 | 43 | 60 | 57 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



GREECE

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 53 | 50 | 42 | 49 | 53 |
| Training & education | 60 | 56 | 55 | 59 | 59 |
| Scientific concentration | 34 | 36 | 35 | 33 | 31 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|---------------------------------------|------|
| Educational assessment PISA - Math | 39 | Employee training | 53 | Total expenditure on R&D (%) | 29 |
| International experience | 38 | Total public expenditure on education | 46 | Total R&D personnel per capita | 29 |
| ▷ Foreign highly skilled personnel | 57 | Higher education achievement | 33 | Female researchers | 26 |
| Management of cities | 51 | ▷ Pupil-teacher ratio (tertiary education) | 60 | R&D productivity by publication | 31 |
| Digital/Technological skills | 44 | ► Graduates in Sciences | 18 | ► Scientific and technical employment | 12 |
| Net flow of international students | 55 | Women with degrees | 35 | High-tech patent grants | 48 |
| | | | | Robots in Education and R&D | 40 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 52 | 41 | 43 | 42 | 46 |
| Capital | 52 | 49 | 52 | 46 | 37 |
| Technological framework | 49 | 46 | 50 | 50 | 52 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|------------------------------------------|------|------------------------------|------|
| ► Starting a business | 06 | ► IT & media stock market capitalization | 16 | Communications technology | 50 |
| ▷ Enforcing contracts | 60 | Funding for technological development | 37 | Mobile broadband subscribers | 49 |
| Immigration laws | 23 | ▷ Banking and financial services | 58 | Wireless broadband | 25 |
| Development & application of tech. | 41 | Country credit rating | 56 | Internet users | 51 |
| Scientific research legislation | 44 | Venture capital | 43 | Internet bandwidth speed | 56 |
| Intellectual property rights | 48 | ► Investment in Telecommunications | 03 | High-tech exports (%) | 52 |

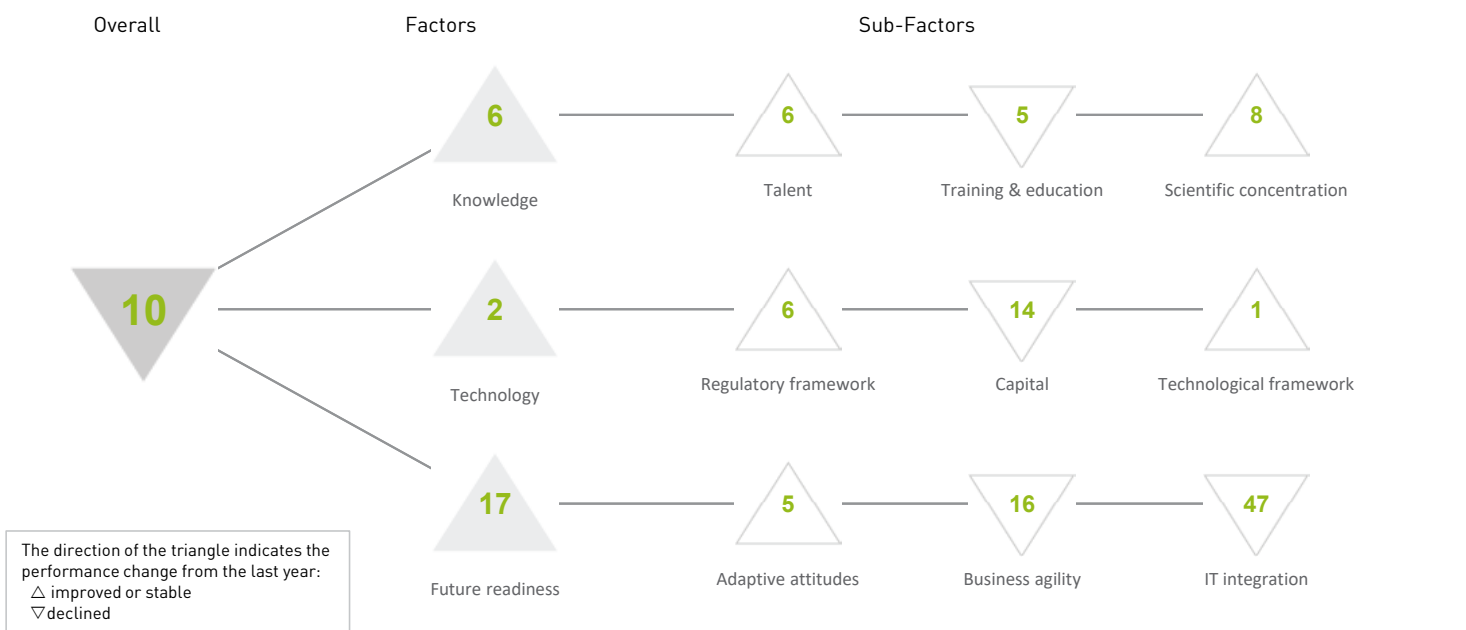
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 41 | 44 | 43 | 60 | 61 |
| Business agility | 60 | 55 | 51 | 61 | 60 |
| IT integration | 50 | 45 | 41 | 41 | 43 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 47 | Opportunities and threats | 42 | E-Government | 31 |
| Internet retailing | 33 | World robots distribution | 44 | Public-private partnerships | 38 |
| Tablet possession | 36 | Agility of companies | 55 | Cyber security | 50 |
| ▷ Smartphone possession | 60 | Use of big data and analytics | 51 | Software piracy | 53 |
| Attitudes toward globalization | 47 | Knowledge transfer | 53 | Government cyber security capacity | 36 |
| | | Entrepreneurial fear of failure | 43 | Privacy protection by law content | 35 |

HONG KONG SAR

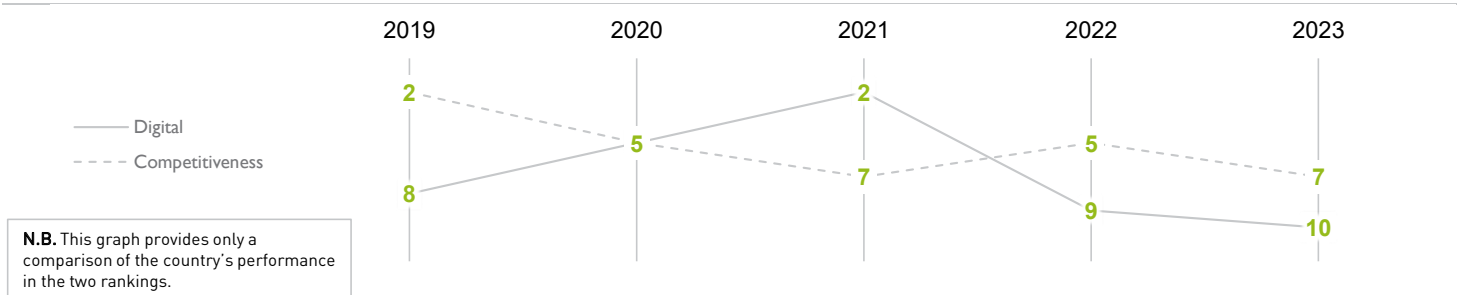
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 08 | 05 | 02 | 09 | 10 |
| Knowledge | 07 | 07 | 05 | 07 | 06 |
| Technology | 04 | 02 | 01 | 02 | 02 |
| Future readiness | 15 | 10 | 10 | 18 | 17 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (37 countries)



HONG KONG SAR

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 04 | 07 | 06 | 10 | 06 |
| Training & education | 12 | 05 | 01 | 02 | 05 |
| Scientific concentration | 16 | 17 | 14 | 18 | 08 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 03 | Employee training | 32 | ▷ Total expenditure on R&D (%) | 41 |
| International experience | 08 | ▷ Total public expenditure on education | 50 | Total R&D personnel per capita | 33 |
| Foreign highly skilled personnel | 23 | Higher education achievement | 09 | Female researchers | - |
| Management of cities | 03 | Pupil-teacher ratio (tertiary education) | 27 | R&D productivity by publication | 25 |
| Digital/Technological skills | 15 | ▶ Graduates in Sciences | 01 | Scientific and technical employment | 08 |
| Net flow of international students | 26 | Women with degrees | - | ▶ High-tech patent grants | 02 |
| | | | | Robots in Education and R&D | 34 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 12 | 07 | 06 | 09 | 06 |
| Capital | 06 | 12 | 07 | 08 | 14 |
| Technological framework | 03 | 02 | 01 | 01 | 01 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 04 | IT & media stock market capitalization | 04 | Communications technology | 10 |
| Enforcing contracts | 24 | Funding for technological development | 13 | Mobile broadband subscribers | 21 |
| Immigration laws | 12 | Banking and financial services | 13 | ▶ Wireless broadband | 03 |
| Development & application of tech. | 14 | Country credit rating | 16 | Internet users | 23 |
| Scientific research legislation | 18 | Venture capital | 21 | Internet bandwidth speed | 23 |
| Intellectual property rights | 12 | ▷ Investment in Telecommunications | 57 | ▶ High-tech exports (%) | 01 |

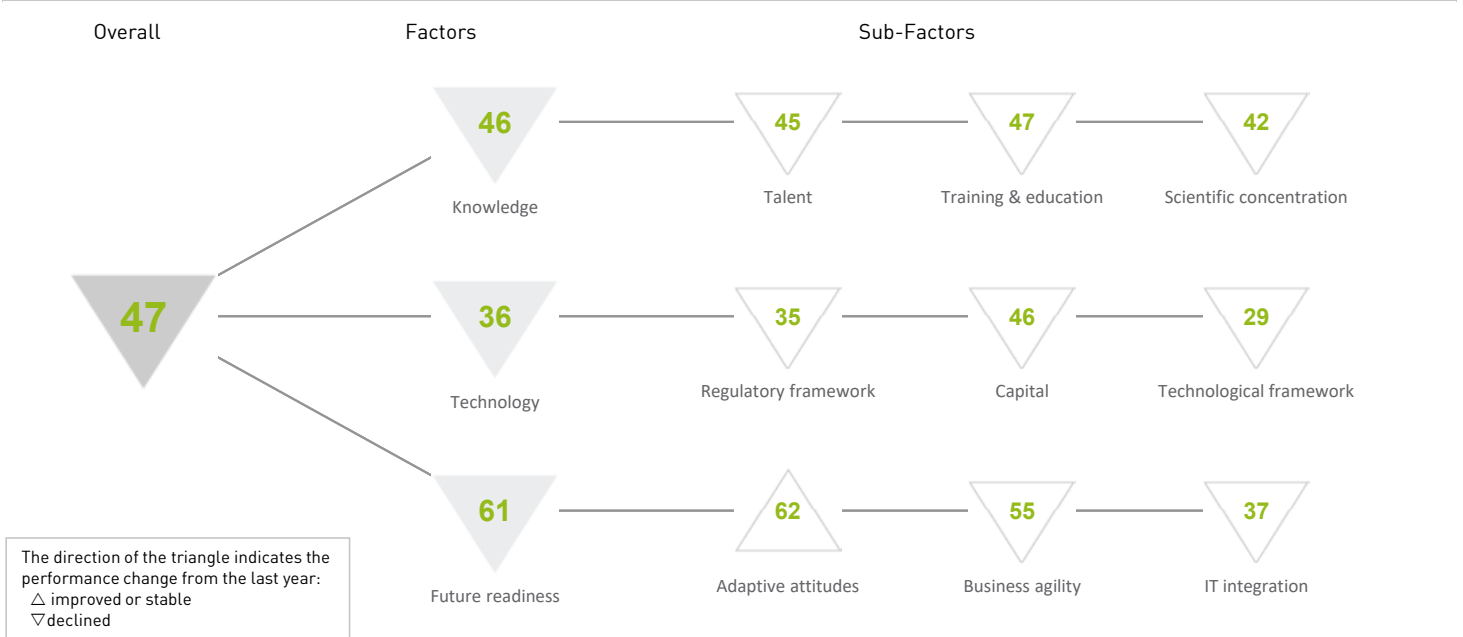
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 12 | 04 | 03 | 09 | 05 |
| Business agility | 08 | 14 | 09 | 11 | 16 |
| IT integration | 22 | 19 | 17 | 45 | 47 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | - | Opportunities and threats | 04 | E-Government | - |
| Internet retailing | 08 | World robots distribution | 37 | Public-private partnerships | 15 |
| Tablet possession | 13 | Agility of companies | 06 | Cyber security | 14 |
| ▶ Smartphone possession | 02 | Use of big data and analytics | 23 | Software piracy | 28 |
| Attitudes toward globalization | 12 | Knowledge transfer | 15 | ▷ Government cyber security capacity | 49 |
| | | Entrepreneurial fear of failure | - | ▷ Privacy protection by law content | 64 |

HUNGARY

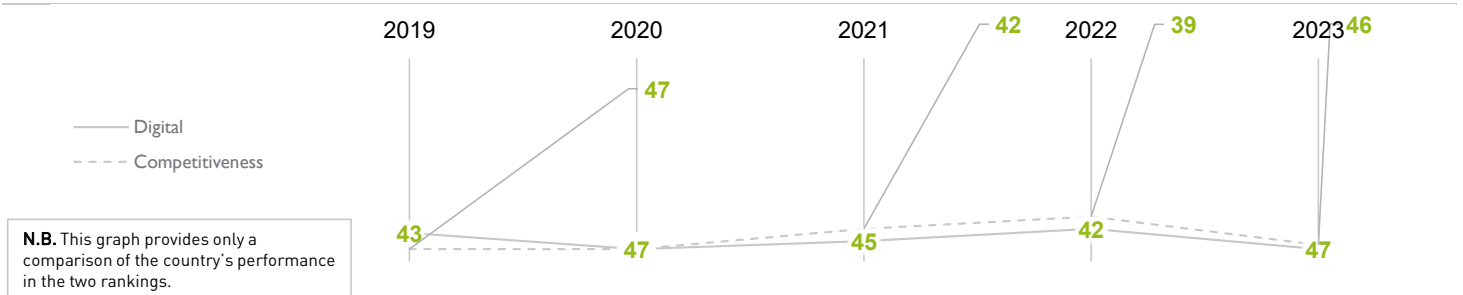
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 43 | 47 | 45 | 42 | 47 |
| Knowledge | 44 | 44 | 43 | 43 | 46 |
| Technology | 36 | 39 | 36 | 31 | 36 |
| Future readiness | 57 | 60 | 61 | 57 | 61 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



HUNGARY

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 47 | 44 | 43 | 40 | 45 |
| Training & education | 43 | 45 | 47 | 44 | 47 |
| Scientific concentration | 45 | 44 | 42 | 38 | 42 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 34 | Employee training | 59 | Total expenditure on R&D (%) | 25 |
| International experience | 43 | Total public expenditure on education | 30 | Total R&D personnel per capita | 27 |
| Foreign highly skilled personnel | 55 | Higher education achievement | 48 | Female researchers | 48 |
| Management of cities | 41 | ► Pupil-teacher ratio (tertiary education) | 15 | R&D productivity by publication | 46 |
| ▷ Digital/Technological skills | 60 | Graduates in Sciences | 57 | Scientific and technical employment | 30 |
| ► Net flow of international students | 17 | Women with degrees | 38 | High-tech patent grants | 39 |
| | | | | Robots in Education and R&D | 31 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 35 | 39 | 36 | 26 | 35 |
| Capital | 46 | 46 | 45 | 42 | 46 |
| Technological framework | 19 | 24 | 21 | 19 | 29 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 38 | IT & media stock market capitalization | 31 | Communications technology | 39 |
| Enforcing contracts | 21 | Funding for technological development | 41 | ► Mobile broadband subscribers | 13 |
| ► Immigration laws | 15 | Banking and financial services | 46 | Wireless broadband | 49 |
| Development & application of tech. | 43 | Country credit rating | 48 | Internet users | 35 |
| Scientific research legislation | 40 | Venture capital | 54 | Internet bandwidth speed | 24 |
| Intellectual property rights | 40 | Investment in Telecommunications | 31 | High-tech exports (%) | 26 |

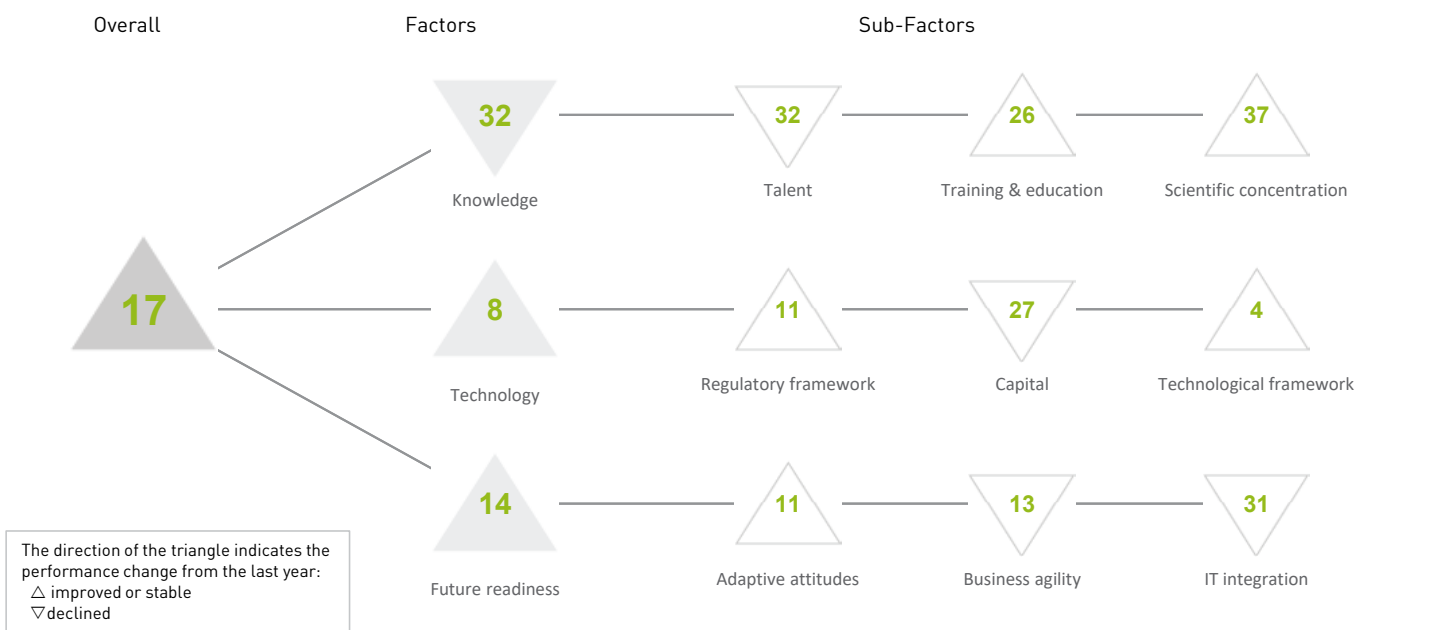
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 62 | 62 | 62 | 62 | 62 |
| Business agility | 53 | 59 | 62 | 48 | 55 |
| IT integration | 37 | 41 | 42 | 35 | 37 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|----------------------------------|------|-----------------------------------|------|------------------------------------|------|
| E-Participation | 55 | ▷ Opportunities and threats | 60 | E-Government | 44 |
| Internet retailing | 41 | World robots distribution | 25 | Public-private partnerships | 47 |
| Tablet possession | 52 | ▷ Agility of companies | 60 | Cyber security | 48 |
| ▷ Smartphone possession | 59 | Use of big data and analytics | 59 | Software piracy | 27 |
| ▷ Attitudes toward globalization | 63 | Knowledge transfer | 52 | Government cyber security capacity | 25 |
| | | ► Entrepreneurial fear of failure | 09 | Privacy protection by law content | 28 |

ICELAND

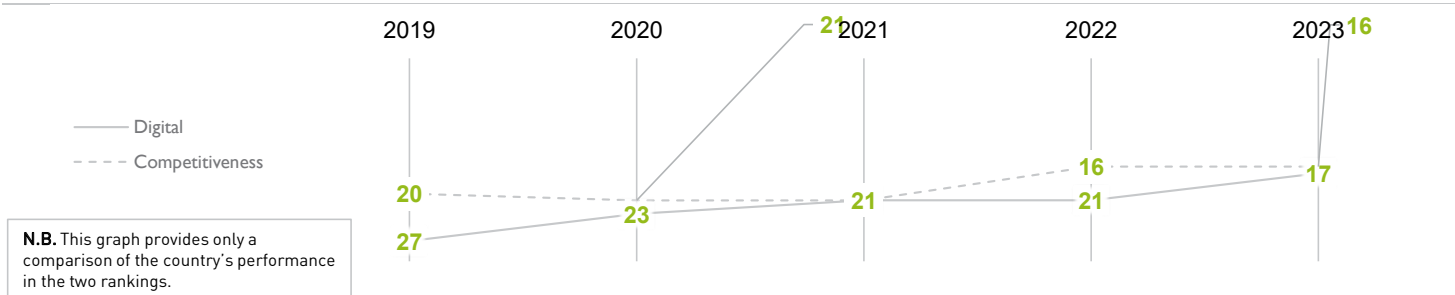
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 27 | 23 | 21 | 21 | 17 |
| Knowledge | 29 | 27 | 33 | 31 | 32 |
| Technology | 20 | 21 | 10 | 11 | 08 |
| Future readiness | 26 | 22 | 25 | 21 | 14 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



ICELAND

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 34 | 33 | 35 | 24 | 32 |
| Training & education | 18 | 15 | 22 | 26 | 26 |
| Scientific concentration | 39 | 46 | 39 | 45 | 37 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 25 | Employee training | 30 | Total expenditure on R&D (%) | 14 |
| International experience | 49 | ▶ Total public expenditure on education | 03 | ▶ Total R&D personnel per capita | 02 |
| Foreign highly skilled personnel | 37 | Higher education achievement | 36 | Female researchers | 13 |
| Management of cities | 40 | Pupil-teacher ratio (tertiary education) | 42 | ▷ R&D productivity by publication | 60 |
| Digital/Technological skills | 08 | Graduates in Sciences | 53 | Scientific and technical employment | 26 |
| ▷ Net flow of international students | 58 | Women with degrees | 18 | High-tech patent grants | 47 |
| | | | | ▷ Robots in Education and R&D | 54 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 15 | 15 | 14 | 11 | 11 |
| Capital | 39 | 35 | 26 | 17 | 27 |
| Technological framework | 15 | 16 | 03 | 05 | 04 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 32 | IT & media stock market capitalization | - | Communications technology | 05 |
| Enforcing contracts | 25 | Funding for technological development | 12 | Mobile broadband subscribers | 04 |
| Immigration laws | 10 | Banking and financial services | 12 | Wireless broadband | 15 |
| Development & application of tech. | 09 | Country credit rating | 34 | Internet users | 03 |
| Scientific research legislation | 11 | Venture capital | 20 | ▶ Internet bandwidth speed | 02 |
| Intellectual property rights | 08 | Investment in Telecommunications | 50 | High-tech exports (%) | 07 |

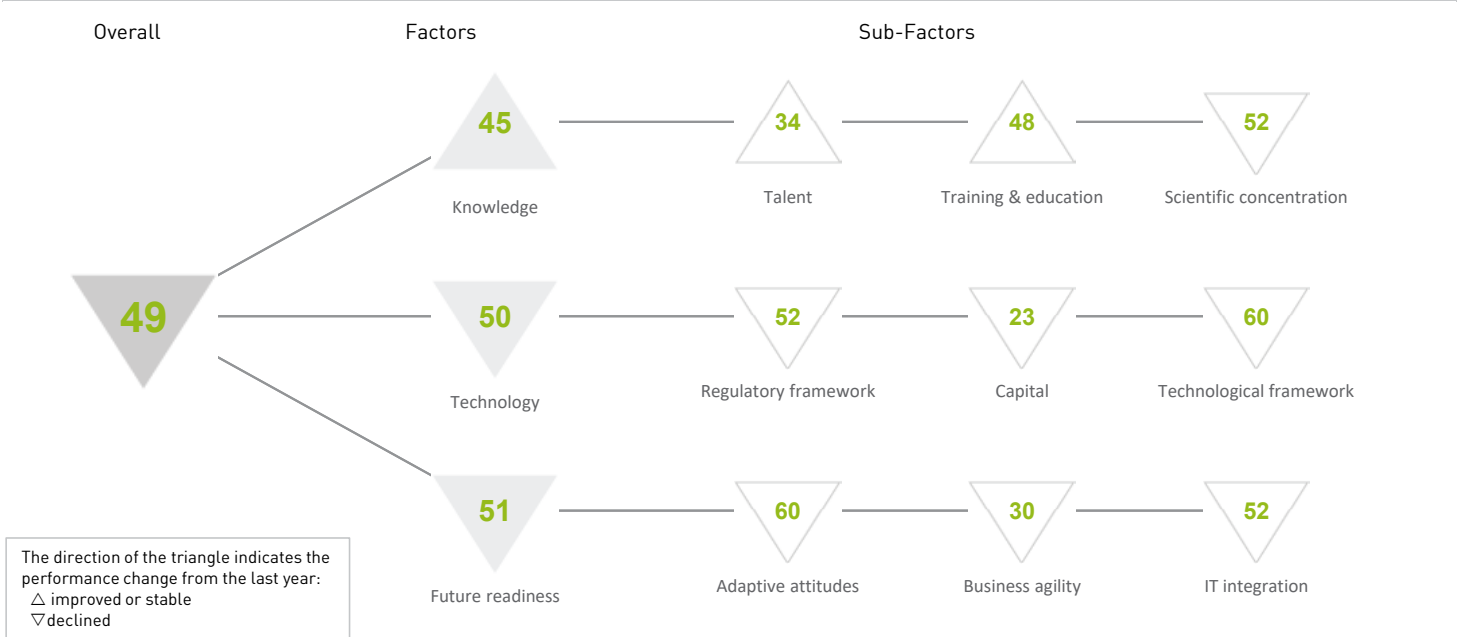
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 28 | 25 | 31 | 21 | 11 |
| Business agility | 24 | 19 | 16 | 12 | 13 |
| IT integration | 28 | 27 | 27 | 30 | 31 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | 16 | ▶ Opportunities and threats | 02 | E-Government | 05 |
| Internet retailing | 20 | ▷ World robots distribution | 54 | Public-private partnerships | 43 |
| Tablet possession | - | Agility of companies | 04 | Cyber security | 21 |
| ▶ Smartphone possession | 01 | Use of big data and analytics | 14 | Software piracy | 34 |
| Attitudes toward globalization | 09 | Knowledge transfer | 21 | ▷ Government cyber security capacity | 53 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 32 |

INDIA

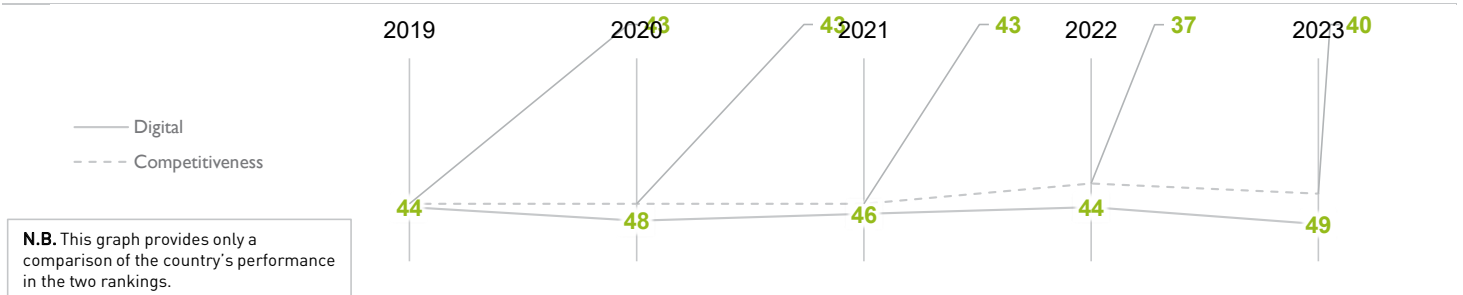
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 44 | 48 | 46 | 44 | 49 |
| Knowledge | 38 | 39 | 41 | 46 | 45 |
| Technology | 49 | 50 | 44 | 43 | 50 |
| Future readiness | 46 | 56 | 50 | 42 | 51 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 38 | 41 | 38 | 34 | 34 |
| Training & education | 47 | 51 | 43 | 56 | 48 |
| Scientific concentration | 28 | 29 | 47 | 50 | 52 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | - |
| International experience | 29 |
| Foreign highly skilled personnel | 33 |
| Management of cities | 46 |
| Digital/Technological skills | 21 |
| Net flow of international students | 45 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 31 |
| Total public expenditure on education | 39 |
| Higher education achievement | 56 |
| Pupil-teacher ratio (tertiary education) | 53 |
| ▶ Graduates in Sciences | 05 |
| Women with degrees | 58 |

| Scientific concentration | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 47 |
| Total R&D personnel per capita | 56 |
| Female researchers | - |
| ▶ R&D productivity by publication | 02 |
| Scientific and technical employment | 59 |
| High-tech patent grants | 52 |
| Robots in Education and R&D | 22 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 55 | 53 | 52 | 48 | 52 |
| Capital | 03 | 07 | 04 | 01 | 23 |
| Technological framework | 62 | 62 | 62 | 58 | 60 |

| Regulatory framework | Rank |
|------------------------------------|------|
| Starting a business | 57 |
| ▷ Enforcing contracts | 63 |
| Immigration laws | 35 |
| Development & application of tech. | 23 |
| Scientific research legislation | 33 |
| Intellectual property rights | 44 |

| Capital | Rank |
|------------------------------------------|------|
| ▶ IT & media stock market capitalization | 14 |
| Funding for technological development | 23 |
| Banking and financial services | 23 |
| Country credit rating | 52 |
| Venture capital | 16 |
| ▶ Investment in Telecommunications | 15 |

| Technological framework | Rank |
|------------------------------|------|
| Communications technology | 43 |
| Mobile broadband subscribers | 50 |
| ▷ Wireless broadband | 62 |
| ▷ Internet users | 64 |
| Internet bandwidth speed | 53 |
| High-tech exports (%) | 39 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 54 | 55 | 55 | 56 | 60 |
| Business agility | 29 | 52 | 36 | 25 | 30 |
| IT integration | 56 | 55 | 51 | 48 | 52 |

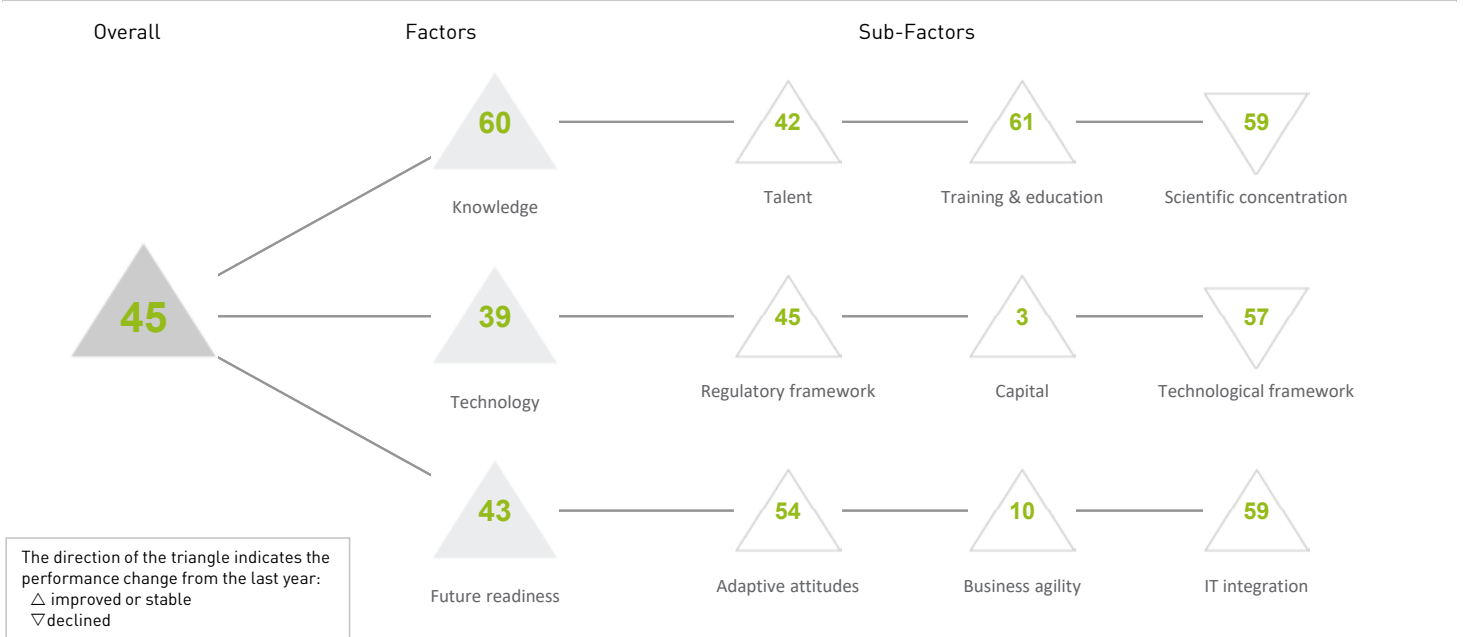
| Adaptive attitudes | Rank |
|--------------------------------|------|
| E-Participation | 50 |
| Internet retailing | 58 |
| ▷ Tablet possession | 59 |
| Smartphone possession | 54 |
| Attitudes toward globalization | 29 |

| Business agility | Rank |
|---------------------------------|------|
| Opportunities and threats | 21 |
| ▶ World robots distribution | 12 |
| Agility of companies | 33 |
| Use of big data and analytics | 20 |
| Knowledge transfer | 34 |
| Entrepreneurial fear of failure | 49 |

| IT integration | Rank |
|------------------------------------|------|
| ▷ E-Government | 60 |
| Public-private partnerships | 19 |
| Cyber security | 33 |
| Software piracy | 49 |
| Government cyber security capacity | 32 |
| Privacy protection by law content | 48 |

INDONESIA

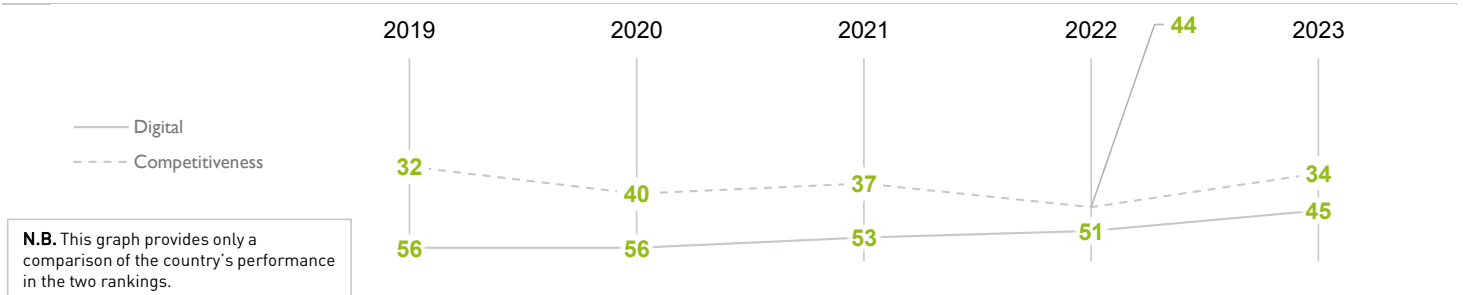
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 56 | 56 | 53 | 51 | 45 |
| Knowledge | 56 | 63 | 60 | 60 | 60 |
| Technology | 47 | 54 | 49 | 45 | 39 |
| Future readiness | 58 | 48 | 48 | 52 | 43 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



INDONESIA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 42 | 43 | 48 | 45 | 42 |
| Training & education | 61 | 63 | 64 | 62 | 61 |
| Scientific concentration | 52 | 51 | 44 | 54 | 59 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 55 |
| International experience | 24 |
| Foreign highly skilled personnel | 16 |
| Management of cities | 30 |
| Digital/Technological skills | 33 |
| Net flow of international students | 42 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 14 |
| Total public expenditure on education | 55 |
| Higher education achievement | 59 |
| Pupil-teacher ratio (tertiary education) | 57 |
| Graduates in Sciences | 45 |
| Women with degrees | 57 |

| Scientific concentration | Rank |
|---------------------------------------|------|
| Total expenditure on R&D (%) | 56 |
| Total R&D personnel per capita | 57 |
| Female researchers | 18 |
| ► R&D productivity by publication | 04 |
| ▷ Scientific and technical employment | 60 |
| ▷ High-tech patent grants | 61 |
| Robots in Education and R&D | 44 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 51 | 51 | 50 | 49 | 45 |
| Capital | 26 | 41 | 25 | 18 | 03 |
| Technological framework | 56 | 55 | 55 | 56 | 57 |

| Regulatory framework | Rank |
|------------------------------------|------|
| Starting a business | 60 |
| Enforcing contracts | 58 |
| Immigration laws | 20 |
| Development & application of tech. | 22 |
| Scientific research legislation | 38 |
| Intellectual property rights | 41 |

| Capital | Rank |
|----------------------------------------|------|
| IT & media stock market capitalization | 13 |
| Funding for technological development | 21 |
| ► Banking and financial services | 05 |
| Country credit rating | 47 |
| ► Venture capital | 05 |
| ► Investment in Telecommunications | 02 |

| Technological framework | Rank |
|------------------------------|------|
| Communications technology | 47 |
| Mobile broadband subscribers | 45 |
| Wireless broadband | 46 |
| ▷ Internet users | 60 |
| ▷ Internet bandwidth speed | 62 |
| High-tech exports (%) | 49 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 60 | 58 | 57 | 55 | 54 |
| Business agility | 21 | 24 | 26 | 22 | 10 |
| IT integration | 60 | 60 | 60 | 60 | 59 |

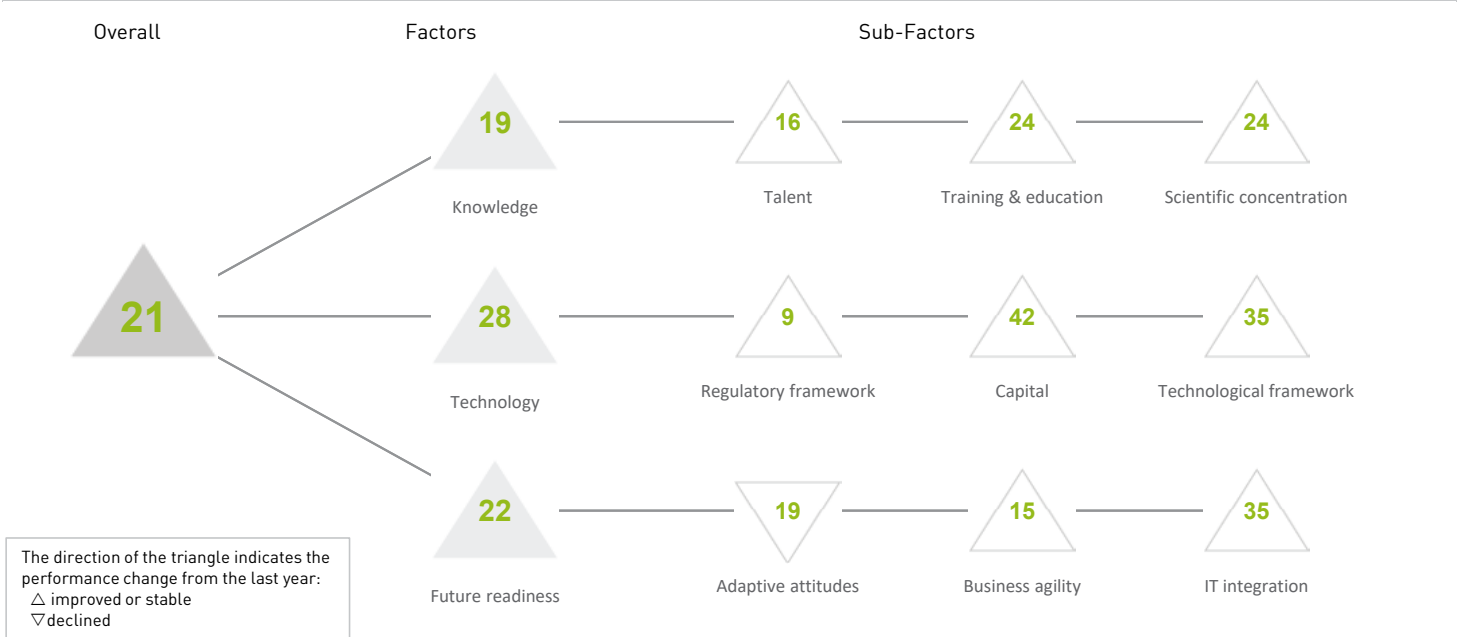
| Adaptive attitudes | Rank |
|--------------------------------|------|
| E-Participation | 34 |
| Internet retailing | 46 |
| Tablet possession | 58 |
| Smartphone possession | 49 |
| Attitudes toward globalization | 15 |

| Business agility | Rank |
|-----------------------------------|------|
| Opportunities and threats | 24 |
| World robots distribution | 27 |
| Agility of companies | 18 |
| Use of big data and analytics | 15 |
| Knowledge transfer | 23 |
| ► Entrepreneurial fear of failure | 03 |

| IT integration | Rank |
|------------------------------------|------|
| E-Government | 56 |
| Public-private partnerships | 16 |
| Cyber security | 34 |
| ▷ Software piracy | 61 |
| Government cyber security capacity | 59 |
| Privacy protection by law content | 58 |

IRELAND

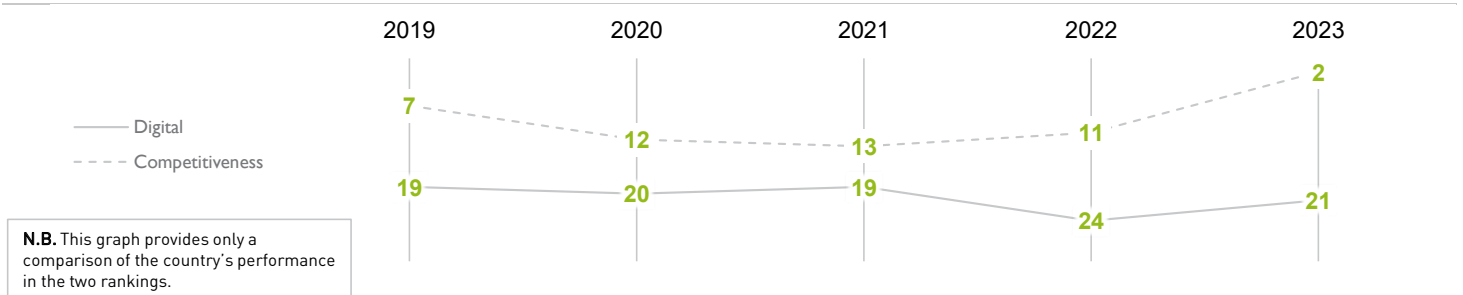
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 19 | 20 | 19 | 24 | 21 |
| Knowledge | 24 | 24 | 23 | 22 | 19 |
| Technology | 28 | 30 | 28 | 37 | 28 |
| Future readiness | 05 | 14 | 14 | 22 | 22 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



IRELAND

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 10 | 19 | 18 | 19 | 16 |
| Training & education | 30 | 35 | 32 | 31 | 24 |
| Scientific concentration | 29 | 25 | 26 | 24 | 24 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 20 |
| International experience | 10 |
| Foreign highly skilled personnel | 08 |
| Management of cities | 39 |
| Digital/Technological skills | 27 |
| Net flow of international students | 23 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 08 |
| ▷ Total public expenditure on education | 60 |
| Higher education achievement | 08 |
| Pupil-teacher ratio (tertiary education) | 46 |
| Graduates in Sciences | 21 |
| ► Women with degrees | 05 |

| Scientific concentration | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 38 |
| Total R&D personnel per capita | 26 |
| Female researchers | 29 |
| R&D productivity by publication | 36 |
| Scientific and technical employment | 16 |
| High-tech patent grants | 07 |
| Robots in Education and R&D | 27 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 13 | 14 | 19 | 22 | 09 |
| Capital | 49 | 45 | 35 | 44 | 42 |
| Technological framework | 24 | 30 | 34 | 38 | 35 |

| Regulatory framework | Rank |
|------------------------------------|------|
| Starting a business | 12 |
| Enforcing contracts | 48 |
| ► Immigration laws | 04 |
| Development & application of tech. | 19 |
| Scientific research legislation | 06 |
| Intellectual property rights | 10 |

| Capital | Rank |
|------------------------------------------|------|
| ▷ IT & media stock market capitalization | 59 |
| Funding for technological development | 10 |
| Banking and financial services | 25 |
| Country credit rating | 23 |
| Venture capital | 14 |
| ▷ Investment in Telecommunications | 59 |

| Technological framework | Rank |
|------------------------------|------|
| Communications technology | 25 |
| Mobile broadband subscribers | 47 |
| Wireless broadband | 41 |
| Internet users | 21 |
| Internet bandwidth speed | 34 |
| High-tech exports (%) | 12 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 03 | 12 | 12 | 11 | 19 |
| Business agility | 09 | 09 | 14 | 18 | 15 |
| IT integration | 20 | 25 | 19 | 38 | 35 |

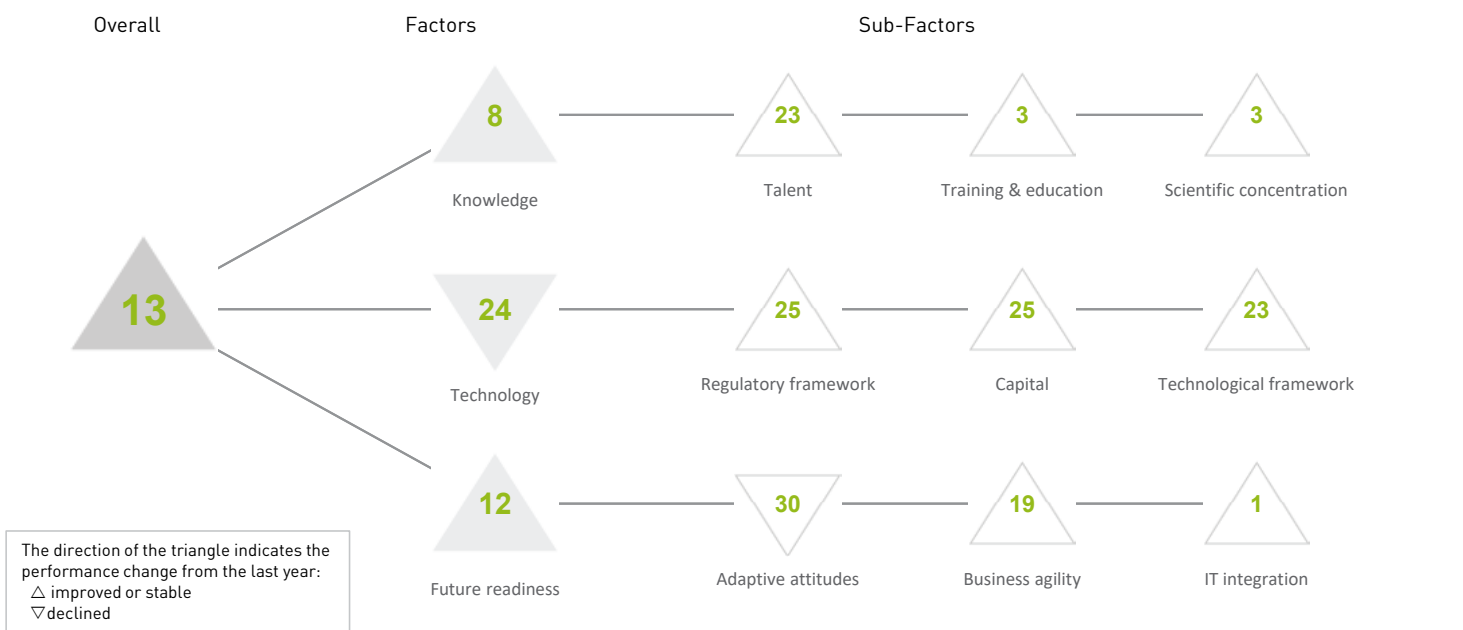
| Adaptive attitudes | Rank |
|----------------------------------|------|
| E-Participation | 42 |
| Internet retailing | 06 |
| Tablet possession | 19 |
| ▷ Smartphone possession | 56 |
| ► Attitudes toward globalization | 01 |

| Business agility | Rank |
|---------------------------------|------|
| ► Opportunities and threats | 01 |
| World robots distribution | 41 |
| ► Agility of companies | 02 |
| Use of big data and analytics | 22 |
| Knowledge transfer | 14 |
| Entrepreneurial fear of failure | 40 |

| IT integration | Rank |
|--------------------------------------|------|
| E-Government | 28 |
| Public-private partnerships | 20 |
| Cyber security | 32 |
| Software piracy | 19 |
| ▷ Government cyber security capacity | 57 |
| Privacy protection by law content | 51 |

ISRAEL

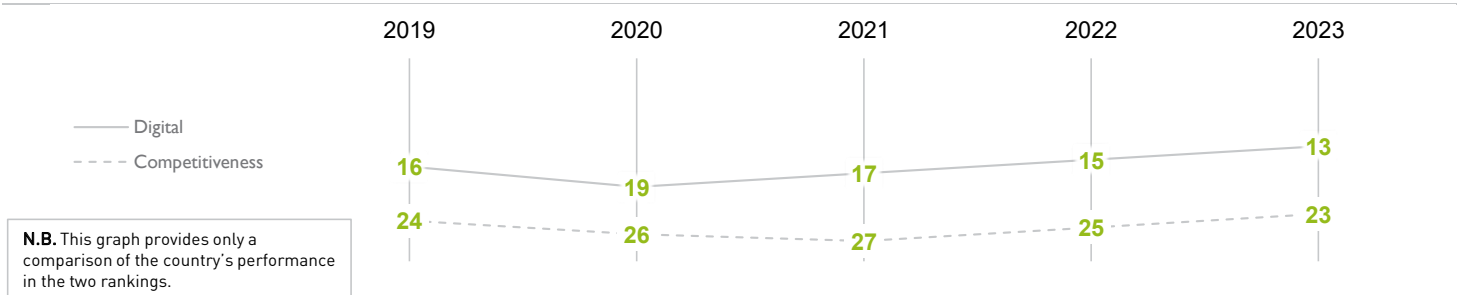
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 16 | 19 | 17 | 15 | 13 |
| Knowledge | 08 | 09 | 12 | 10 | 08 |
| Technology | 30 | 32 | 27 | 22 | 24 |
| Future readiness | 19 | 23 | 21 | 14 | 12 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



ISRAEL

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 27 | 28 | 27 | 26 | 23 |
| Training & education | 03 | 01 | 03 | 06 | 03 |
| Scientific concentration | 05 | 03 | 09 | 05 | 03 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|---------------------------------------|------|
| Educational assessment PISA - Math | 37 | Employee training | 33 | ▶ Total expenditure on R&D (%) | 01 |
| International experience | 15 | ▶ Total public expenditure on education | 04 | Total R&D personnel per capita | - |
| Foreign highly skilled personnel | 26 | Higher education achievement | 29 | Female researchers | - |
| Management of cities | 25 | Pupil-teacher ratio (tertiary education) | 07 | ▷ R&D productivity by publication | 53 |
| Digital/Technological skills | 14 | Graduates in Sciences | 20 | ▶ Scientific and technical employment | 04 |
| ▷ Net flow of international students | 48 | Women with degrees | 09 | High-tech patent grants | 19 |
| | | | | Robots in Education and R&D | 36 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 32 | 32 | 31 | 31 | 25 |
| Capital | 20 | 26 | 28 | 25 | 25 |
| Technological framework | 35 | 36 | 26 | 23 | 23 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 17 | IT & media stock market capitalization | 11 | Communications technology | 40 |
| ▷ Enforcing contracts | 47 | Funding for technological development | 15 | Mobile broadband subscribers | 25 |
| Immigration laws | 39 | Banking and financial services | 34 | Wireless broadband | 20 |
| Development & application of tech. | 13 | Country credit rating | 27 | Internet users | 38 |
| Scientific research legislation | 13 | Venture capital | 22 | Internet bandwidth speed | 26 |
| Intellectual property rights | 27 | ▷ Investment in Telecommunications | 55 | High-tech exports (%) | 10 |

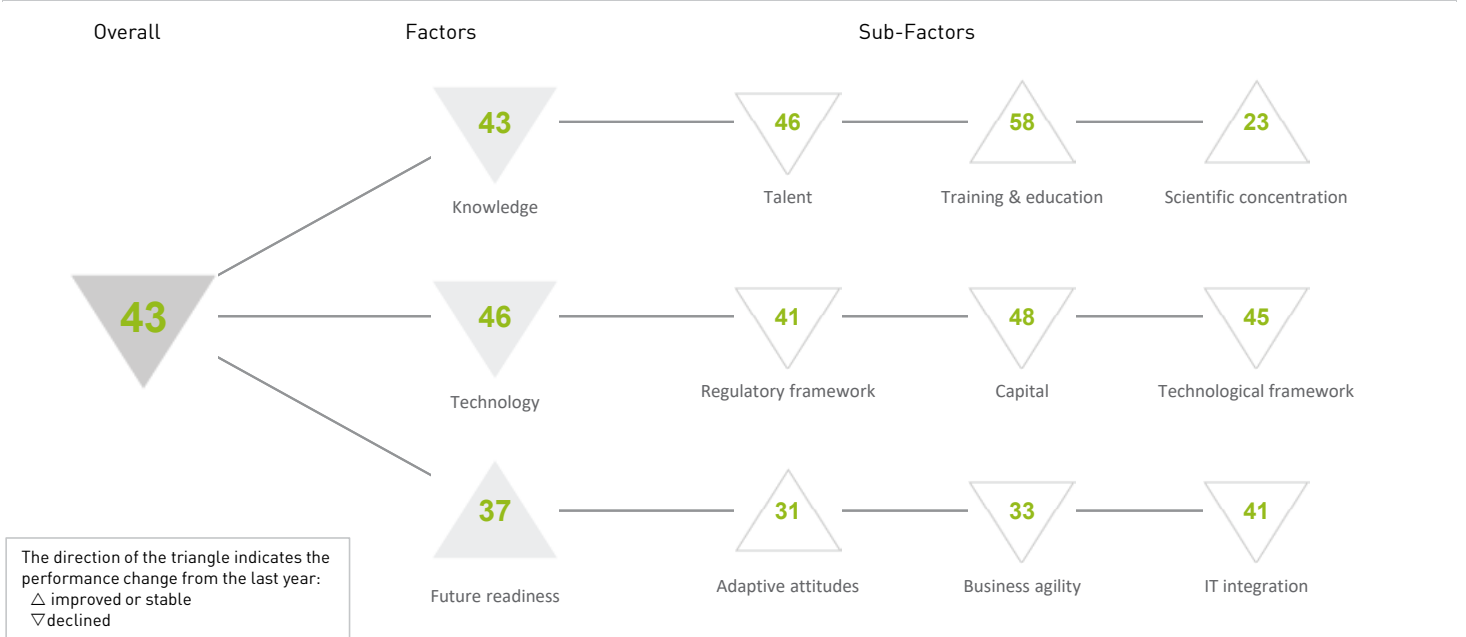
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 21 | 26 | 25 | 24 | 30 |
| Business agility | 19 | 29 | 31 | 23 | 19 |
| IT integration | 16 | 14 | 13 | 05 | 01 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | 34 | Opportunities and threats | 17 | E-Government | 15 |
| Internet retailing | 21 | World robots distribution | 38 | Public-private partnerships | 11 |
| ▷ Tablet possession | 45 | Agility of companies | 16 | Cyber security | 06 |
| Smartphone possession | 41 | ▶ Use of big data and analytics | 05 | Software piracy | 17 |
| Attitudes toward globalization | 27 | Knowledge transfer | 16 | ▶ Government cyber security capacity | 01 |
| | | Entrepreneurial fear of failure | 31 | Privacy protection by law content | 22 |

ITALY

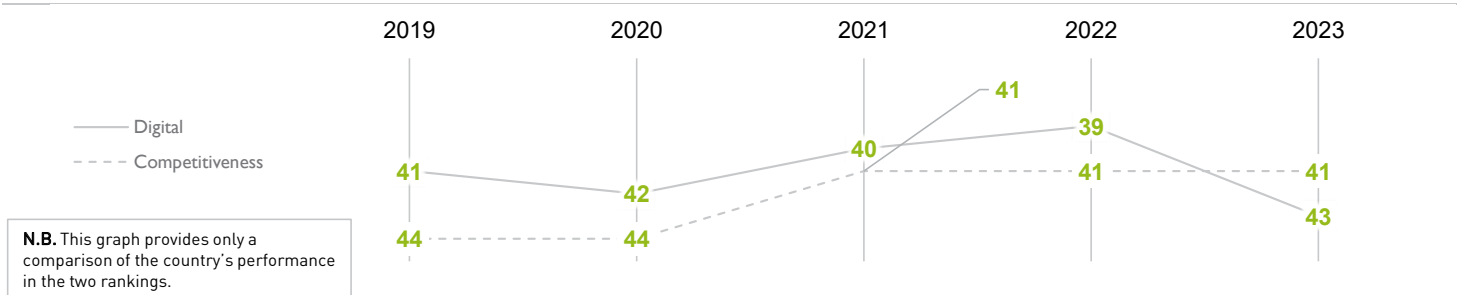
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 41 | 42 | 40 | 39 | 43 |
| Knowledge | 41 | 42 | 40 | 41 | 43 |
| Technology | 46 | 46 | 42 | 44 | 46 |
| Future readiness | 31 | 38 | 30 | 38 | 37 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (27 countries)



► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 44 | 42 | 40 | 43 | 46 |
| Training & education | 57 | 58 | 60 | 58 | 58 |
| Scientific concentration | 23 | 22 | 25 | 23 | 23 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|---------------------------------------|------|
| Educational assessment PISA - Math | 29 | ▷ Employee training | 52 | Total expenditure on R&D (%) | 28 |
| ▷ International experience | 57 | Total public expenditure on education | 45 | Total R&D personnel per capita | 28 |
| Foreign highly skilled personnel | 52 | Higher education achievement | 50 | Female researchers | 36 |
| Management of cities | 44 | Pupil-teacher ratio (tertiary education) | 49 | ▷ R&D productivity by publication | 06 |
| Digital/Technological skills | 42 | Graduates in Sciences | 36 | ▷ Scientific and technical employment | 14 |
| Net flow of international students | 46 | Women with degrees | 51 | High-tech patent grants | 46 |
| | | | | ▷ Robots in Education and R&D | 12 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 44 | 48 | 42 | 38 | 41 |
| Capital | 53 | 54 | 48 | 41 | 48 |
| Technological framework | 46 | 43 | 44 | 44 | 45 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 42 | IT & media stock market capitalization | 40 | Communications technology | 45 |
| ▷ Enforcing contracts | 56 | Funding for technological development | 40 | Mobile broadband subscribers | 44 |
| ▷ Immigration laws | 17 | Banking and financial services | 49 | Wireless broadband | 21 |
| Development & application of tech. | 45 | Country credit rating | 50 | Internet users | 44 |
| Scientific research legislation | 42 | ▷ Venture capital | 57 | Internet bandwidth speed | 43 |
| Intellectual property rights | 25 | Investment in Telecommunications | 18 | High-tech exports (%) | 48 |

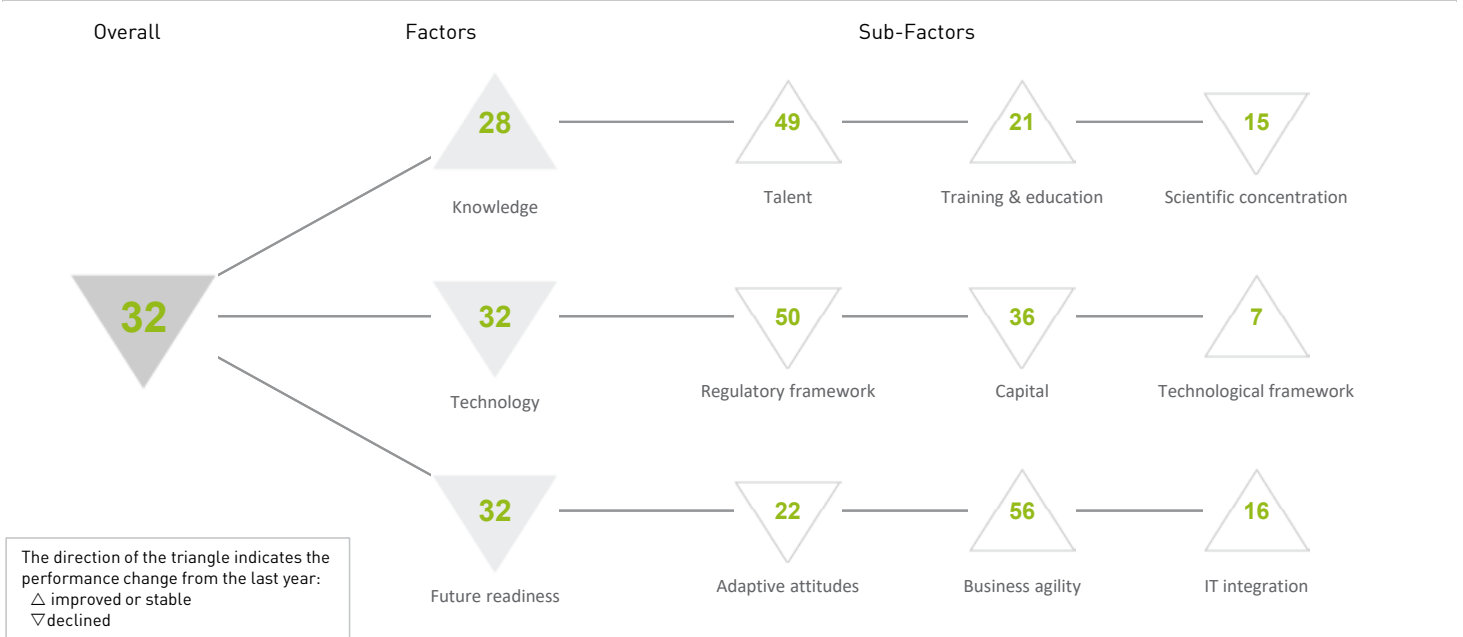
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 35 | 42 | 36 | 32 | 31 |
| Business agility | 31 | 23 | 19 | 30 | 33 |
| IT integration | 34 | 39 | 38 | 40 | 41 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 29 | Opportunities and threats | 26 | E-Government | 34 |
| Internet retailing | 31 | ▷ World robots distribution | 06 | Public-private partnerships | 46 |
| Tablet possession | 40 | Agility of companies | 39 | Cyber security | 42 |
| Smartphone possession | 27 | ▷ Use of big data and analytics | 56 | Software piracy | 33 |
| Attitudes toward globalization | 43 | Knowledge transfer | 39 | Government cyber security capacity | 48 |
| | | Entrepreneurial fear of failure | 28 | Privacy protection by law content | 34 |

JAPAN

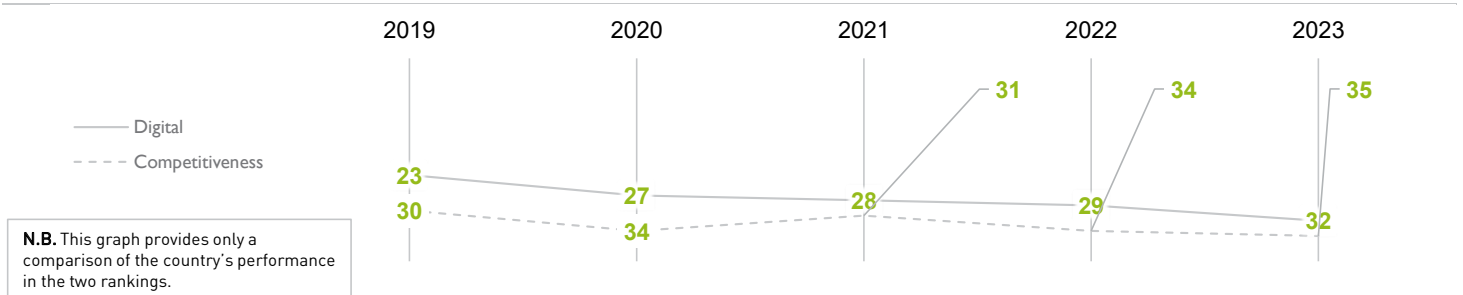
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 23 | 27 | 28 | 29 | 32 |
| Knowledge | 25 | 22 | 25 | 28 | 28 |
| Technology | 24 | 26 | 30 | 30 | 32 |
| Future readiness | 24 | 26 | 27 | 28 | 32 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



JAPAN

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 46 | 46 | 47 | 50 | 49 |
| Training & education | 19 | 18 | 21 | 21 | 21 |
| Scientific concentration | 11 | 11 | 13 | 14 | 15 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 05 | Employee training | 35 | Total expenditure on R&D (%) | 06 |
| ▷ International experience | 64 | Total public expenditure on education | 53 | Total R&D personnel per capita | 20 |
| Foreign highly skilled personnel | 54 | Higher education achievement | 06 | Female researchers | 57 |
| Management of cities | 09 | ▶ Pupil-teacher ratio (tertiary education) | 03 | R&D productivity by publication | 16 |
| ▷ Digital/Technological skills | 63 | Graduates in Sciences | 39 | Scientific and technical employment | 39 |
| Net flow of international students | 27 | Women with degrees | 06 | High-tech patent grants | 06 |
| | | | | Robots in Education and R&D | 06 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 42 | 44 | 48 | 47 | 50 |
| Capital | 37 | 33 | 37 | 32 | 36 |
| Technological framework | 02 | 05 | 08 | 08 | 07 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 44 | IT & media stock market capitalization | 10 | Communications technology | 26 |
| Enforcing contracts | 35 | Funding for technological development | 43 | Mobile broadband subscribers | 19 |
| Immigration laws | 62 | Banking and financial services | 42 | ▶ Wireless broadband | 02 |
| Development & application of tech. | 49 | Country credit rating | 30 | Internet users | 20 |
| Scientific research legislation | 48 | Venture capital | 39 | Internet bandwidth speed | 11 |
| Intellectual property rights | 34 | Investment in Telecommunications | 44 | High-tech exports (%) | 24 |

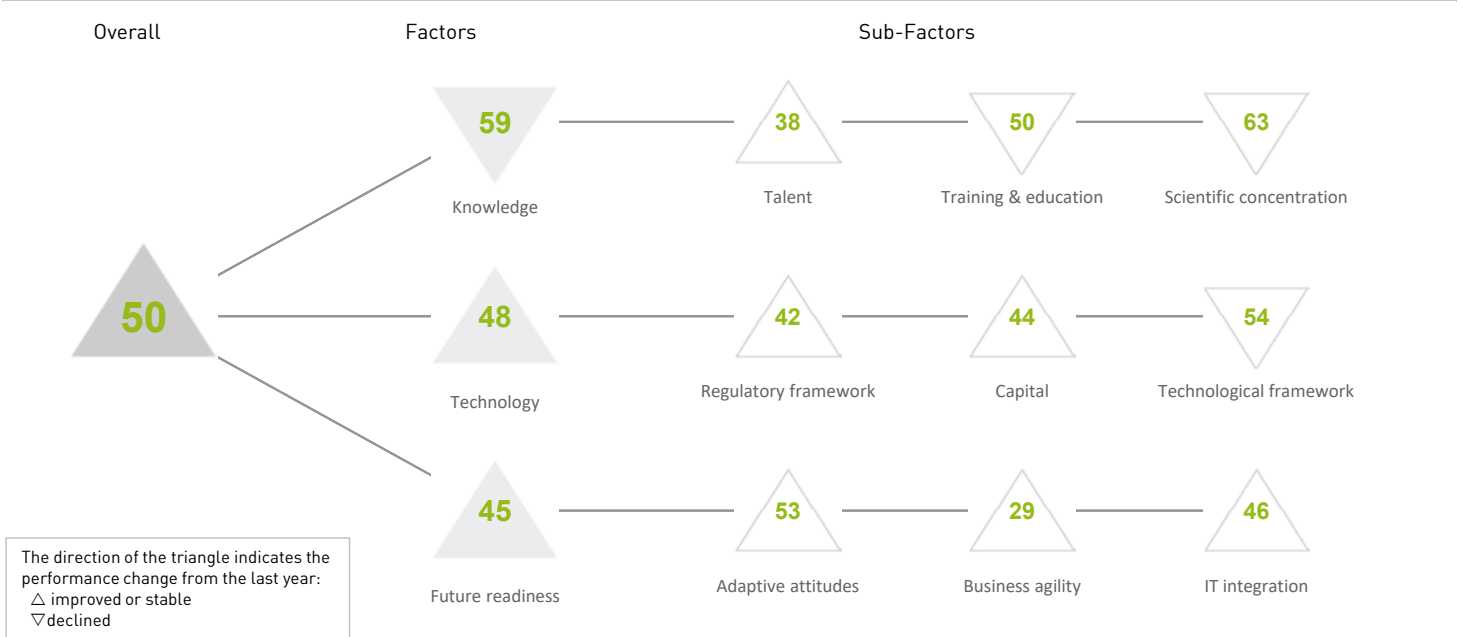
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 15 | 19 | 18 | 20 | 22 |
| Business agility | 41 | 56 | 53 | 62 | 56 |
| IT integration | 18 | 23 | 23 | 18 | 16 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| ▶ E-Participation | 01 | ▷ Opportunities and threats | 62 | E-Government | 14 |
| Internet retailing | 17 | ▶ World robots distribution | 02 | Public-private partnerships | 41 |
| Tablet possession | 32 | ▷ Agility of companies | 64 | Cyber security | 43 |
| Smartphone possession | 55 | ▷ Use of big data and analytics | 64 | ▶ Software piracy | 02 |
| Attitudes toward globalization | 46 | Knowledge transfer | 43 | Government cyber security capacity | 24 |
| | | Entrepreneurial fear of failure | 36 | Privacy protection by law content | 11 |

JORDAN

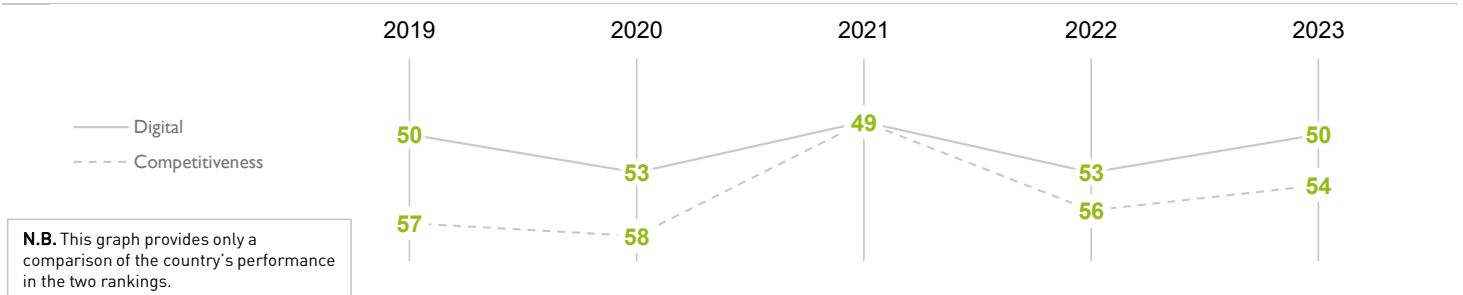
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 50 | 53 | 49 | 53 | 50 |
| Knowledge | 49 | 54 | 48 | 53 | 59 |
| Technology | 53 | 44 | 43 | 50 | 48 |
| Future readiness | 52 | 58 | 56 | 55 | 45 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



JORDAN

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 43 | 40 | 34 | 41 | 38 |
| Training & education | 32 | 33 | 33 | 41 | 50 |
| Scientific concentration | 63 | 63 | 62 | 62 | 63 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 51 | Employee training | 25 | Total expenditure on R&D (%) | - |
| International experience | 18 | Total public expenditure on education | 57 | Total R&D personnel per capita | - |
| Foreign highly skilled personnel | 41 | Higher education achievement | - | Female researchers | 56 |
| Management of cities | 36 | Pupil-teacher ratio (tertiary education) | 58 | R&D productivity by publication | - |
| ▶ Digital/Technological skills | 11 | ▶ Graduates in Sciences | 14 | Scientific and technical employment | 44 |
| Net flow of international students | 31 | Women with degrees | 46 | High-tech patent grants | 53 |
| | | | | Robots in Education and R&D | - |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 47 | 42 | 38 | 45 | 42 |
| Capital | 41 | 38 | 41 | 45 | 44 |
| Technological framework | 55 | 53 | 53 | 53 | 54 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 50 | IT & media stock market capitalization | 52 | Communications technology | 29 |
| Enforcing contracts | 53 | Funding for technological development | 24 | Mobile broadband subscribers | 42 |
| Immigration laws | 43 | Banking and financial services | 28 | ▷ Wireless broadband | 60 |
| Development & application of tech. | 20 | ▷ Country credit rating | 59 | Internet users | 52 |
| Scientific research legislation | 26 | Venture capital | 26 | Internet bandwidth speed | 51 |
| Intellectual property rights | 39 | Investment in Telecommunications | 21 | ▷ High-tech exports (%) | 60 |

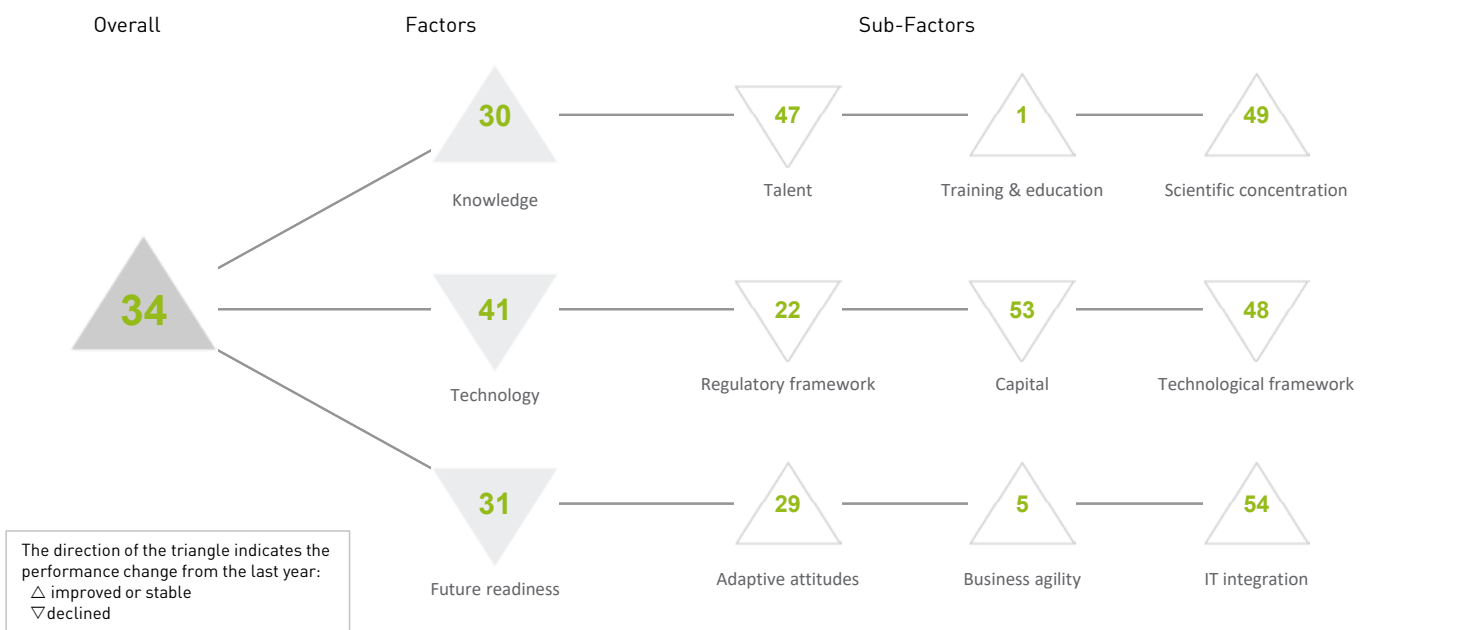
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 61 | 61 | 61 | 61 | 53 |
| Business agility | 22 | 37 | 28 | 34 | 29 |
| IT integration | 54 | 57 | 54 | 52 | 46 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 52 | Opportunities and threats | 23 | ▷ E-Government | 59 |
| ▷ Internet retailing | 59 | World robots distribution | - | Public-private partnerships | 27 |
| Tablet possession | 50 | Agility of companies | 43 | ▶ Cyber security | 16 |
| ▶ Smartphone possession | 09 | ▶ Use of big data and analytics | 08 | Software piracy | 47 |
| Attitudes toward globalization | 37 | Knowledge transfer | 29 | Government cyber security capacity | 29 |
| | | Entrepreneurial fear of failure | 50 | Privacy protection by law content | 45 |

KAZAKHSTAN

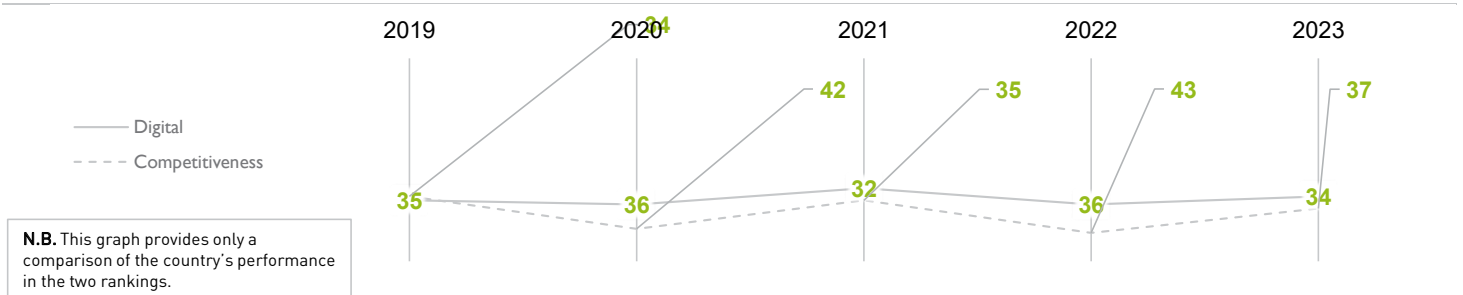
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 35 | 36 | 32 | 36 | 34 |
| Knowledge | 32 | 34 | 36 | 30 | 30 |
| Technology | 39 | 41 | 40 | 40 | 41 |
| Future readiness | 35 | 33 | 28 | 30 | 31 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



KAZAKHSTAN

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 39 | 49 | 45 | 46 | 47 |
| Training & education | 01 | 04 | 14 | 01 | 01 |
| Scientific concentration | 55 | 54 | 54 | 51 | 49 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 45 | Employee training | 17 | ▷ Total expenditure on R&D (%) | 57 |
| International experience | 32 | Total public expenditure on education | 27 | Total R&D personnel per capita | 51 |
| Foreign highly skilled personnel | 30 | ► Higher education achievement | 01 | ► Female researchers | 05 |
| Management of cities | 38 | Pupil-teacher ratio (tertiary education) | 38 | R&D productivity by publication | 21 |
| Digital/Technological skills | 53 | Graduates in Sciences | 28 | Scientific and technical employment | 46 |
| Net flow of international students | 56 | ► Women with degrees | 01 | High-tech patent grants | 51 |
| | | | | Robots in Education and R&D | - |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 16 | 23 | 22 | 21 | 22 |
| Capital | 54 | 55 | 51 | 50 | 53 |
| Technological framework | 43 | 48 | 47 | 47 | 48 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 11 | IT & media stock market capitalization | - | Communications technology | 52 |
| ► Enforcing contracts | 04 | Funding for technological development | 31 | Mobile broadband subscribers | 43 |
| Immigration laws | 22 | Banking and financial services | 35 | Wireless broadband | 57 |
| Development & application of tech. | 33 | Country credit rating | 51 | Internet users | 43 |
| Scientific research legislation | 35 | Venture capital | 48 | ▷ Internet bandwidth speed | 60 |
| Intellectual property rights | 45 | ▷ Investment in Telecommunications | 62 | High-tech exports (%) | 08 |

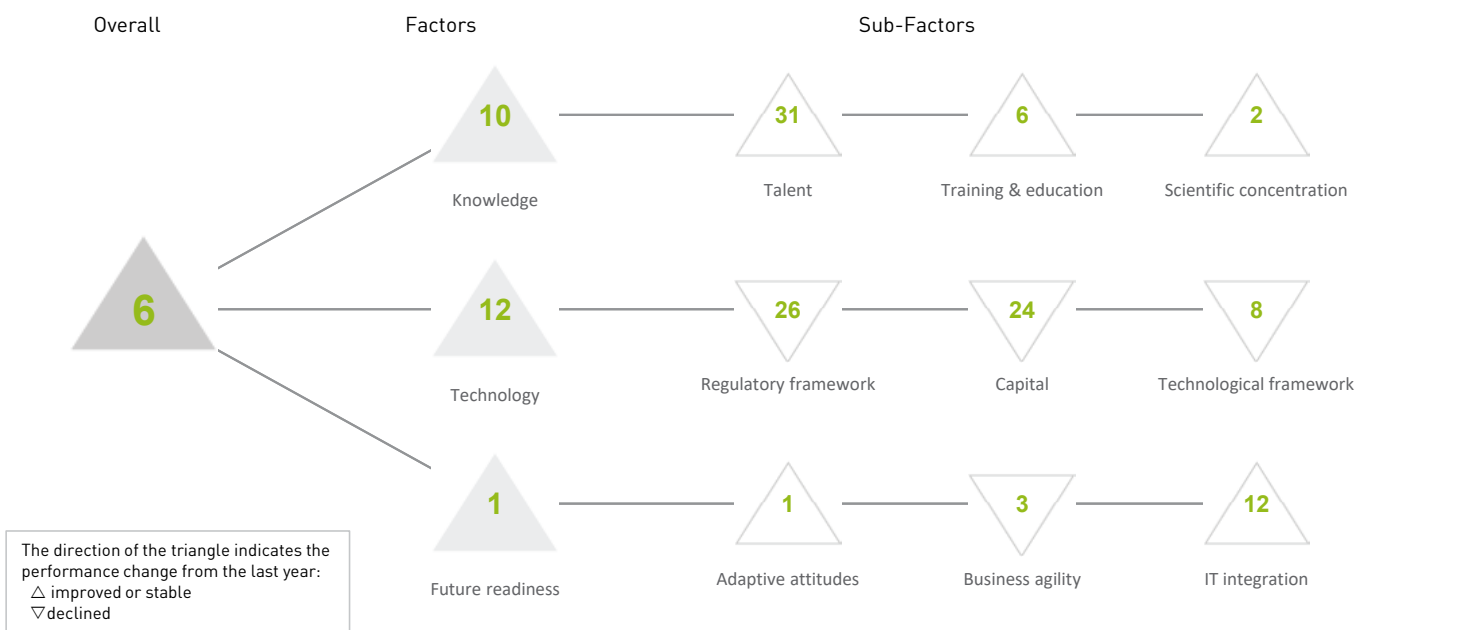
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 39 | 33 | 32 | 34 | 29 |
| Business agility | 15 | 13 | 06 | 06 | 05 |
| IT integration | 46 | 46 | 44 | 56 | 54 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|-----------------------------------|------|-------------------------------------|------|
| E-Participation | 15 | Opportunities and threats | 35 | E-Government | 26 |
| Internet retailing | 52 | World robots distribution | - | Public-private partnerships | 25 |
| Tablet possession | 36 | Agility of companies | 25 | Cyber security | 44 |
| Smartphone possession | 36 | Use of big data and analytics | 10 | ▷ Software piracy | 59 |
| Attitudes toward globalization | 39 | Knowledge transfer | 31 | Government cyber security capacity | 40 |
| | | ► Entrepreneurial fear of failure | 01 | ▷ Privacy protection by law content | 59 |

KOREA REP.

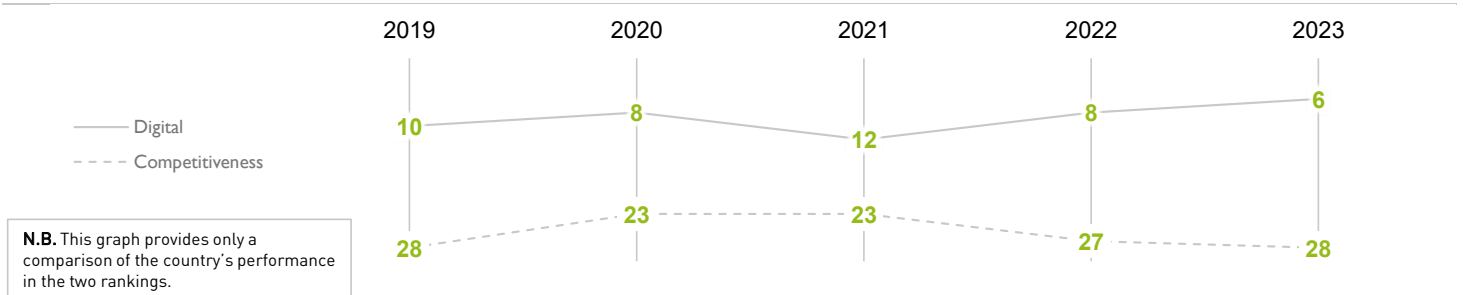
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 10 | 08 | 12 | 08 | 06 |
| Knowledge | 11 | 10 | 15 | 16 | 10 |
| Technology | 17 | 12 | 13 | 13 | 12 |
| Future readiness | 04 | 03 | 05 | 02 | 01 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



KOREA REP.

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 30 | 21 | 26 | 33 | 31 |
| Training & education | 05 | 11 | 16 | 16 | 06 |
| Scientific concentration | 06 | 04 | 03 | 03 | 02 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 06 | Employee training | 23 | ▶ Total expenditure on R&D (%) | 02 |
| ▷ International experience | 51 | Total public expenditure on education | 26 | Total R&D personnel per capita | 04 |
| Foreign highly skilled personnel | 47 | Higher education achievement | 04 | ▷ Female researchers | 55 |
| Management of cities | 08 | Pupil-teacher ratio (tertiary education) | 25 | R&D productivity by publication | 26 |
| ▷ Digital/Technological skills | 48 | Graduates in Sciences | 09 | Scientific and technical employment | 31 |
| Net flow of international students | 37 | Women with degrees | 21 | High-tech patent grants | 03 |
| | | | | Robots in Education and R&D | 04 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 26 | 26 | 23 | 23 | 26 |
| Capital | 29 | 25 | 16 | 15 | 24 |
| Technological framework | 07 | 03 | 07 | 07 | 08 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|--------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 19 | IT & media stock market capitalization | 03 | Communications technology | 11 |
| ▶ Enforcing contracts | 02 | Funding for technological development | 36 | Mobile broadband subscribers | 12 |
| Immigration laws | 46 | ▷ Banking and financial services | 50 | Wireless broadband | 28 |
| ▷ Development & application of tech. | 52 | Country credit rating | 16 | Internet users | 09 |
| Scientific research legislation | 32 | Venture capital | 44 | Internet bandwidth speed | 15 |
| Intellectual property rights | 28 | Investment in Telecommunications | 23 | High-tech exports (%) | 06 |

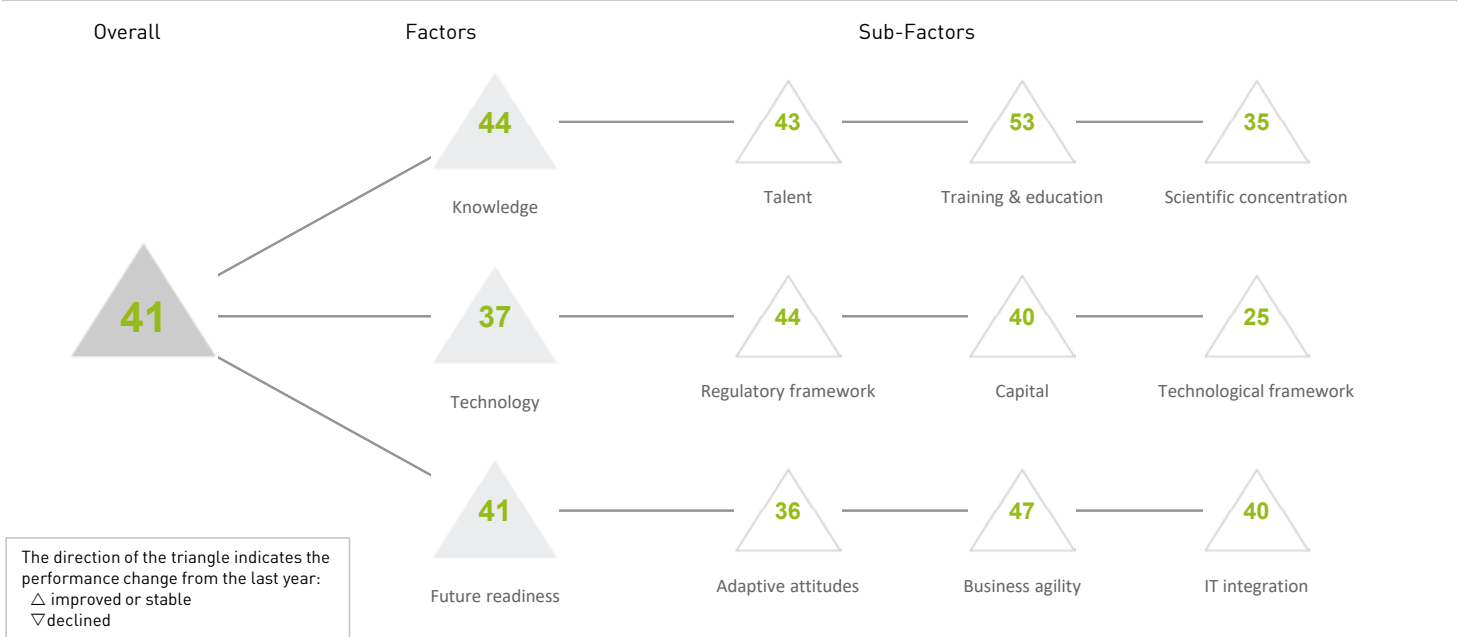
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 04 | 01 | 02 | 01 | 01 |
| Business agility | 05 | 03 | 05 | 02 | 03 |
| IT integration | 21 | 15 | 16 | 14 | 12 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|-----------------------------------|------|------------------------------------|------|
| E-Participation | 09 | Opportunities and threats | 43 | E-Government | 03 |
| ▶ Internet retailing | 02 | ▶ World robots distribution | 03 | Public-private partnerships | 40 |
| Tablet possession | 21 | Agility of companies | 28 | Cyber security | 24 |
| Smartphone possession | 06 | Use of big data and analytics | 31 | Software piracy | 20 |
| Attitudes toward globalization | 07 | Knowledge transfer | 26 | Government cyber security capacity | 06 |
| | | ▶ Entrepreneurial fear of failure | 02 | Privacy protection by law content | 33 |

KUWAIT

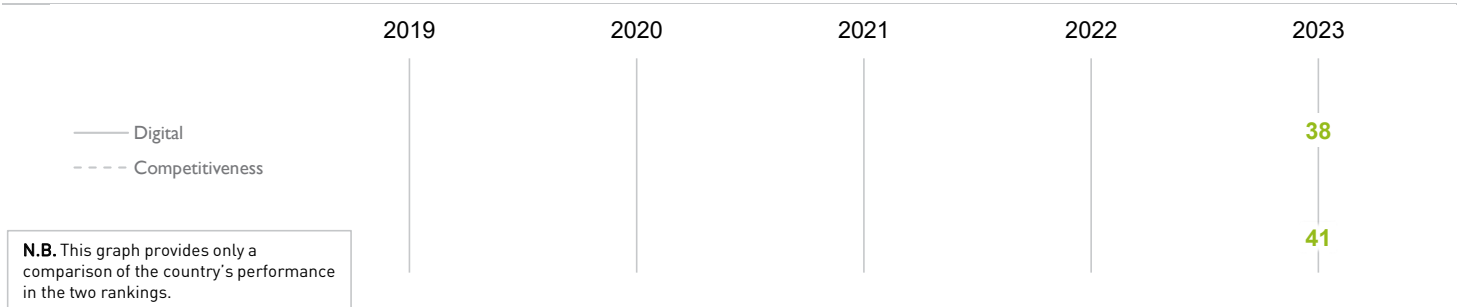
OVERALL PERFORMANCE (64 countries)



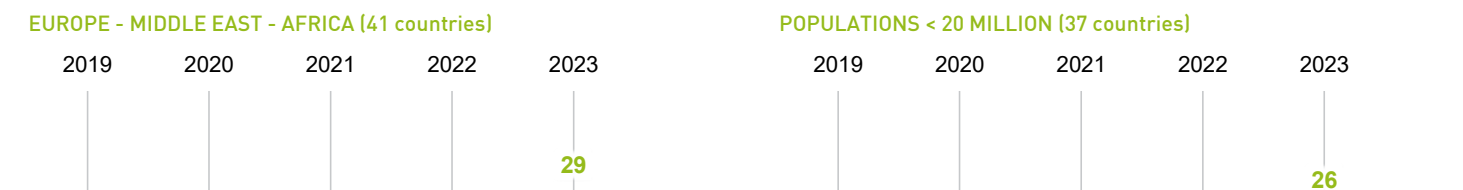
OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | - | - | - | - | 41 |
| Knowledge | - | - | - | - | 44 |
| Technology | - | - | - | - | 37 |
| Future readiness | - | - | - | - | 41 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS



► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | - | - | - | - | 43 |
| Training & education | - | - | - | - | 53 |
| Scientific concentration | - | - | - | - | 35 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | - | Employee training | 34 | ▷ Total expenditure on R&D (%) | 60 |
| International experience | 27 | ► Total public expenditure on education | 06 | ► Total R&D personnel per capita | 03 |
| Foreign highly skilled personnel | 43 | ▷ Higher education achievement | 61 | ► Female researchers | 10 |
| Management of cities | 49 | Pupil-teacher ratio (tertiary education) | - | R&D productivity by publication | 33 |
| Digital/Technological skills | 45 | Graduates in Sciences | - | Scientific and technical employment | - |
| Net flow of international students | - | Women with degrees | 56 | High-tech patent grants | - |
| | | | | Robots in Education and R&D | 54 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | - | - | - | - | 44 |
| Capital | - | - | - | - | 40 |
| Technological framework | - | - | - | - | 25 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 37 | IT & media stock market capitalization | 27 | Communications technology | 38 |
| Enforcing contracts | 43 | Funding for technological development | 38 | Mobile broadband subscribers | 14 |
| Immigration laws | 44 | ► Banking and financial services | 09 | Wireless broadband | 19 |
| Development & application of tech. | 40 | Country credit rating | 24 | ► Internet users | 04 |
| Scientific research legislation | 46 | Venture capital | 38 | Internet bandwidth speed | 28 |
| Intellectual property rights | 52 | ▷ Investment in Telecommunications | 63 | ▷ High-tech exports (%) | 61 |

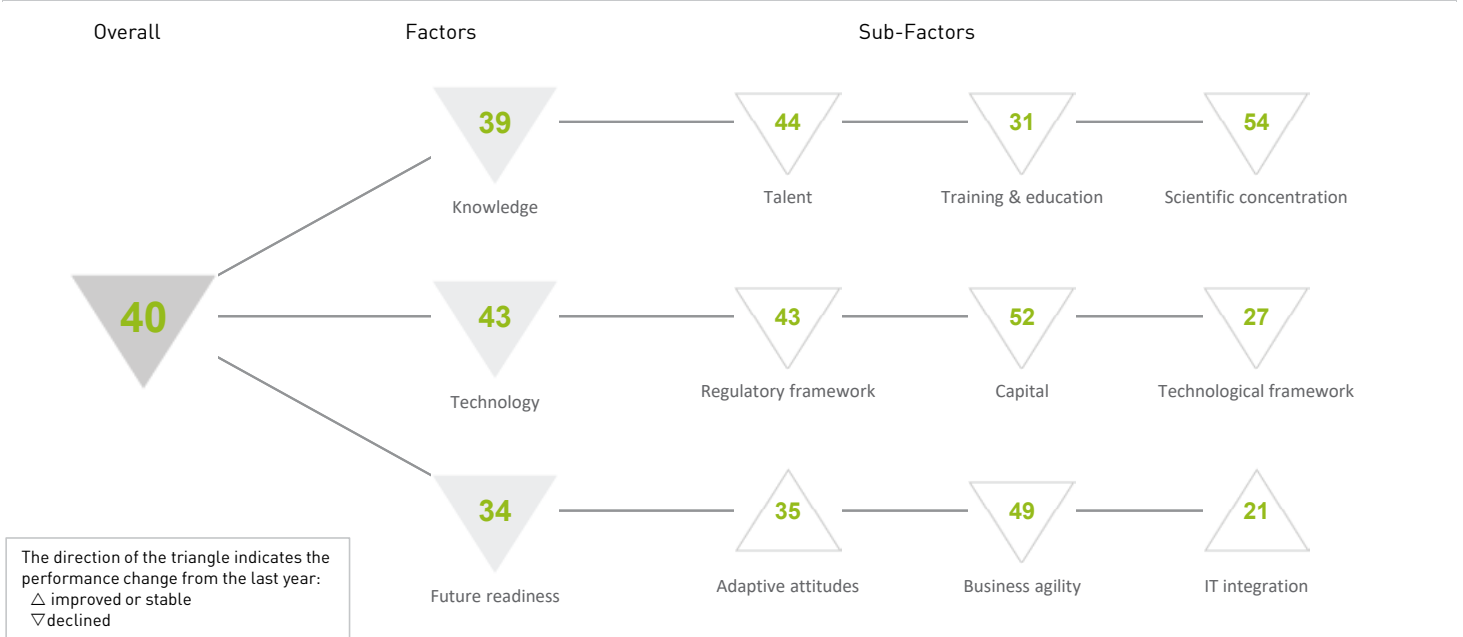
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | - | - | - | - | 36 |
| Business agility | - | - | - | - | 47 |
| IT integration | - | - | - | - | 40 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 52 | Opportunities and threats | 54 | E-Government | 51 |
| Internet retailing | 39 | ▷ World robots distribution | 57 | Public-private partnerships | 42 |
| Tablet possession | 12 | Agility of companies | 51 | Cyber security | 22 |
| Smartphone possession | 23 | Use of big data and analytics | 26 | Software piracy | - |
| Attitudes toward globalization | 45 | Knowledge transfer | 47 | Government cyber security capacity | 16 |
| | | Entrepreneurial fear of failure | 35 | Privacy protection by law content | 54 |

LATVIA

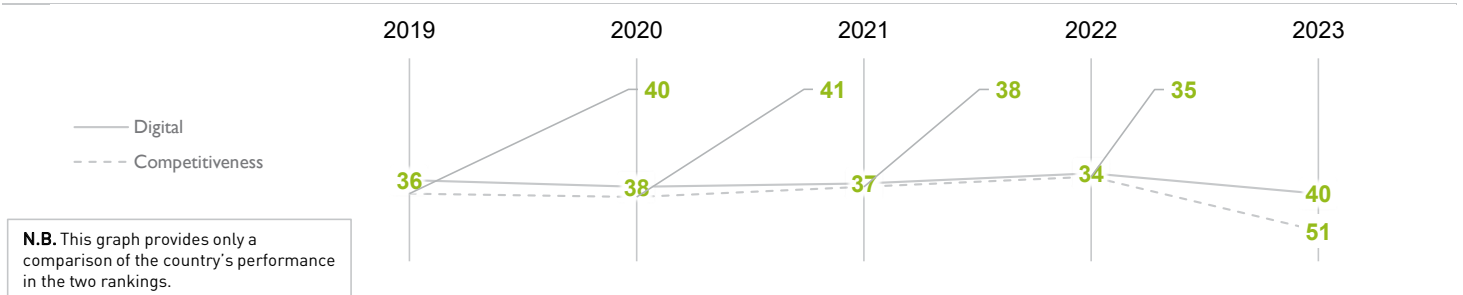
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

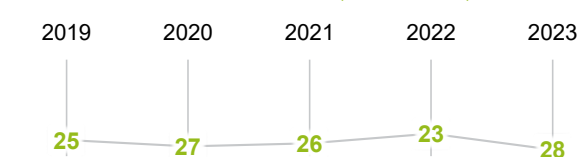
| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 36 | 38 | 37 | 34 | 40 |
| Knowledge | 36 | 36 | 34 | 36 | 39 |
| Technology | 23 | 34 | 34 | 34 | 43 |
| Future readiness | 45 | 42 | 42 | 32 | 34 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 32 | 27 | 24 | 25 | 44 |
| Training & education | 27 | 27 | 30 | 28 | 31 |
| Scientific concentration | 47 | 49 | 51 | 52 | 54 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 23 |
| International experience | 54 |
| Foreign highly skilled personnel | 49 |
| Management of cities | 47 |
| Digital/Technological skills | 49 |
| Net flow of international students | 15 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 45 |
| Total public expenditure on education | 16 |
| Higher education achievement | 30 |
| Pupil-teacher ratio (tertiary education) | 16 |
| Graduates in Sciences | 49 |
| Women with degrees | 24 |

| Scientific concentration | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 45 |
| Total R&D personnel per capita | 38 |
| ► Female researchers | 06 |
| R&D productivity by publication | 54 |
| Scientific and technical employment | 40 |
| High-tech patent grants | 43 |
| Robots in Education and R&D | 48 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 30 | 37 | 34 | 36 | 43 |
| Capital | 35 | 50 | 46 | 39 | 52 |
| Technological framework | 14 | 13 | 18 | 22 | 27 |

| Regulatory framework | Rank |
|------------------------------------|------|
| Starting a business | 15 |
| ► Enforcing contracts | 14 |
| Immigration laws | 55 |
| Development & application of tech. | 44 |
| ▷ Scientific research legislation | 58 |
| ▷ Intellectual property rights | 56 |

| Capital | Rank |
|----------------------------------------|------|
| IT & media stock market capitalization | 26 |
| Funding for technological development | 49 |
| ▷ Banking and financial services | 61 |
| Country credit rating | 36 |
| Venture capital | 53 |
| Investment in Telecommunications | 53 |

| Technological framework | Rank |
|------------------------------|------|
| Communications technology | 44 |
| Mobile broadband subscribers | 26 |
| Wireless broadband | 17 |
| Internet users | 29 |
| Internet bandwidth speed | 33 |
| High-tech exports (%) | 25 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 52 | 51 | 51 | 44 | 35 |
| Business agility | 47 | 45 | 48 | 31 | 49 |
| IT integration | 44 | 37 | 37 | 23 | 21 |

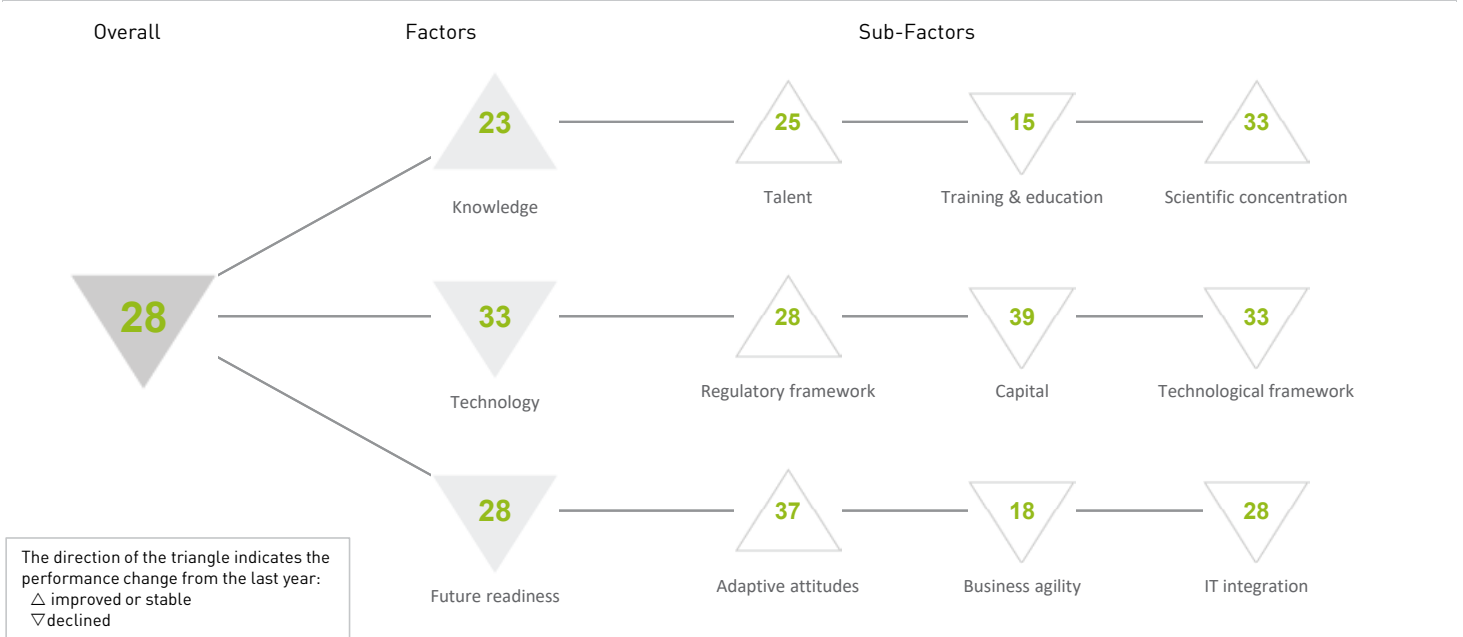
| Adaptive attitudes | Rank |
|----------------------------------|------|
| E-Participation | 26 |
| Internet retailing | 37 |
| Tablet possession | 23 |
| Smartphone possession | 22 |
| ▷ Attitudes toward globalization | 56 |

| Business agility | Rank |
|-----------------------------------|------|
| Opportunities and threats | 48 |
| World robots distribution | 52 |
| ▷ Agility of companies | 58 |
| Use of big data and analytics | 48 |
| Knowledge transfer | 46 |
| ► Entrepreneurial fear of failure | 12 |

| IT integration | Rank |
|--------------------------------------|------|
| E-Government | 27 |
| Public-private partnerships | 47 |
| Cyber security | 36 |
| Software piracy | 40 |
| ► Government cyber security capacity | 11 |
| ► Privacy protection by law content | 02 |

LITHUANIA

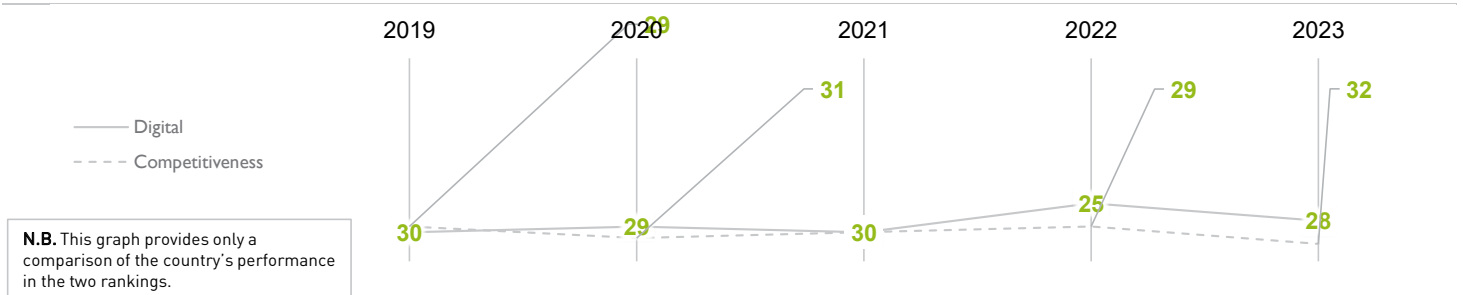
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 30 | 29 | 30 | 25 | 28 |
| Knowledge | 26 | 25 | 26 | 24 | 23 |
| Technology | 25 | 29 | 29 | 32 | 33 |
| Future readiness | 32 | 30 | 33 | 24 | 28 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



LITHUANIA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 23 | 23 | 25 | 27 | 25 |
| Training & education | 13 | 16 | 15 | 13 | 15 |
| Scientific concentration | 41 | 40 | 37 | 37 | 33 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 33 | Employee training | 24 | Total expenditure on R&D (%) | 37 |
| International experience | 30 | Total public expenditure on education | 34 | Total R&D personnel per capita | 30 |
| Foreign highly skilled personnel | 35 | Higher education achievement | 13 | Female researchers | 08 |
| Management of cities | 32 | Pupil-teacher ratio (tertiary education) | 11 | R&D productivity by publication | 52 |
| ► Digital/Technological skills | 01 | Graduates in Sciences | 22 | Scientific and technical employment | 28 |
| ▷ Net flow of international students | 54 | Women with degrees | 14 | High-tech patent grants | 17 |
| | | | | Robots in Education and R&D | 47 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 24 | 27 | 32 | 28 | 28 |
| Capital | 36 | 42 | 30 | 37 | 39 |
| Technological framework | 21 | 18 | 30 | 32 | 33 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 20 | IT & media stock market capitalization | 07 | ► Communications technology | 04 |
| ► Enforcing contracts | 07 | Funding for technological development | 33 | ▷ Mobile broadband subscribers | 53 |
| ▷ Immigration laws | 53 | ▷ Banking and financial services | 55 | Wireless broadband | 16 |
| Development & application of tech. | 29 | Country credit rating | 31 | Internet users | 33 |
| Scientific research legislation | 29 | Venture capital | 35 | Internet bandwidth speed | 25 |
| Intellectual property rights | 33 | ▷ Investment in Telecommunications | 60 | High-tech exports (%) | 35 |

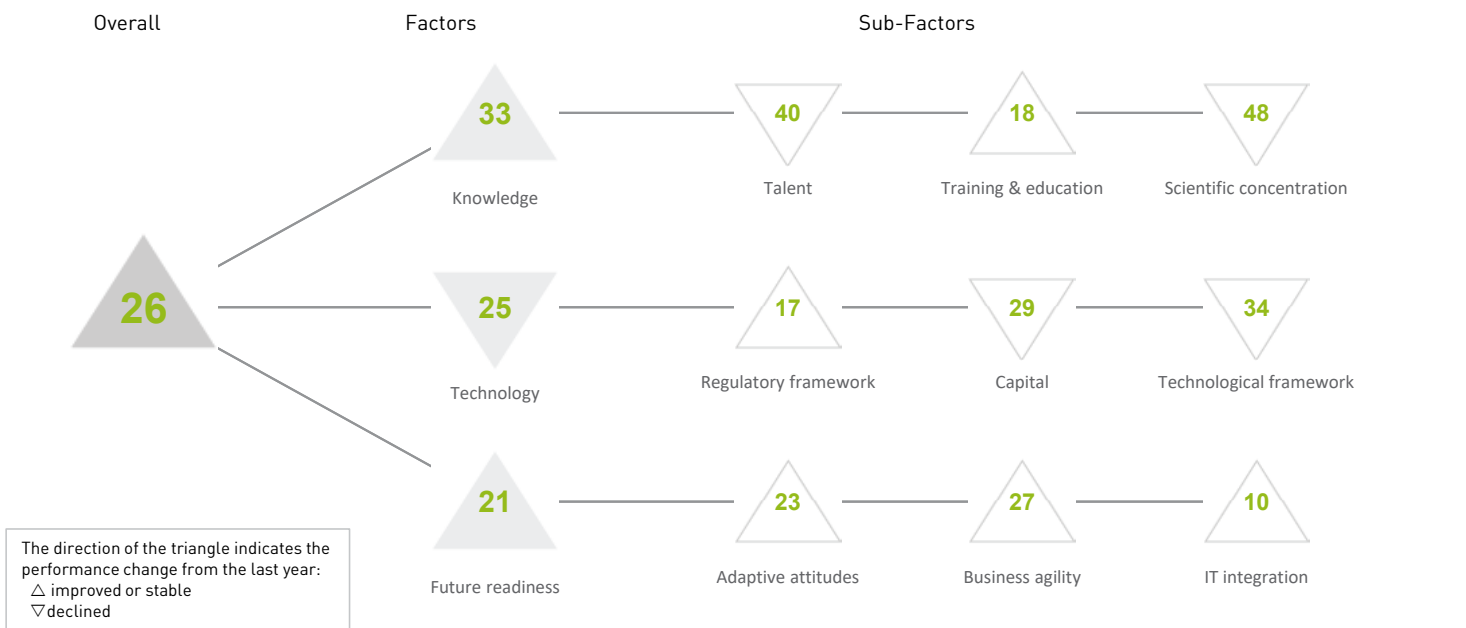
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 45 | 47 | 47 | 38 | 37 |
| Business agility | 18 | 18 | 24 | 17 | 18 |
| IT integration | 32 | 32 | 34 | 26 | 28 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 52 | ► Opportunities and threats | 03 | E-Government | 23 |
| Internet retailing | 27 | World robots distribution | 45 | Public-private partnerships | 29 |
| Tablet possession | 28 | ► Agility of companies | 05 | Cyber security | 31 |
| Smartphone possession | 35 | Use of big data and analytics | 21 | Software piracy | 43 |
| Attitudes toward globalization | 38 | Knowledge transfer | 37 | Government cyber security capacity | 33 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 08 |

LUXEMBOURG

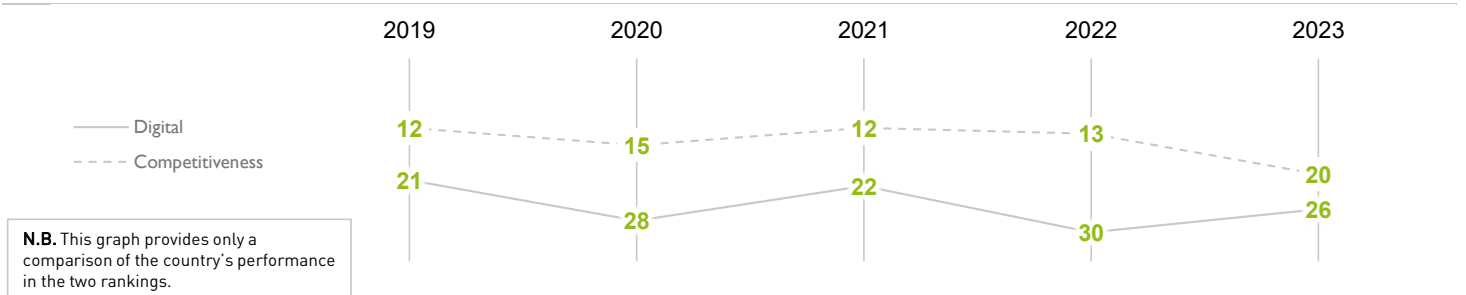
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 21 | 28 | 22 | 30 | 26 |
| Knowledge | 34 | 35 | 29 | 35 | 33 |
| Technology | 12 | 17 | 14 | 19 | 25 |
| Future readiness | 17 | 27 | 24 | 35 | 21 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



LUXEMBOURG

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 31 | 39 | 33 | 35 | 40 |
| Training & education | 24 | 23 | 20 | 20 | 18 |
| Scientific concentration | 42 | 41 | 38 | 42 | 48 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 31 | Employee training | 16 | Total expenditure on R&D (%) | 39 |
| ▶ International experience | 05 | Total public expenditure on education | 36 | Total R&D personnel per capita | 12 |
| Foreign highly skilled personnel | 09 | Higher education achievement | 07 | Female researchers | 52 |
| Management of cities | 20 | ▶ Pupil-teacher ratio (tertiary education) | 01 | ▷ R&D productivity by publication | 59 |
| Digital/Technological skills | 34 | Graduates in Sciences | 50 | Scientific and technical employment | 23 |
| ▷ Net flow of international students | 61 | Women with degrees | 17 | High-tech patent grants | 25 |
| | | | | Robots in Education and R&D | - |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 04 | 08 | 08 | 18 | 17 |
| Capital | 09 | 15 | 08 | 24 | 29 |
| Technological framework | 34 | 35 | 25 | 27 | 34 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 34 | IT & media stock market capitalization | 08 | Communications technology | 22 |
| Enforcing contracts | 17 | Funding for technological development | 22 | ▷ Mobile broadband subscribers | 55 |
| Immigration laws | 14 | Banking and financial services | 41 | Wireless broadband | 31 |
| Development & application of tech. | 18 | ▶ Country credit rating | 01 | Internet users | 06 |
| Scientific research legislation | 12 | Venture capital | 37 | Internet bandwidth speed | 17 |
| Intellectual property rights | 14 | ▷ Investment in Telecommunications | 61 | ▷ High-tech exports (%) | 53 |

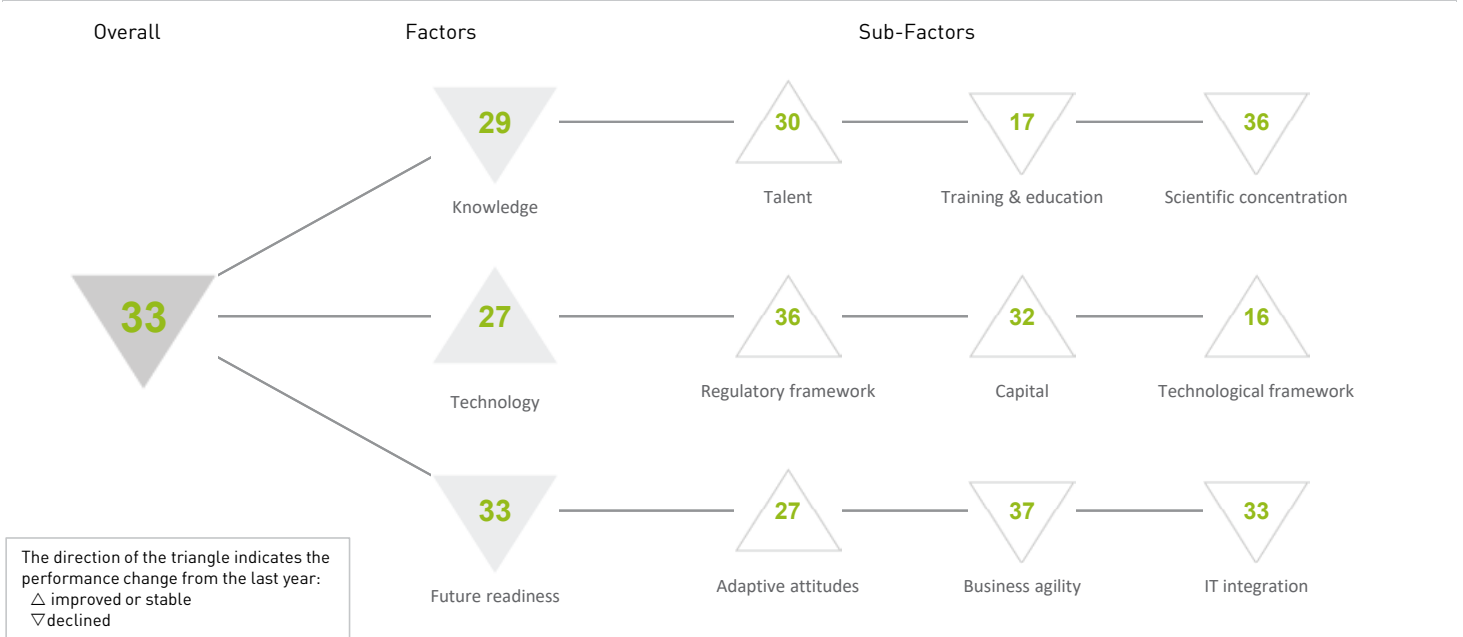
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 22 | 48 | 38 | 47 | 23 |
| Business agility | 20 | 34 | 22 | 36 | 27 |
| IT integration | 06 | 16 | 12 | 17 | 10 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|-------------------------------------|------|
| E-Participation | 22 | Opportunities and threats | 28 | E-Government | 24 |
| Internet retailing | - | World robots distribution | - | Public-private partnerships | 23 |
| Tablet possession | - | Agility of companies | 20 | Cyber security | 13 |
| Smartphone possession | - | Use of big data and analytics | 39 | ▶ Software piracy | 04 |
| Attitudes toward globalization | 31 | Knowledge transfer | 22 | Government cyber security capacity | 37 |
| | | Entrepreneurial fear of failure | 20 | ▶ Privacy protection by law content | 04 |

MALAYSIA

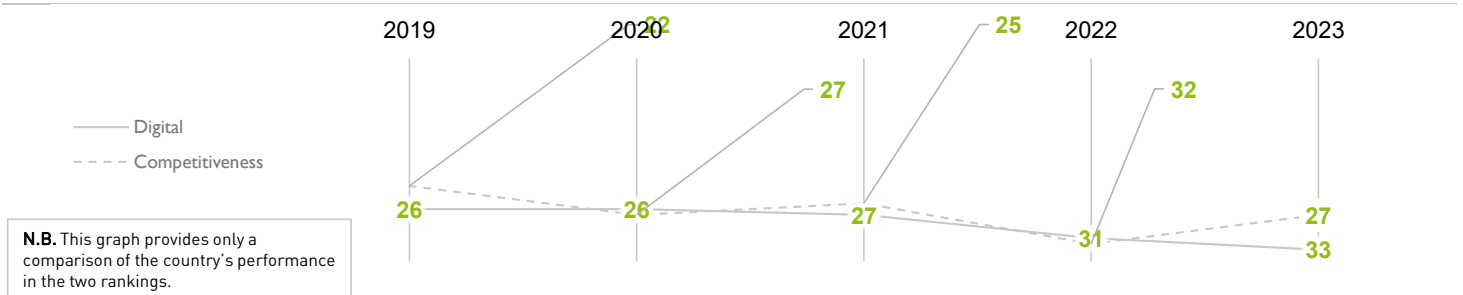
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 26 | 26 | 27 | 31 | 33 |
| Knowledge | 19 | 19 | 22 | 25 | 29 |
| Technology | 19 | 20 | 26 | 29 | 27 |
| Future readiness | 28 | 32 | 29 | 31 | 33 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



MALAYSIA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 22 | 30 | 30 | 36 | 30 |
| Training & education | 11 | 08 | 09 | 10 | 17 |
| Scientific concentration | 27 | 26 | 32 | 35 | 36 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|---------------------------------------|------|
| Educational assessment PISA - Math | 41 | Employee training | 39 | Total expenditure on R&D (%) | 40 |
| International experience | 34 | Total public expenditure on education | 44 | Total R&D personnel per capita | 43 |
| Foreign highly skilled personnel | 27 | Higher education achievement | 37 | ► Female researchers | 07 |
| Management of cities | 16 | Pupil-teacher ratio (tertiary education) | 33 | R&D productivity by publication | 23 |
| Digital/Technological skills | 25 | ► Graduates in Sciences | 02 | ▷ Scientific and technical employment | 49 |
| Net flow of international students | 30 | ► Women with degrees | 04 | ▷ High-tech patent grants | 49 |
| | | | | Robots in Education and R&D | 29 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 29 | 35 | 35 | 40 | 36 |
| Capital | 14 | 18 | 31 | 33 | 32 |
| Technological framework | 20 | 15 | 15 | 16 | 16 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| ▷ Starting a business | 52 | IT & media stock market capitalization | 17 | Communications technology | 42 |
| Enforcing contracts | 27 | Funding for technological development | 28 | Mobile broadband subscribers | 29 |
| Immigration laws | 33 | Banking and financial services | 21 | Wireless broadband | 27 |
| Development & application of tech. | 27 | Country credit rating | 39 | Internet users | 27 |
| Scientific research legislation | 31 | Venture capital | 28 | Internet bandwidth speed | 36 |
| Intellectual property rights | 30 | Investment in Telecommunications | 40 | ► High-tech exports (%) | 05 |

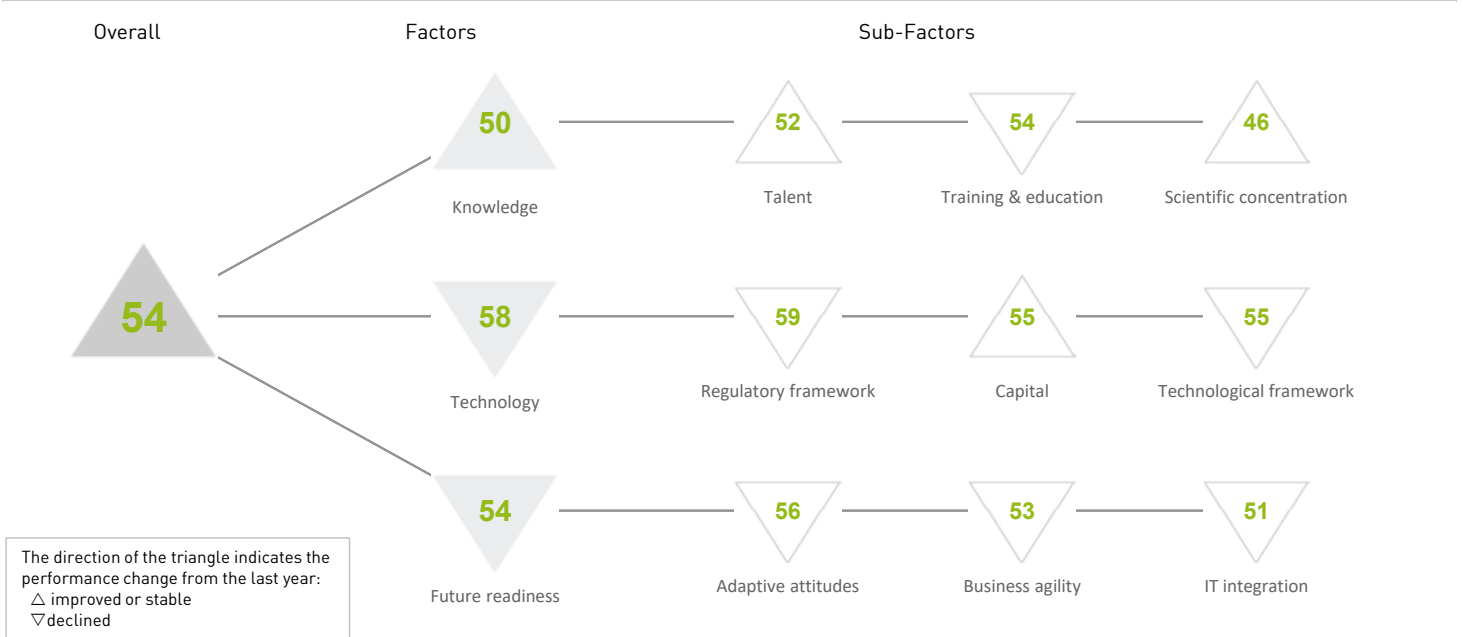
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 30 | 30 | 29 | 30 | 27 |
| Business agility | 17 | 30 | 27 | 35 | 37 |
| IT integration | 33 | 33 | 31 | 31 | 33 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | 42 | Opportunities and threats | 39 | E-Government | 46 |
| ▷ Internet retailing | 48 | World robots distribution | 22 | Public-private partnerships | 22 |
| Tablet possession | 24 | Agility of companies | 38 | Cyber security | 35 |
| Smartphone possession | 08 | Use of big data and analytics | 32 | Software piracy | 45 |
| Attitudes toward globalization | 32 | Knowledge transfer | 36 | ► Government cyber security capacity | 05 |
| | | Entrepreneurial fear of failure | 26 | ▷ Privacy protection by law content | 56 |

MEXICO

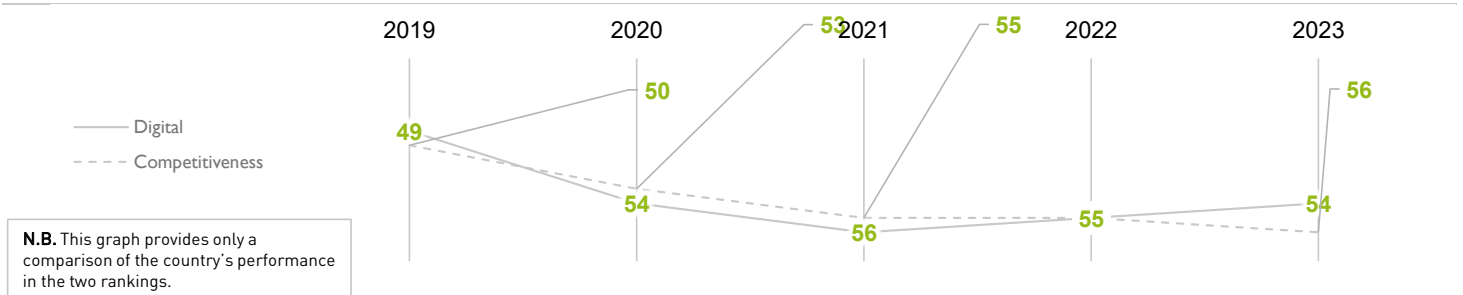
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 49 | 54 | 56 | 55 | 54 |
| Knowledge | 52 | 52 | 54 | 52 | 50 |
| Technology | 52 | 56 | 57 | 56 | 58 |
| Future readiness | 49 | 52 | 51 | 53 | 54 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



MEXICO

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 55 | 45 | 51 | 54 | 52 |
| Training & education | 53 | 57 | 57 | 53 | 54 |
| Scientific concentration | 40 | 43 | 50 | 49 | 46 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 49 | Employee training | 51 | Total expenditure on R&D (%) | 54 |
| International experience | 25 | Total public expenditure on education | 59 | Total R&D personnel per capita | 54 |
| Foreign highly skilled personnel | 31 | Higher education achievement | 52 | Female researchers | 43 |
| Management of cities | 58 | Pupil-teacher ratio (tertiary education) | 23 | ► R&D productivity by publication | 05 |
| ▷ Digital/Technological skills | 61 | Graduates in Sciences | 25 | Scientific and technical employment | 33 |
| Net flow of international students | 38 | Women with degrees | 53 | High-tech patent grants | 56 |
| | | | | ► Robots in Education and R&D | 10 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 48 | 50 | 54 | 56 | 59 |
| Capital | 47 | 53 | 57 | 55 | 55 |
| Technological framework | 53 | 54 | 54 | 54 | 55 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|--------------------------------------|------|------------------------------------------|------|------------------------------|------|
| Starting a business | 45 | ► IT & media stock market capitalization | 20 | Communications technology | 59 |
| Enforcing contracts | 32 | ▷ Funding for technological development | 62 | Mobile broadband subscribers | 48 |
| Immigration laws | 50 | Banking and financial services | 52 | Wireless broadband | 54 |
| ▷ Development & application of tech. | 60 | Country credit rating | 48 | Internet users | 55 |
| ▷ Scientific research legislation | 62 | Venture capital | 58 | Internet bandwidth speed | 55 |
| Intellectual property rights | 58 | Investment in Telecommunications | 27 | High-tech exports (%) | 21 |

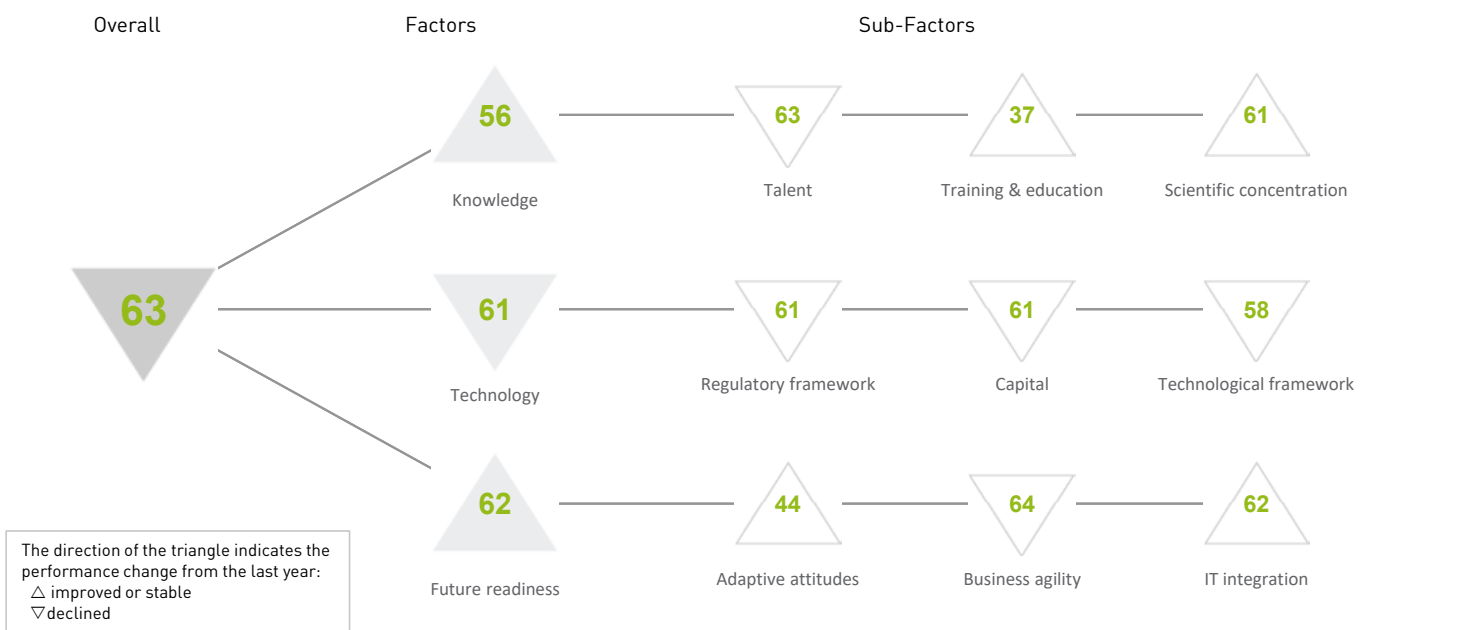
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 47 | 52 | 52 | 54 | 56 |
| Business agility | 51 | 50 | 41 | 46 | 53 |
| IT integration | 53 | 53 | 52 | 47 | 51 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|-------------------------------------|------|
| E-Participation | 29 | Opportunities and threats | 53 | E-Government | 52 |
| Internet retailing | 45 | ► World robots distribution | 09 | Public-private partnerships | 55 |
| Tablet possession | 49 | Agility of companies | 48 | ▷ Cyber security | 61 |
| Smartphone possession | 58 | Use of big data and analytics | 54 | Software piracy | 42 |
| Attitudes toward globalization | 33 | Knowledge transfer | 54 | Government cyber security capacity | 38 |
| | | Entrepreneurial fear of failure | 34 | ► Privacy protection by law content | 20 |

MONGOLIA

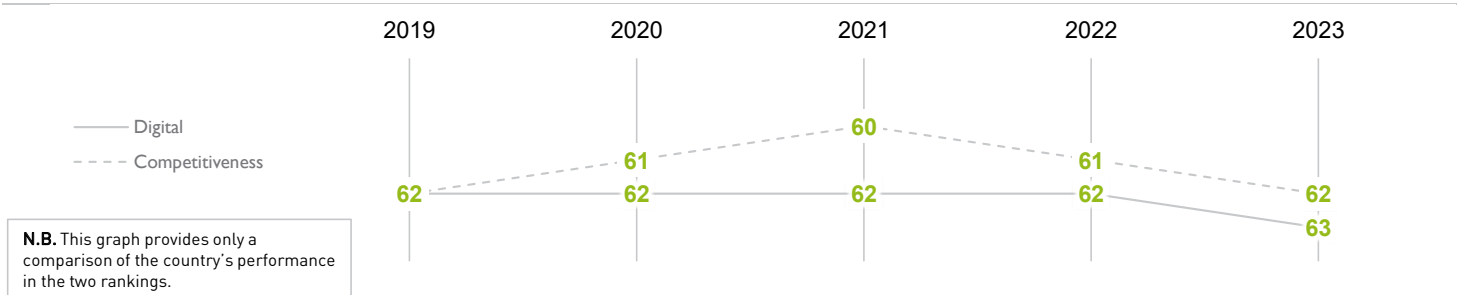
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 62 | 62 | 62 | 62 | 63 |
| Knowledge | 62 | 58 | 58 | 61 | 56 |
| Technology | 62 | 60 | 61 | 60 | 61 |
| Future readiness | 61 | 59 | 62 | 62 | 62 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (37 countries)



MONGOLIA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 60 | 60 | 60 | 60 | 63 |
| Training & education | 45 | 41 | 39 | 47 | 37 |
| Scientific concentration | 60 | 61 | 61 | 61 | 61 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | - | Employee training | 26 | Total expenditure on R&D (%) | 59 |
| International experience | 62 | Total public expenditure on education | 47 | Total R&D personnel per capita | 45 |
| Foreign highly skilled personnel | 60 | ▶ Higher education achievement | 15 | ▶ Female researchers | 01 |
| ▷ Management of cities | 63 | Pupil-teacher ratio (tertiary education) | 52 | R&D productivity by publication | 57 |
| Digital/Technological skills | 50 | Graduates in Sciences | 32 | Scientific and technical employment | 56 |
| Net flow of international students | 59 | Women with degrees | 22 | High-tech patent grants | 61 |
| | | | | Robots in Education and R&D | - |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 62 | 58 | 58 | 60 | 61 |
| Capital | 58 | 60 | 62 | 59 | 61 |
| Technological framework | 58 | 60 | 60 | 57 | 58 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 43 | IT & media stock market capitalization | - | Communications technology | 53 |
| Enforcing contracts | 44 | Funding for technological development | 61 | ▷ Mobile broadband subscribers | 63 |
| Immigration laws | 56 | Banking and financial services | 62 | Wireless broadband | 48 |
| Development & application of tech. | 63 | Country credit rating | 61 | Internet users | 53 |
| Scientific research legislation | 63 | Venture capital | 62 | Internet bandwidth speed | 58 |
| ▷ Intellectual property rights | 63 | ▶ Investment in Telecommunications | 11 | ▶ High-tech exports (%) | 15 |

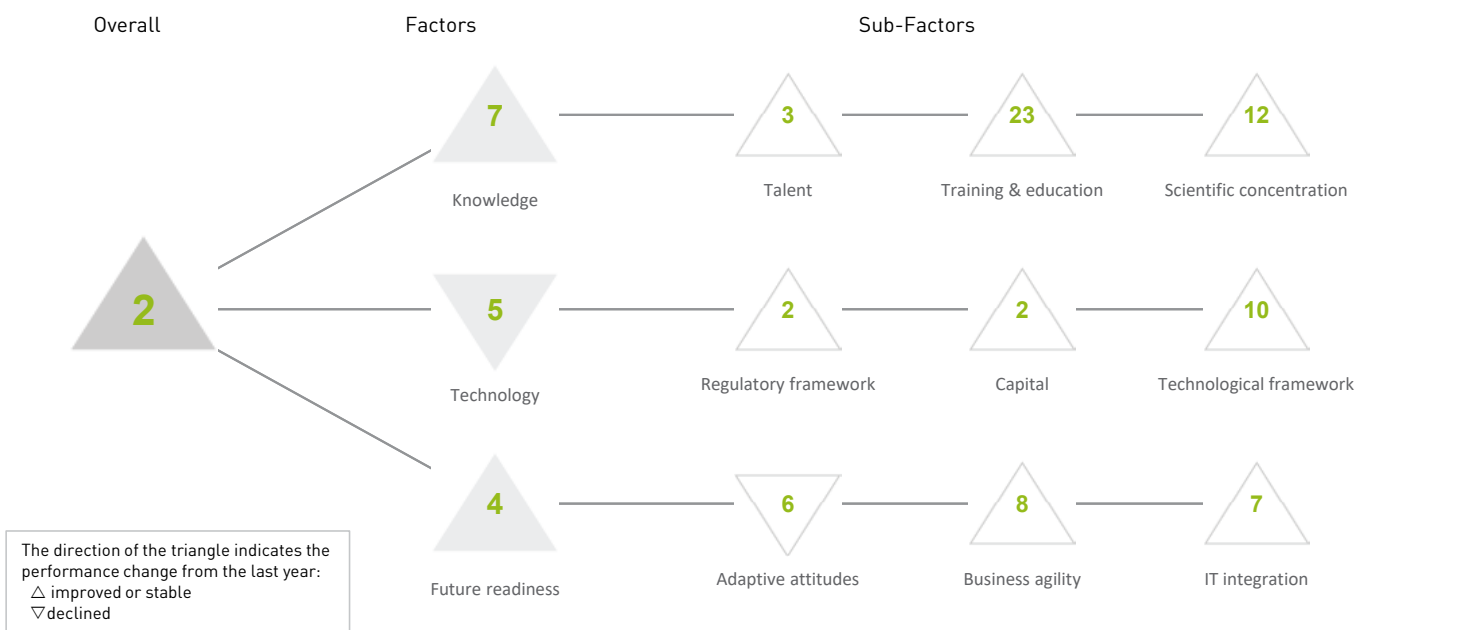
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 31 | 40 | 37 | 51 | 44 |
| Business agility | 63 | 61 | 63 | 63 | 64 |
| IT integration | 62 | 61 | 62 | 62 | 62 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 48 | ▷ Opportunities and threats | 64 | E-Government | 55 |
| Internet retailing | 60 | World robots distribution | - | Public-private partnerships | 63 |
| Tablet possession | - | Agility of companies | 63 | Cyber security | 63 |
| ▶ Smartphone possession | 05 | Use of big data and analytics | 62 | Software piracy | - |
| Attitudes toward globalization | 48 | ▷ Knowledge transfer | 64 | Government cyber security capacity | 56 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 44 |

NETHERLANDS

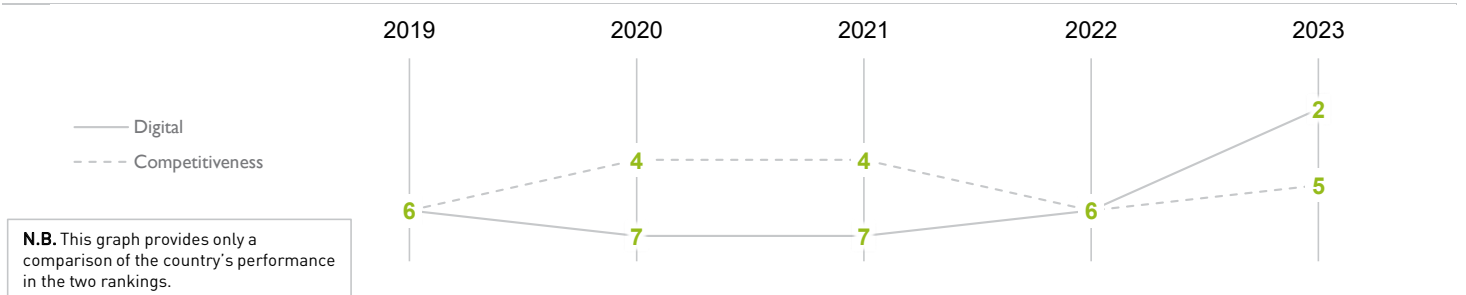
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 06 | 07 | 07 | 06 | 02 |
| Knowledge | 13 | 14 | 11 | 08 | 07 |
| Technology | 06 | 08 | 07 | 04 | 05 |
| Future readiness | 03 | 04 | 04 | 05 | 04 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



NETHERLANDS

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 03 | 03 | 04 | 04 | 03 |
| Training & education | 36 | 29 | 28 | 25 | 23 |
| Scientific concentration | 19 | 16 | 16 | 12 | 12 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 08 |
| International experience | 03 |
| ▶ Foreign highly skilled personnel | 02 |
| Management of cities | 11 |
| Digital/Technological skills | 05 |
| Net flow of international students | 06 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 06 |
| Total public expenditure on education | 22 |
| Higher education achievement | 16 |
| Pupil-teacher ratio (tertiary education) | 24 |
| ▷ Graduates in Sciences | 51 |
| Women with degrees | 28 |

| Scientific concentration | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 16 |
| Total R&D personnel per capita | 09 |
| ▷ Female researchers | 47 |
| R&D productivity by publication | 27 |
| Scientific and technical employment | 03 |
| High-tech patent grants | 12 |
| Robots in Education and R&D | 23 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 06 | 11 | 07 | 07 | 02 |
| Capital | 05 | 02 | 03 | 03 | 02 |
| Technological framework | 10 | 12 | 10 | 10 | 10 |

| Regulatory framework | Rank |
|------------------------------------|------|
| Starting a business | 13 |
| ▷ Enforcing contracts | 45 |
| Immigration laws | 07 |
| Development & application of tech. | 08 |
| Scientific research legislation | 04 |
| ▶ Intellectual property rights | 02 |

| Capital | Rank |
|------------------------------------------|------|
| ▶ IT & media stock market capitalization | 02 |
| Funding for technological development | 08 |
| Banking and financial services | 16 |
| ▶ Country credit rating | 01 |
| Venture capital | 04 |
| ▷ Investment in Telecommunications | 45 |

| Technological framework | Rank |
|------------------------------|------|
| ▶ Communications technology | 02 |
| Mobile broadband subscribers | 17 |
| Wireless broadband | 35 |
| Internet users | 14 |
| Internet bandwidth speed | 16 |
| High-tech exports (%) | 16 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 09 | 06 | 06 | 02 | 06 |
| Business agility | 07 | 07 | 08 | 08 | 08 |
| IT integration | 03 | 05 | 06 | 09 | 07 |

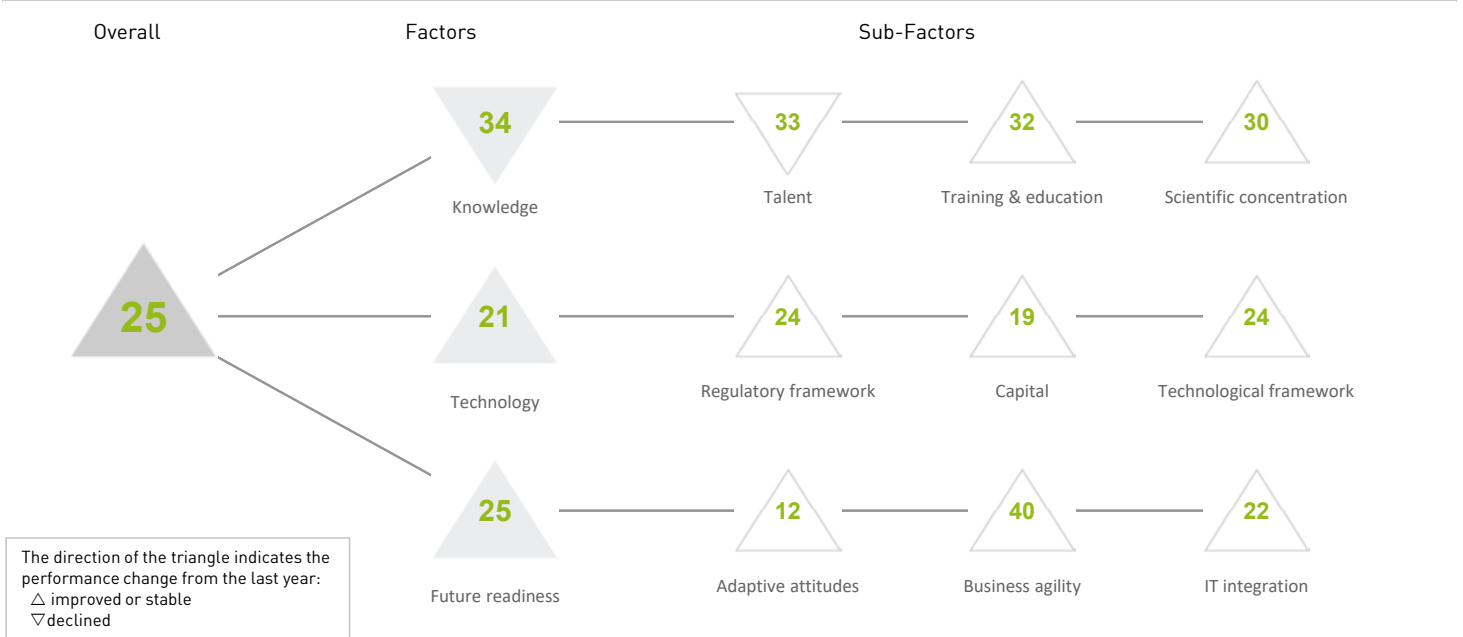
| Adaptive attitudes | Rank |
|--------------------------------|------|
| E-Participation | 05 |
| Internet retailing | 09 |
| Tablet possession | 11 |
| Smartphone possession | 25 |
| Attitudes toward globalization | 11 |

| Business agility | Rank |
|---------------------------------|------|
| Opportunities and threats | 09 |
| World robots distribution | 20 |
| Agility of companies | 10 |
| Use of big data and analytics | 13 |
| Knowledge transfer | 03 |
| Entrepreneurial fear of failure | 11 |

| IT integration | Rank |
|--------------------------------------|------|
| E-Government | 09 |
| Public-private partnerships | 05 |
| Cyber security | 12 |
| Software piracy | 13 |
| ▷ Government cyber security capacity | 41 |
| Privacy protection by law content | 07 |

NEW ZEALAND

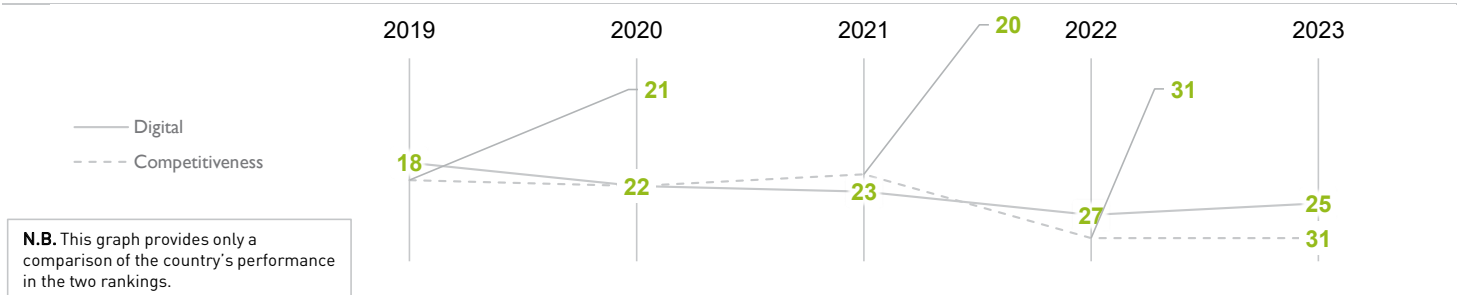
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 18 | 22 | 23 | 27 | 25 |
| Knowledge | 21 | 28 | 28 | 33 | 34 |
| Technology | 15 | 18 | 21 | 28 | 21 |
| Future readiness | 20 | 21 | 19 | 26 | 25 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (37 countries)



NEW ZEALAND

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 11 | 17 | 14 | 32 | 33 |
| Training & education | 34 | 37 | 36 | 32 | 32 |
| Scientific concentration | 26 | 34 | 33 | 32 | 30 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 26 | Employee training | 43 | Total expenditure on R&D (%) | 32 |
| ▷ International experience | 55 | Total public expenditure on education | 19 | Total R&D personnel per capita | 18 |
| Foreign highly skilled personnel | 40 | Higher education achievement | 31 | Female researchers | - |
| ▷ Management of cities | 53 | Pupil-teacher ratio (tertiary education) | 35 | R&D productivity by publication | 40 |
| ▷ Digital/Technological skills | 50 | Graduates in Sciences | 29 | Scientific and technical employment | 09 |
| ► Net flow of international students | 04 | Women with degrees | 29 | High-tech patent grants | 41 |
| | | | | Robots in Education and R&D | 45 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 11 | 21 | 24 | 33 | 24 |
| Capital | 15 | 24 | 22 | 30 | 19 |
| Technological framework | 25 | 21 | 23 | 25 | 24 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| ► Starting a business | 01 | IT & media stock market capitalization | 25 | Communications technology | 20 |
| Enforcing contracts | 19 | Funding for technological development | 44 | Mobile broadband subscribers | 46 |
| ▷ Immigration laws | 64 | Banking and financial services | 15 | Wireless broadband | 13 |
| Development & application of tech. | 15 | Country credit rating | 12 | Internet users | 24 |
| Scientific research legislation | 21 | Venture capital | 31 | Internet bandwidth speed | 14 |
| Intellectual property rights | 07 | Investment in Telecommunications | 13 | High-tech exports (%) | 40 |

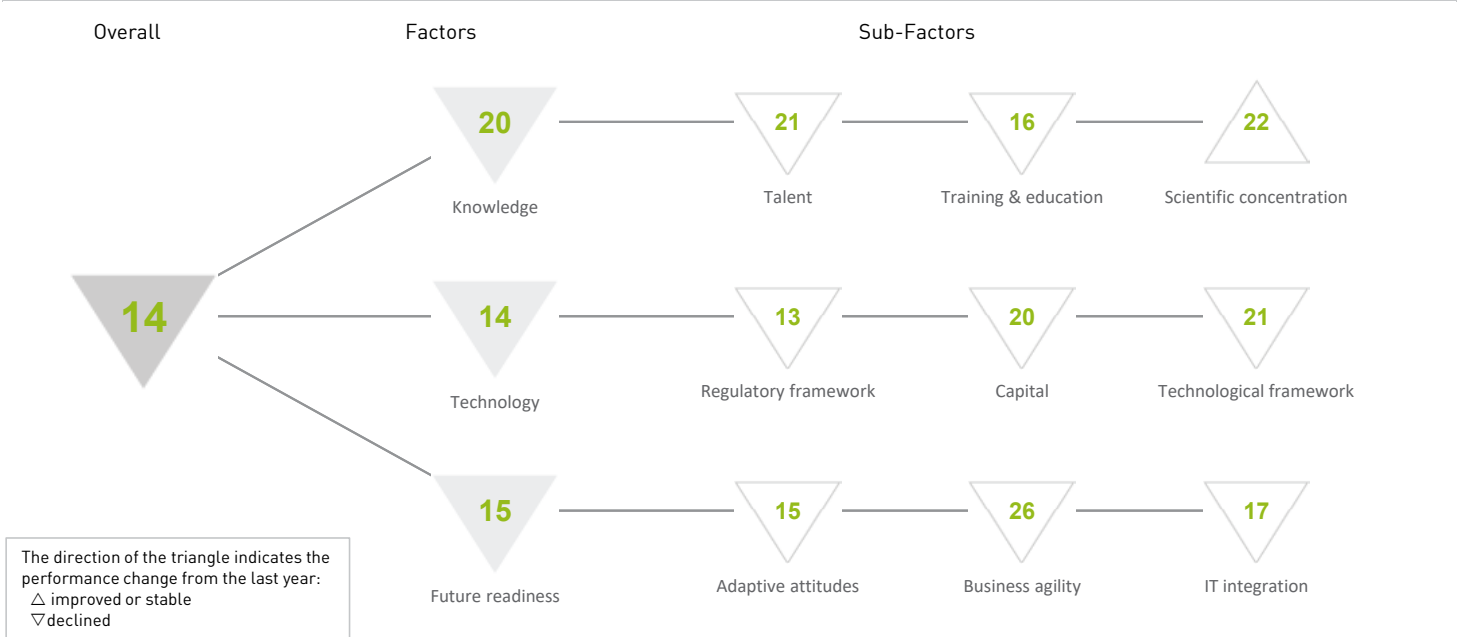
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 13 | 13 | 16 | 15 | 12 |
| Business agility | 32 | 46 | 30 | 49 | 40 |
| IT integration | 10 | 18 | 18 | 27 | 22 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| ► E-Participation | 06 | Opportunities and threats | 40 | ► E-Government | 04 |
| Internet retailing | 18 | World robots distribution | 42 | ▷ Public-private partnerships | 56 |
| Tablet possession | 08 | Agility of companies | 36 | Cyber security | 40 |
| Smartphone possession | 40 | Use of big data and analytics | 42 | ► Software piracy | 02 |
| Attitudes toward globalization | 19 | Knowledge transfer | 25 | Government cyber security capacity | 20 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 39 |

NORWAY

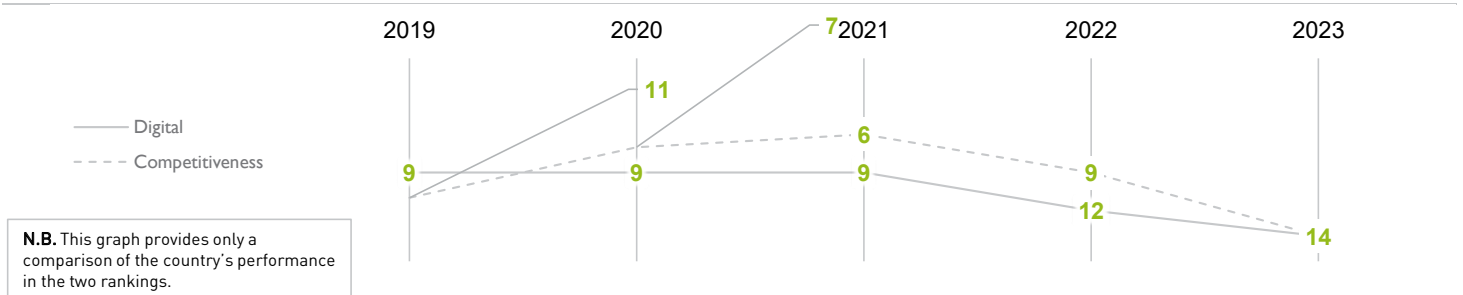
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 09 | 09 | 09 | 12 | 14 |
| Knowledge | 16 | 16 | 17 | 19 | 20 |
| Technology | 03 | 03 | 06 | 10 | 14 |
| Future readiness | 08 | 06 | 08 | 09 | 15 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



NORWAY

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 16 | 16 | 16 | 18 | 21 |
| Training & education | 17 | 10 | 11 | 14 | 16 |
| Scientific concentration | 21 | 23 | 22 | 22 | 22 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 18 | Employee training | 13 | Total expenditure on R&D (%) | 21 |
| International experience | 21 | Total public expenditure on education | 31 | Total R&D personnel per capita | 11 |
| Foreign highly skilled personnel | 20 | Higher education achievement | 17 | Female researchers | 27 |
| Management of cities | 24 | ► Pupil-teacher ratio (tertiary education) | 05 | ▷ R&D productivity by publication | 41 |
| Digital/Technological skills | 20 | ▷ Graduates in Sciences | 41 | Scientific and technical employment | 20 |
| ▷ Net flow of international students | 49 | Women with degrees | 13 | High-tech patent grants | 27 |
| | | | | Robots in Education and R&D | 26 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 03 | 02 | 01 | 04 | 13 |
| Capital | 07 | 09 | 06 | 04 | 20 |
| Technological framework | 06 | 09 | 12 | 14 | 21 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 14 | IT & media stock market capitalization | 34 | Communications technology | 41 |
| ► Enforcing contracts | 03 | Funding for technological development | 32 | Mobile broadband subscribers | 23 |
| Immigration laws | 29 | Banking and financial services | 20 | Wireless broadband | 36 |
| Development & application of tech. | 31 | ► Country credit rating | 01 | Internet users | 07 |
| Scientific research legislation | 19 | Venture capital | 17 | Internet bandwidth speed | 22 |
| Intellectual property rights | 24 | Investment in Telecommunications | 30 | High-tech exports (%) | 18 |

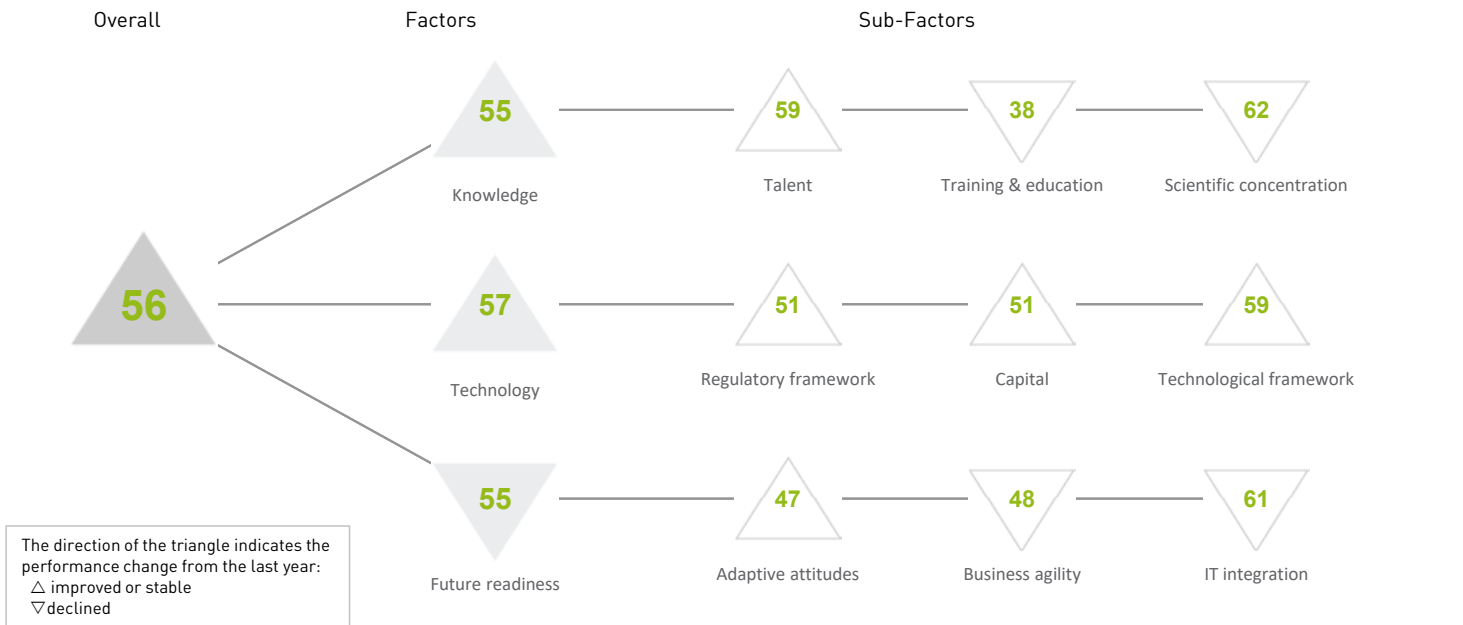
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 05 | 07 | 08 | 06 | 15 |
| Business agility | 23 | 08 | 11 | 13 | 26 |
| IT integration | 09 | 06 | 08 | 12 | 17 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | 39 | ▷ Opportunities and threats | 45 | E-Government | 16 |
| Internet retailing | 11 | World robots distribution | 40 | Public-private partnerships | 26 |
| ► Tablet possession | 02 | Agility of companies | 27 | Cyber security | 39 |
| Smartphone possession | 12 | Use of big data and analytics | 12 | Software piracy | 10 |
| Attitudes toward globalization | 23 | Knowledge transfer | 18 | ▷ Government cyber security capacity | 45 |
| | | Entrepreneurial fear of failure | 15 | ► Privacy protection by law content | 05 |

PERU

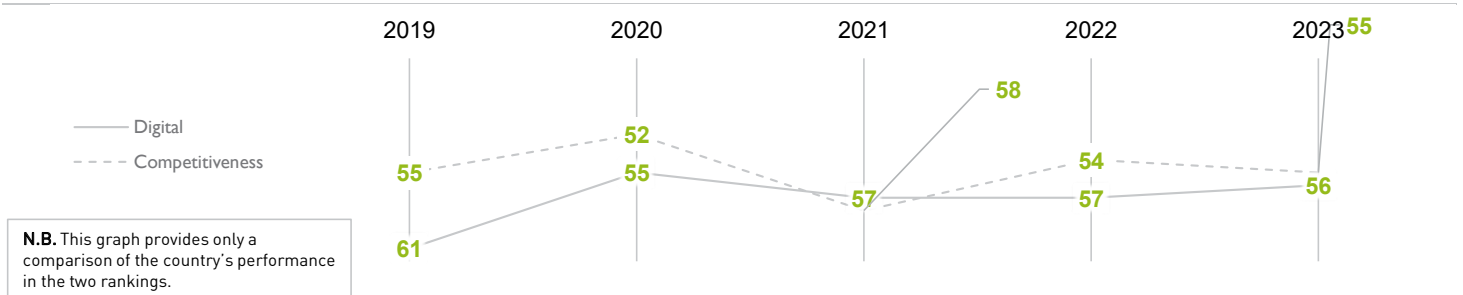
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 61 | 55 | 57 | 57 | 56 |
| Knowledge | 61 | 55 | 59 | 56 | 55 |
| Technology | 58 | 58 | 56 | 57 | 57 |
| Future readiness | 59 | 55 | 54 | 54 | 55 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 59 | 58 | 59 | 59 | 59 |
| Training & education | 42 | 39 | 41 | 37 | 38 |
| Scientific concentration | 62 | 59 | 60 | 60 | 62 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 50 | ▷ Employee training | 62 | Total expenditure on R&D (%) | 58 |
| International experience | 35 | Total public expenditure on education | 49 | Total R&D personnel per capita | - |
| Foreign highly skilled personnel | 42 | ► Higher education achievement | 10 | Female researchers | 44 |
| ▷ Management of cities | 60 | Pupil-teacher ratio (tertiary education) | 37 | R&D productivity by publication | 28 |
| Digital/Technological skills | 59 | ► Graduates in Sciences | 10 | Scientific and technical employment | 53 |
| Net flow of international students | - | Women with degrees | 40 | High-tech patent grants | 59 |
| | | | | Robots in Education and R&D | 42 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 50 | 49 | 49 | 51 | 51 |
| Capital | 45 | 37 | 43 | 53 | 51 |
| Technological framework | 61 | 59 | 58 | 59 | 59 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 55 | IT & media stock market capitalization | 56 | ▷ Communications technology | 60 |
| Enforcing contracts | 46 | Funding for technological development | 56 | Mobile broadband subscribers | 54 |
| ► Immigration laws | 08 | Banking and financial services | 40 | ▷ Wireless broadband | 61 |
| Development & application of tech. | 58 | Country credit rating | 42 | Internet users | 58 |
| Scientific research legislation | 56 | Venture capital | 40 | Internet bandwidth speed | 50 |
| Intellectual property rights | 56 | ► Investment in Telecommunications | 10 | High-tech exports (%) | 55 |

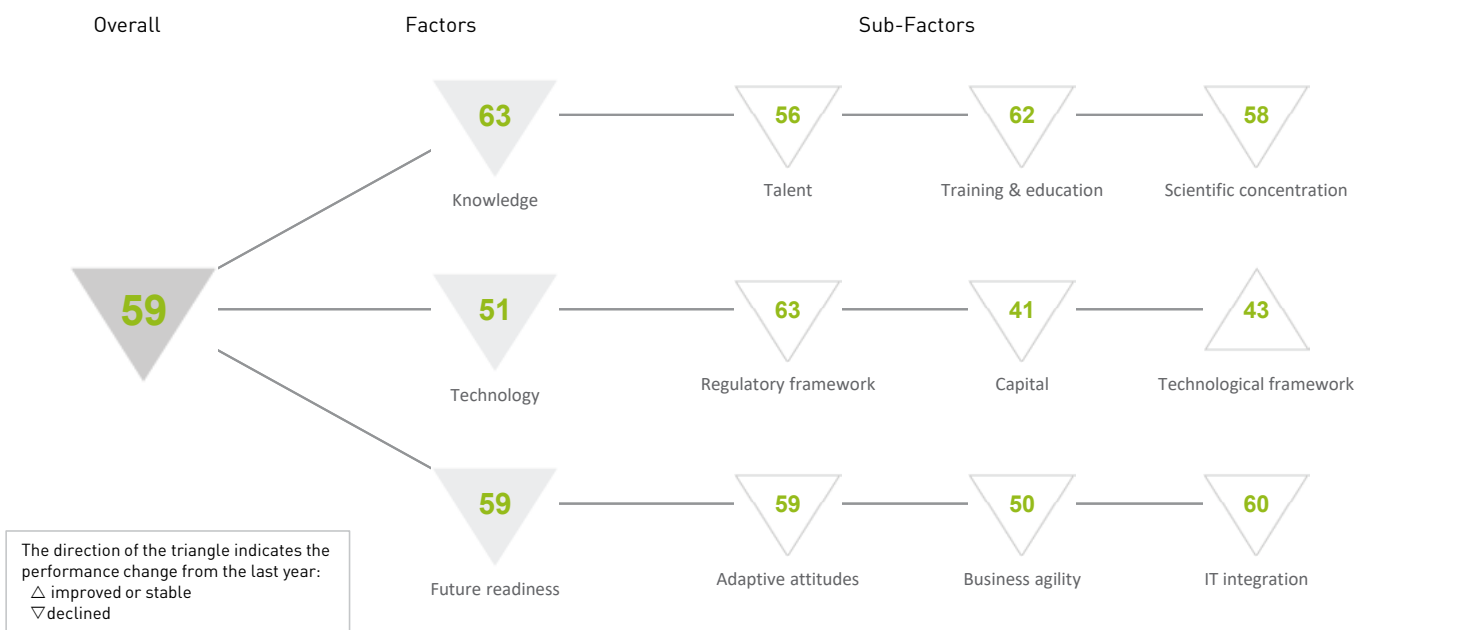
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 49 | 54 | 54 | 53 | 47 |
| Business agility | 59 | 47 | 39 | 39 | 48 |
| IT integration | 59 | 58 | 56 | 59 | 61 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|-----------------------------------|------|--------------------------------------|------|
| E-Participation | 21 | Opportunities and threats | 56 | E-Government | 50 |
| Internet retailing | 54 | World robots distribution | 53 | Public-private partnerships | 52 |
| Tablet possession | 53 | Agility of companies | 57 | Cyber security | 58 |
| Smartphone possession | 37 | Use of big data and analytics | 57 | Software piracy | 54 |
| Attitudes toward globalization | 36 | Knowledge transfer | 57 | ▷ Government cyber security capacity | 63 |
| | | ► Entrepreneurial fear of failure | 04 | Privacy protection by law content | 53 |

PHILIPPINES

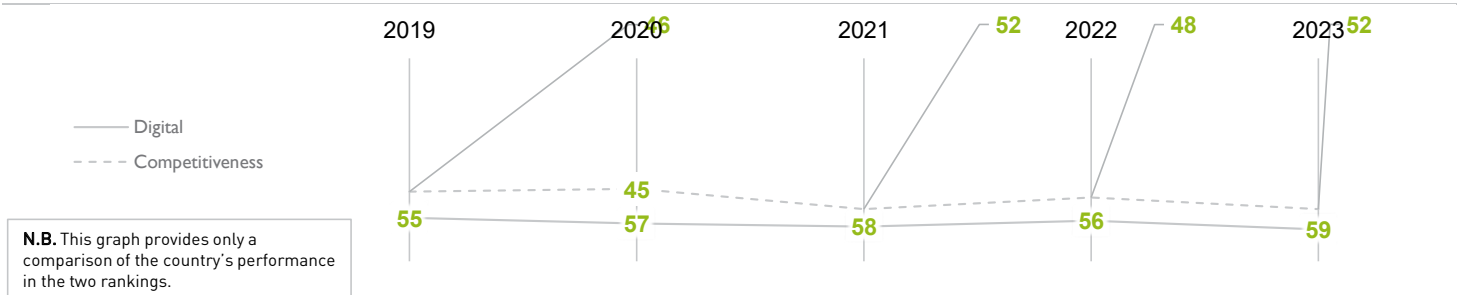
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 55 | 57 | 58 | 56 | 59 |
| Knowledge | 51 | 62 | 63 | 62 | 63 |
| Technology | 55 | 53 | 54 | 49 | 51 |
| Future readiness | 54 | 54 | 57 | 58 | 59 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



PHILIPPINES

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 41 | 55 | 55 | 55 | 56 |
| Training & education | 54 | 59 | 61 | 61 | 62 |
| Scientific concentration | 54 | 56 | 56 | 57 | 58 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 57 | Employee training | 37 | Total expenditure on R&D (%) | 53 |
| International experience | 44 | Total public expenditure on education | 58 | Total R&D personnel per capita | 55 |
| Foreign highly skilled personnel | 46 | Higher education achievement | 57 | ► Female researchers | 02 |
| Management of cities | 50 | Pupil-teacher ratio (tertiary education) | 51 | R&D productivity by publication | 37 |
| Digital/Technological skills | 46 | Graduates in Sciences | 34 | Scientific and technical employment | 58 |
| Net flow of international students | 40 | ▷ Women with degrees | 59 | High-tech patent grants | 37 |
| | | | | Robots in Education and R&D | 52 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 60 | 62 | 62 | 62 | 63 |
| Capital | 40 | 39 | 40 | 40 | 41 |
| Technological framework | 51 | 49 | 49 | 45 | 43 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| ▷ Starting a business | 63 | IT & media stock market capitalization | 35 | ▷ Communications technology | 63 |
| ▷ Enforcing contracts | 62 | Funding for technological development | 55 | Mobile broadband subscribers | 52 |
| Immigration laws | 38 | Banking and financial services | 32 | Wireless broadband | 33 |
| Development & application of tech. | 53 | Country credit rating | 46 | ▷ Internet users | 59 |
| Scientific research legislation | 53 | Venture capital | 52 | Internet bandwidth speed | 44 |
| Intellectual property rights | 59 | ► Investment in Telecommunications | 09 | ► High-tech exports (%) | 02 |

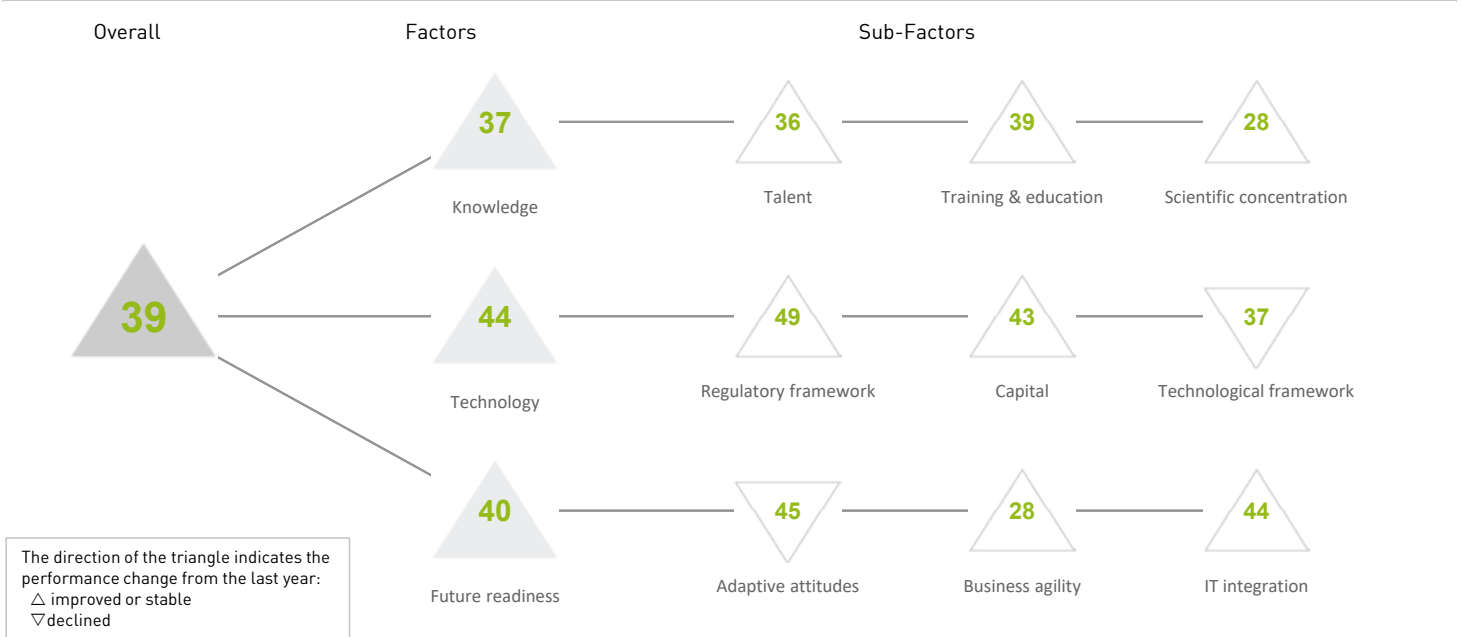
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 53 | 57 | 60 | 58 | 59 |
| Business agility | 42 | 32 | 37 | 45 | 50 |
| IT integration | 58 | 56 | 57 | 57 | 60 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|----------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 56 | Opportunities and threats | 46 | E-Government | 58 |
| Internet retailing | 56 | World robots distribution | 39 | ► Public-private partnerships | 31 |
| Tablet possession | 54 | Agility of companies | 49 | Cyber security | 56 |
| Smartphone possession | 52 | Use of big data and analytics | 38 | Software piracy | 55 |
| ► Attitudes toward globalization | 22 | Knowledge transfer | 51 | Government cyber security capacity | 54 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 42 |

POLAND

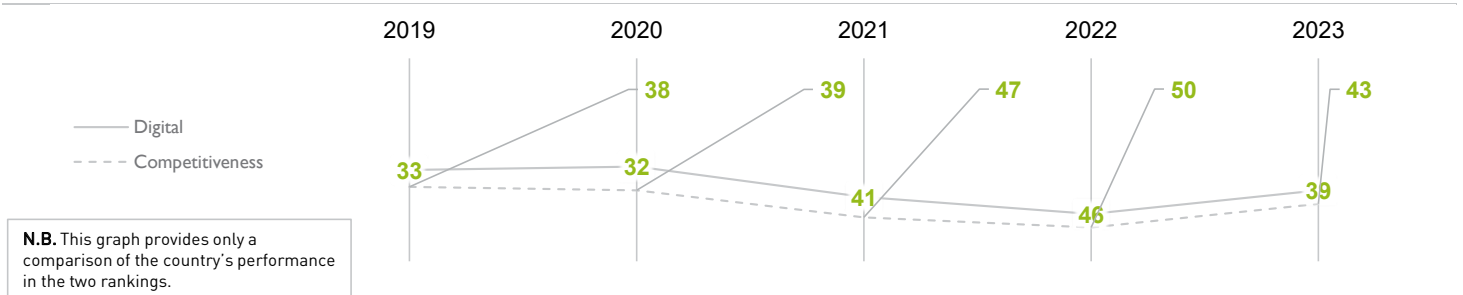
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 33 | 32 | 41 | 46 | 39 |
| Knowledge | 33 | 30 | 38 | 42 | 37 |
| Technology | 37 | 37 | 41 | 46 | 44 |
| Future readiness | 33 | 35 | 39 | 43 | 40 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (27 countries)



POLAND

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 28 | 29 | 41 | 48 | 36 |
| Training & education | 35 | 32 | 44 | 42 | 39 |
| Scientific concentration | 31 | 28 | 28 | 30 | 28 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| ► Educational assessment PISA - Math | 09 | Employee training | 46 | Total expenditure on R&D (%) | 30 |
| International experience | 36 | Total public expenditure on education | 33 | Total R&D personnel per capita | 34 |
| Foreign highly skilled personnel | 50 | Higher education achievement | 38 | Female researchers | 32 |
| Management of cities | 35 | Pupil-teacher ratio (tertiary education) | 29 | R&D productivity by publication | 19 |
| Digital/Technological skills | 41 | Graduates in Sciences | 48 | Scientific and technical employment | 35 |
| Net flow of international students | 32 | Women with degrees | 32 | High-tech patent grants | 42 |
| | | | | ► Robots in Education and R&D | 14 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 45 | 46 | 53 | 57 | 49 |
| Capital | 38 | 36 | 47 | 49 | 43 |
| Technological framework | 30 | 23 | 31 | 33 | 37 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| ▷ Starting a business | 54 | IT & media stock market capitalization | 36 | ▷ Communications technology | 51 |
| Enforcing contracts | 38 | Funding for technological development | 46 | Mobile broadband subscribers | 38 |
| Immigration laws | 47 | Banking and financial services | 48 | ► Wireless broadband | 04 |
| Development & application of tech. | 51 | Country credit rating | 37 | Internet users | 46 |
| Scientific research legislation | 41 | Venture capital | 32 | Internet bandwidth speed | 31 |
| ▷ Intellectual property rights | 54 | Investment in Telecommunications | 32 | High-tech exports (%) | 42 |

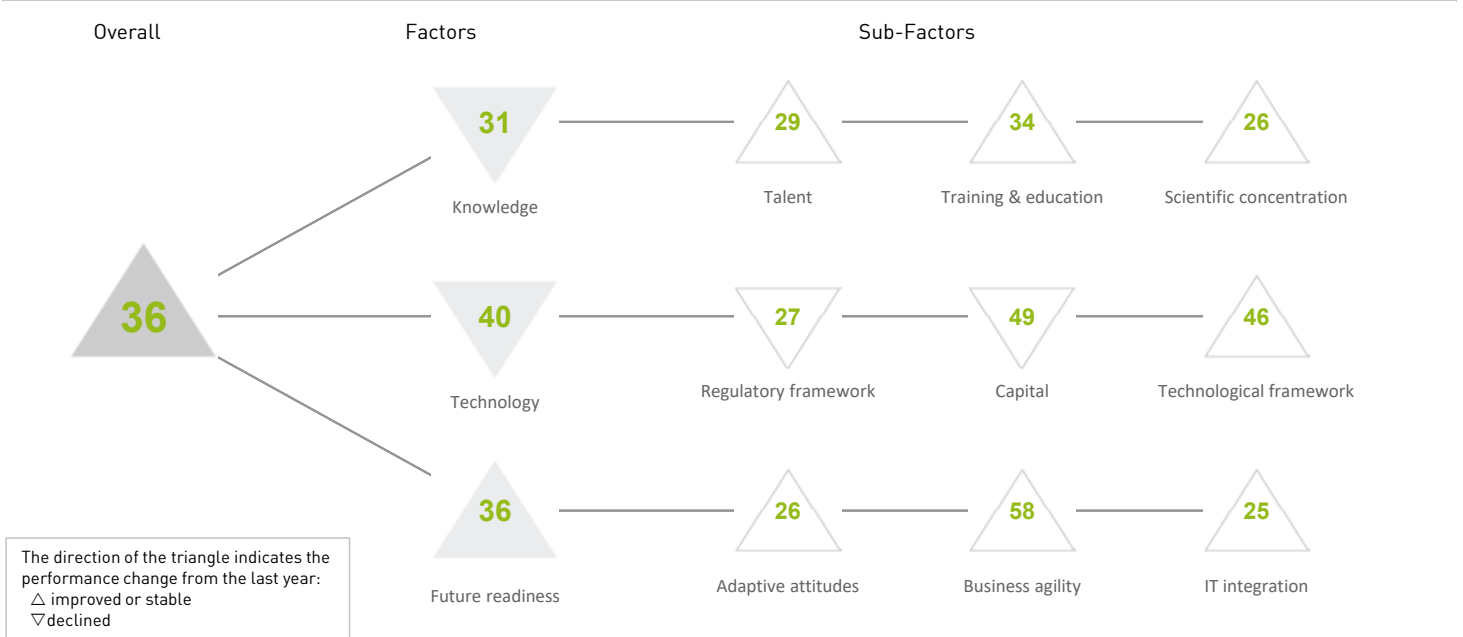
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 37 | 29 | 28 | 37 | 45 |
| Business agility | 28 | 33 | 44 | 47 | 28 |
| IT integration | 36 | 38 | 45 | 51 | 44 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|----------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 44 | ► Opportunities and threats | 15 | E-Government | 32 |
| Internet retailing | 29 | World robots distribution | 17 | Public-private partnerships | 50 |
| ► Tablet possession | 10 | Agility of companies | 22 | Cyber security | 46 |
| ▷ Smartphone possession | 57 | Use of big data and analytics | 27 | Software piracy | 36 |
| ▷ Attitudes toward globalization | 57 | Knowledge transfer | 38 | Government cyber security capacity | 50 |
| | | Entrepreneurial fear of failure | 21 | Privacy protection by law content | 41 |

PORTUGAL

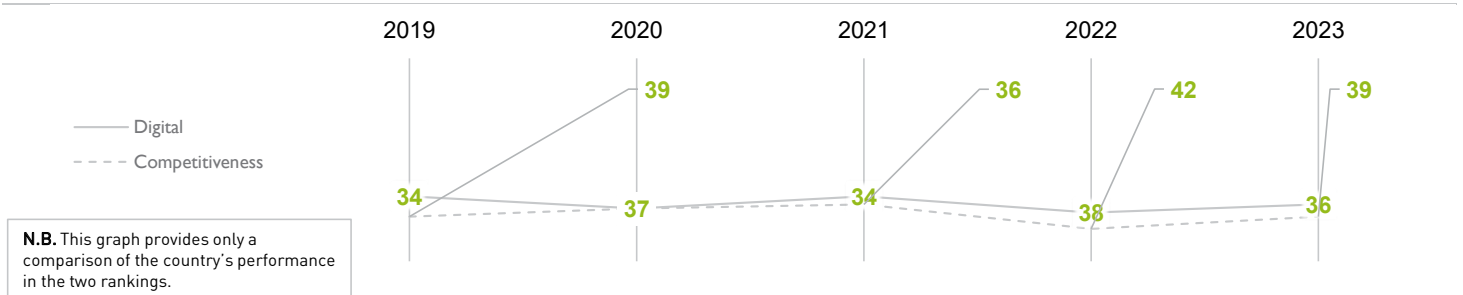
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 34 | 37 | 34 | 38 | 36 |
| Knowledge | 31 | 33 | 32 | 29 | 31 |
| Technology | 38 | 38 | 38 | 39 | 40 |
| Future readiness | 34 | 41 | 38 | 40 | 36 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



PORTUGAL

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 26 | 24 | 22 | 29 | 29 |
| Training & education | 39 | 38 | 38 | 36 | 34 |
| Scientific concentration | 32 | 30 | 27 | 27 | 26 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 27 | ▷ Employee training | 60 | Total expenditure on R&D (%) | 24 |
| ▷ International experience | 56 | Total public expenditure on education | 37 | Total R&D personnel per capita | 25 |
| Foreign highly skilled personnel | 36 | Higher education achievement | 28 | Female researchers | 19 |
| Management of cities | 31 | ► Pupil-teacher ratio (tertiary education) | 12 | R&D productivity by publication | 29 |
| Digital/Technological skills | 22 | ► Graduates in Sciences | 16 | Scientific and technical employment | 27 |
| Net flow of international students | 21 | Women with degrees | 34 | High-tech patent grants | 34 |
| | | | | Robots in Education and R&D | 34 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 21 | 20 | 21 | 19 | 27 |
| Capital | 48 | 44 | 44 | 48 | 49 |
| Technological framework | 45 | 42 | 46 | 48 | 46 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 31 | IT & media stock market capitalization | 46 | ► Communications technology | 08 |
| Enforcing contracts | 29 | Funding for technological development | 45 | ▷ Mobile broadband subscribers | 58 |
| ► Immigration laws | 06 | Banking and financial services | 39 | Wireless broadband | 52 |
| Development & application of tech. | 34 | Country credit rating | 44 | Internet users | 48 |
| Scientific research legislation | 39 | Venture capital | 45 | Internet bandwidth speed | 21 |
| Intellectual property rights | 32 | Investment in Telecommunications | 35 | High-tech exports (%) | 51 |

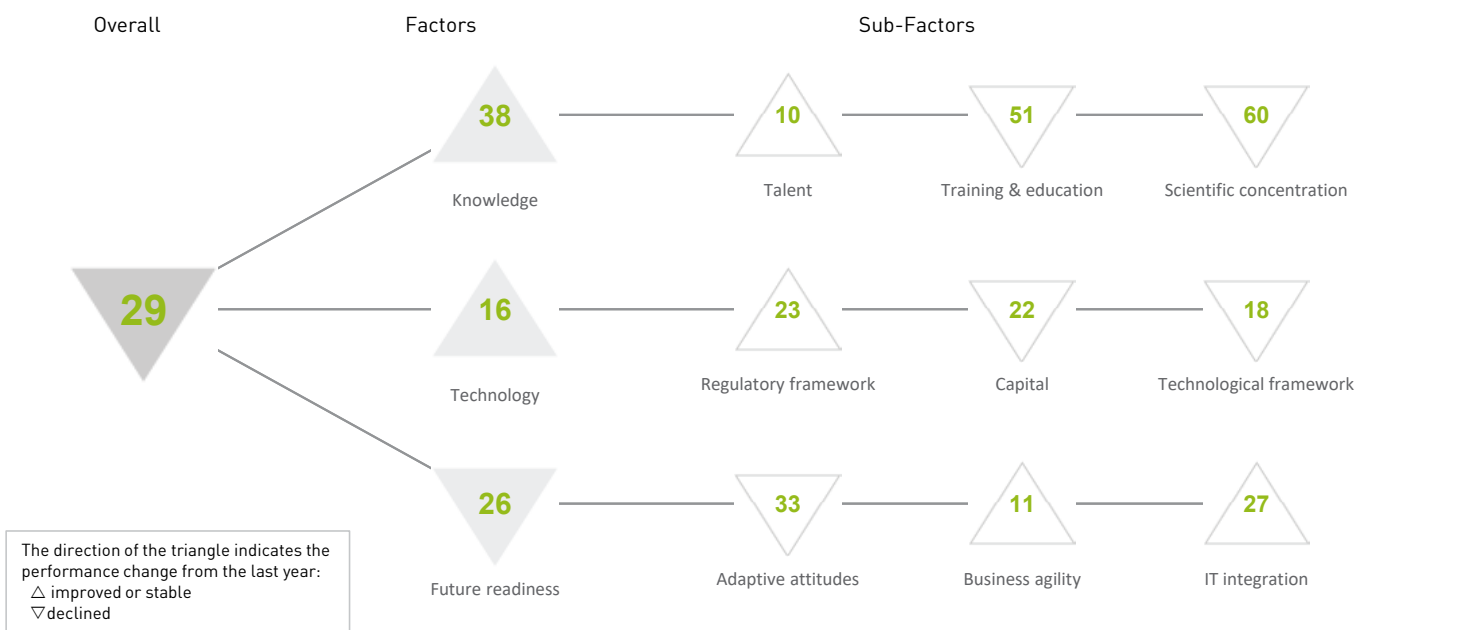
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 32 | 31 | 30 | 35 | 26 |
| Business agility | 52 | 57 | 58 | 60 | 58 |
| IT integration | 29 | 34 | 30 | 25 | 25 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|-------------------------------------|------|
| E-Participation | 29 | Opportunities and threats | 41 | E-Government | 35 |
| Internet retailing | 36 | World robots distribution | 31 | Public-private partnerships | 37 |
| Tablet possession | 28 | ▷ Agility of companies | 56 | Cyber security | 47 |
| Smartphone possession | 24 | ▷ Use of big data and analytics | 52 | Software piracy | 28 |
| Attitudes toward globalization | 26 | Knowledge transfer | 42 | Government cyber security capacity | 17 |
| | | Entrepreneurial fear of failure | 45 | ► Privacy protection by law content | 01 |

QATAR

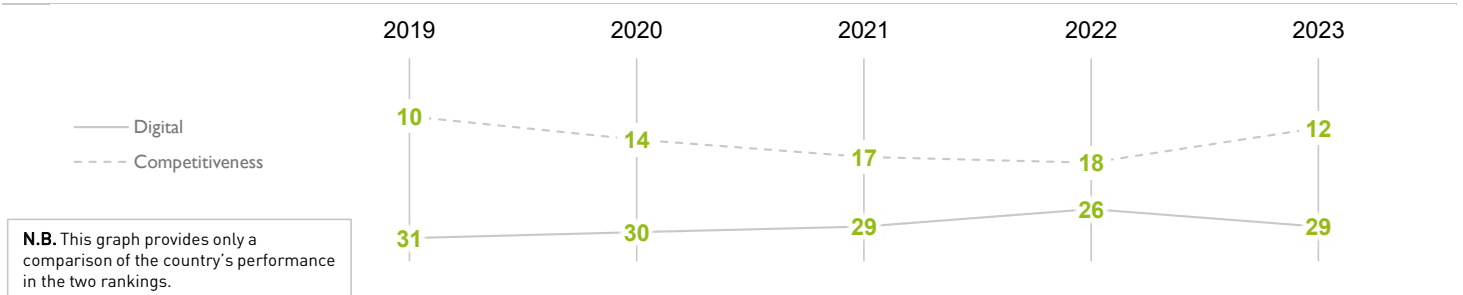
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 31 | 30 | 29 | 26 | 29 |
| Knowledge | 45 | 45 | 44 | 38 | 38 |
| Technology | 33 | 25 | 19 | 17 | 16 |
| Future readiness | 22 | 24 | 23 | 23 | 26 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



QATAR

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 15 | 15 | 19 | 11 | 10 |
| Training & education | 48 | 53 | 54 | 45 | 51 |
| Scientific concentration | 61 | 60 | 59 | 59 | 60 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 48 |
| International experience | 06 |
| Foreign highly skilled personnel | 05 |
| Management of cities | 05 |
| Digital/Technological skills | 07 |
| Net flow of international students | 22 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 22 |
| ▷ Total public expenditure on education | 61 |
| Higher education achievement | 51 |
| Pupil-teacher ratio (tertiary education) | 34 |
| Graduates in Sciences | 42 |
| Women with degrees | - |

| Scientific concentration | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 46 |
| Total R&D personnel per capita | 48 |
| Female researchers | 37 |
| R&D productivity by publication | 51 |
| Scientific and technical employment | 51 |
| High-tech patent grants | 10 |
| Robots in Education and R&D | 52 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 28 | 29 | 27 | 27 | 23 |
| Capital | 23 | 19 | 24 | 21 | 22 |
| Technological framework | 38 | 31 | 16 | 15 | 18 |

| Regulatory framework | Rank |
|------------------------------------|------|
| Starting a business | 46 |
| ▷ Enforcing contracts | 55 |
| Immigration laws | 08 |
| Development & application of tech. | 05 |
| Scientific research legislation | 15 |
| Intellectual property rights | 19 |

| Capital | Rank |
|----------------------------------------|------|
| IT & media stock market capitalization | 37 |
| Funding for technological development | 06 |
| Banking and financial services | 03 |
| Country credit rating | 22 |
| Venture capital | 13 |
| Investment in Telecommunications | 52 |

| Technological framework | Rank |
|--------------------------------|------|
| Communications technology | 09 |
| ▷ Mobile broadband subscribers | 03 |
| Wireless broadband | 08 |
| ▷ Internet users | 02 |
| Internet bandwidth speed | 39 |
| ▷ High-tech exports (%) | 59 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 18 | 27 | 26 | 29 | 33 |
| Business agility | 12 | 17 | 17 | 14 | 11 |
| IT integration | 27 | 28 | 28 | 28 | 27 |

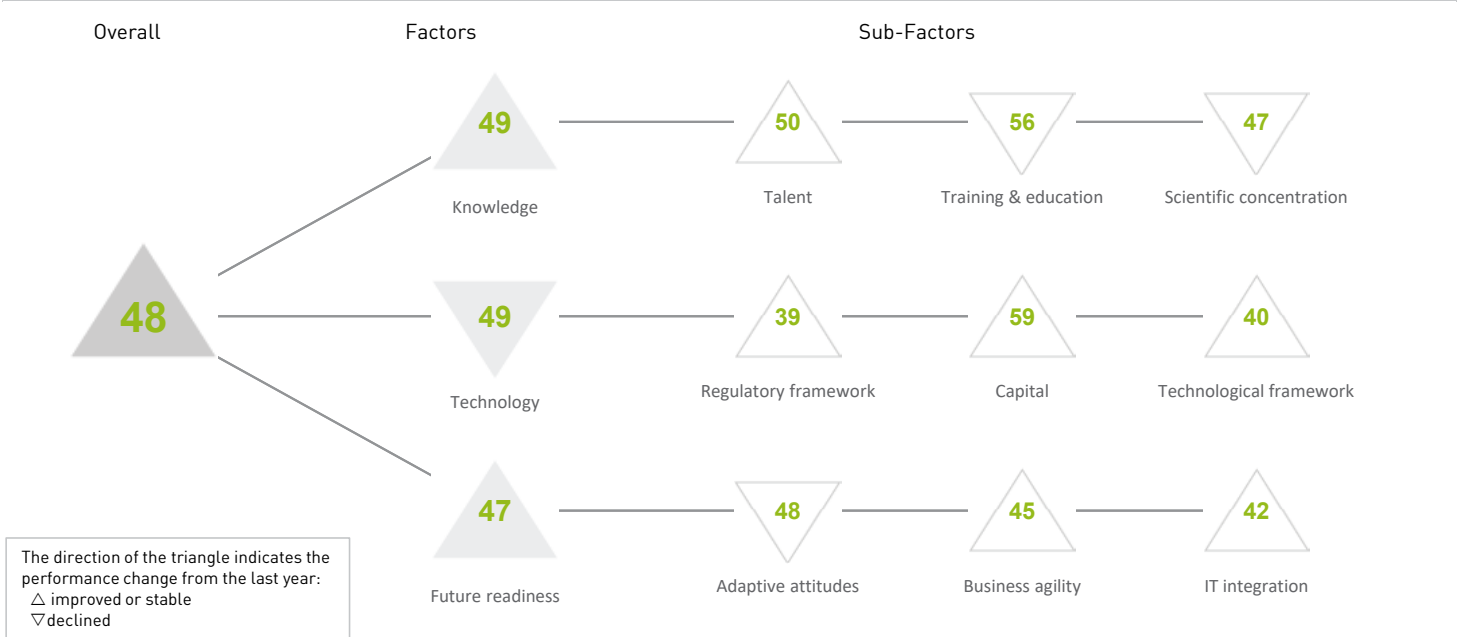
| Adaptive attitudes | Rank |
|--------------------------------|------|
| ▷ E-Participation | 60 |
| Internet retailing | 53 |
| Tablet possession | 05 |
| Smartphone possession | 04 |
| Attitudes toward globalization | 18 |

| Business agility | Rank |
|---------------------------------|------|
| Opportunities and threats | 11 |
| World robots distribution | 55 |
| Agility of companies | 15 |
| ▷ Use of big data and analytics | 03 |
| Knowledge transfer | 06 |
| Entrepreneurial fear of failure | 14 |

| IT integration | Rank |
|------------------------------------|------|
| ▷ E-Government | 57 |
| ▷ Public-private partnerships | 02 |
| ▷ Cyber security | 01 |
| Software piracy | 38 |
| Government cyber security capacity | 13 |
| Privacy protection by law content | 47 |

ROMANIA

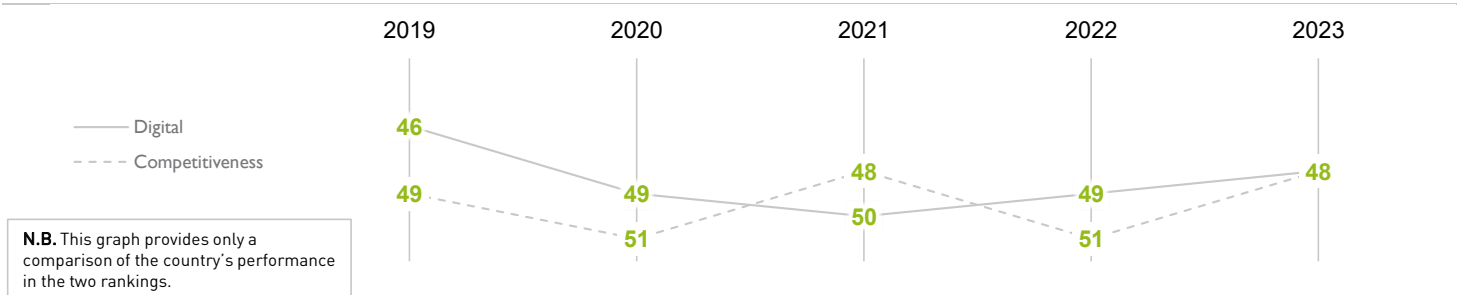
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 46 | 49 | 50 | 49 | 48 |
| Knowledge | 47 | 53 | 52 | 49 | 49 |
| Technology | 45 | 48 | 47 | 48 | 49 |
| Future readiness | 51 | 49 | 49 | 51 | 47 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



ROMANIA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 48 | 51 | 50 | 51 | 50 |
| Training & education | 51 | 54 | 59 | 55 | 56 |
| Scientific concentration | 38 | 39 | 43 | 44 | 47 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 44 | Employee training | 42 | Total expenditure on R&D (%) | 50 |
| International experience | 41 | ▷ Total public expenditure on education | 56 | Total R&D personnel per capita | 47 |
| Foreign highly skilled personnel | 48 | ▷ Higher education achievement | 55 | ► Female researchers | 11 |
| Management of cities | 54 | Pupil-teacher ratio (tertiary education) | 48 | R&D productivity by publication | 22 |
| Digital/Technological skills | 35 | ► Graduates in Sciences | 11 | Scientific and technical employment | 48 |
| Net flow of international students | 39 | Women with degrees | 52 | High-tech patent grants | 36 |
| | | | | Robots in Education and R&D | 37 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 41 | 43 | 40 | 39 | 39 |
| Capital | 59 | 61 | 61 | 61 | 59 |
| Technological framework | 36 | 37 | 40 | 41 | 40 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|--------------------------------|------|
| Starting a business | 39 | IT & media stock market capitalization | 53 | Communications technology | 34 |
| ► Enforcing contracts | 18 | Funding for technological development | 48 | ▷ Mobile broadband subscribers | 56 |
| Immigration laws | 27 | ▷ Banking and financial services | 57 | Wireless broadband | 40 |
| Development & application of tech. | 46 | Country credit rating | 53 | Internet users | 49 |
| Scientific research legislation | 51 | Venture capital | 49 | ► Internet bandwidth speed | 04 |
| Intellectual property rights | 43 | Investment in Telecommunications | 54 | High-tech exports (%) | 36 |

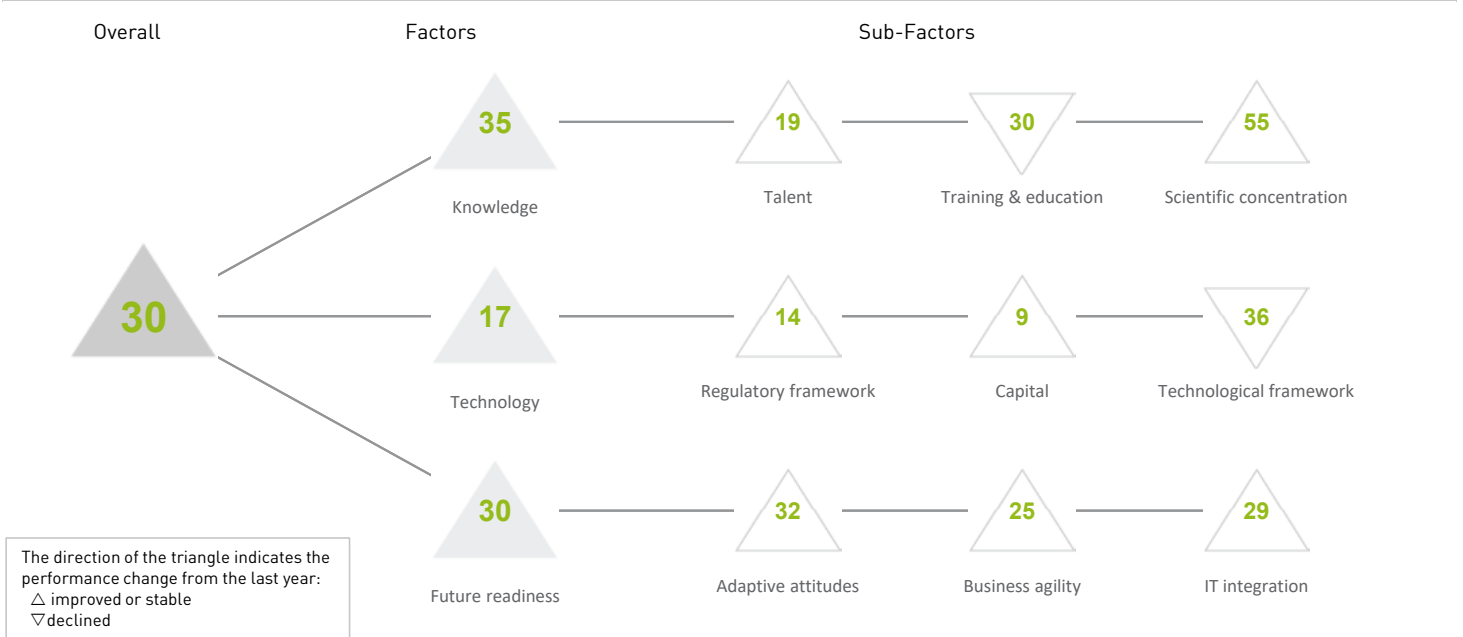
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 48 | 45 | 42 | 46 | 48 |
| Business agility | 46 | 53 | 57 | 59 | 45 |
| IT integration | 55 | 54 | 50 | 42 | 42 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | 46 | Opportunities and threats | 44 | E-Government | 49 |
| Internet retailing | 43 | World robots distribution | 35 | ▷ Public-private partnerships | 58 |
| Tablet possession | 33 | Agility of companies | 41 | Cyber security | 28 |
| Smartphone possession | 43 | Use of big data and analytics | 37 | Software piracy | 52 |
| Attitudes toward globalization | 55 | Knowledge transfer | 40 | ► Government cyber security capacity | 14 |
| | | Entrepreneurial fear of failure | 37 | Privacy protection by law content | 38 |

SAUDI ARABIA

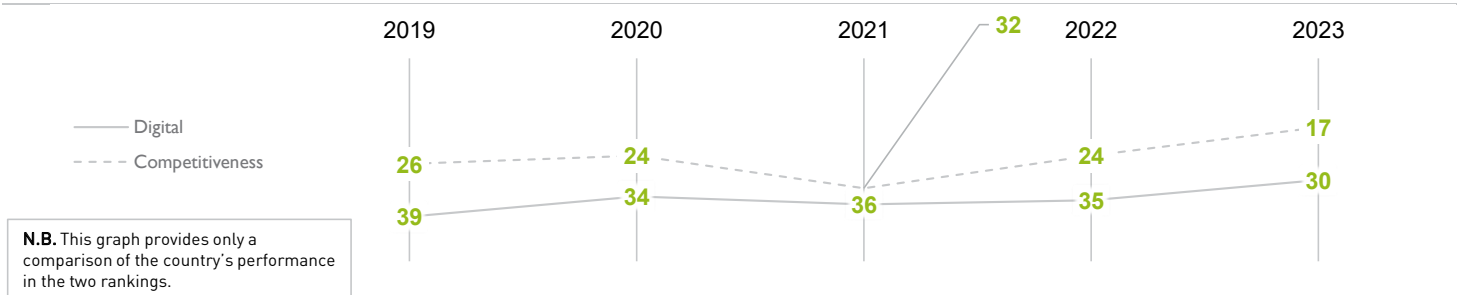
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

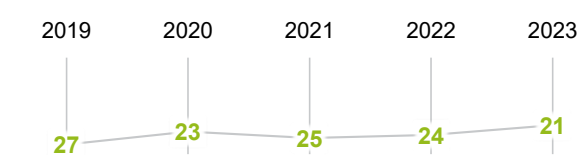
| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 39 | 34 | 36 | 35 | 30 |
| Knowledge | 39 | 46 | 50 | 37 | 35 |
| Technology | 40 | 24 | 24 | 26 | 17 |
| Future readiness | 38 | 28 | 32 | 37 | 30 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (27 countries)



SAUDI ARABIA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 20 | 34 | 32 | 28 | 19 |
| Training & education | 38 | 34 | 34 | 24 | 30 |
| Scientific concentration | 59 | 62 | 64 | 58 | 55 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|---------------------------------------|------|
| ▶ Educational assessment PISA - Math | 56 | Employee training | 21 | Total expenditure on R&D (%) | 51 |
| International experience | 07 | Total public expenditure on education | 11 | Total R&D personnel per capita | 50 |
| Foreign highly skilled personnel | 11 | Higher education achievement | 32 | Female researchers | 16 |
| Management of cities | 14 | Pupil-teacher ratio (tertiary education) | 41 | R&D productivity by publication | 13 |
| Digital/Technological skills | 06 | Graduates in Sciences | 31 | ▷ Scientific and technical employment | 55 |
| Net flow of international students | 36 | Women with degrees | 33 | High-tech patent grants | 38 |
| | | | | ▷ Robots in Education and R&D | 54 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 39 | 25 | 30 | 25 | 14 |
| Capital | 13 | 05 | 15 | 22 | 09 |
| Technological framework | 54 | 47 | 35 | 34 | 36 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|--------------------------------------|------|-----------------------------------------|------|------------------------------|------|
| Starting a business | 22 | IT & media stock market capitalization | 49 | Communications technology | 12 |
| Enforcing contracts | 36 | ▶ Funding for technological development | 01 | Mobile broadband subscribers | 30 |
| Immigration laws | 26 | Banking and financial services | 11 | Wireless broadband | 23 |
| ▶ Development & application of tech. | 02 | Country credit rating | 28 | Internet users | 11 |
| Scientific research legislation | 10 | ▶ Venture capital | 03 | Internet bandwidth speed | 42 |
| Intellectual property rights | 22 | Investment in Telecommunications | 19 | ▷ High-tech exports (%) | 62 |

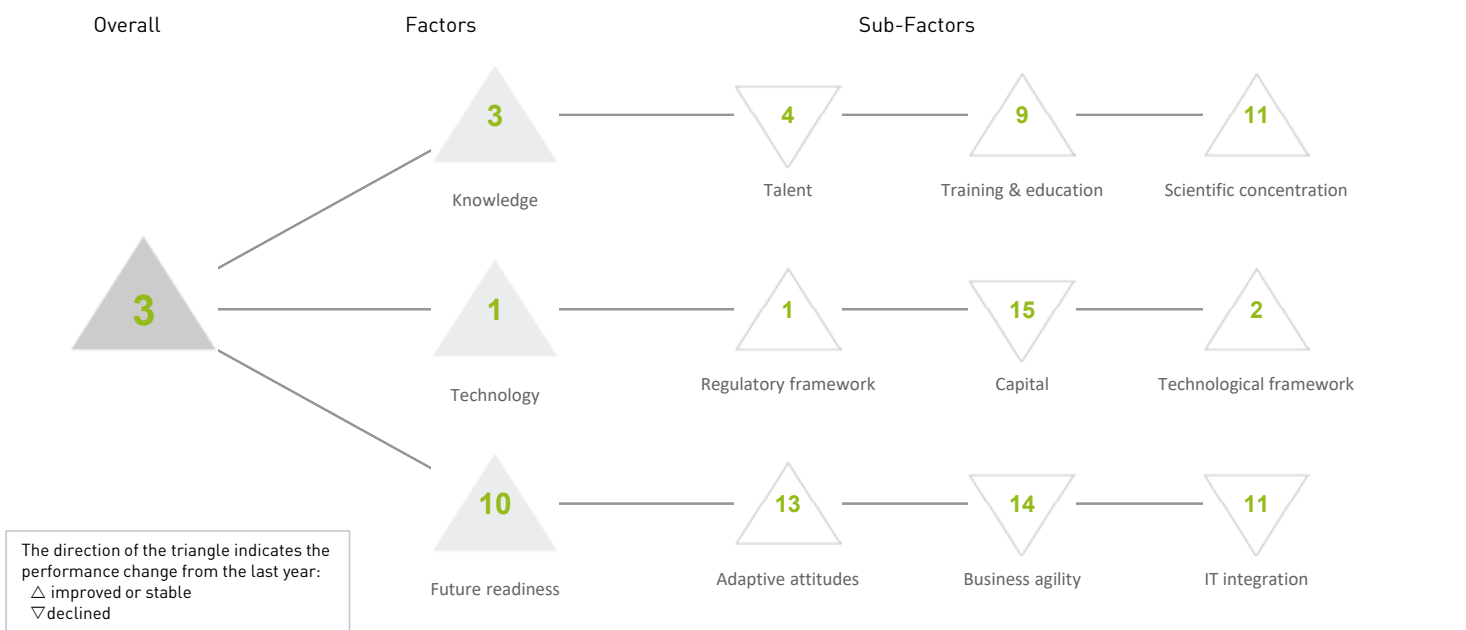
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 50 | 37 | 46 | 33 | 32 |
| Business agility | 36 | 28 | 35 | 32 | 25 |
| IT integration | 30 | 24 | 24 | 33 | 29 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|-------------------------------------|------|
| E-Participation | 39 | Opportunities and threats | 13 | E-Government | 29 |
| Internet retailing | 51 | World robots distribution | 51 | ▶ Public-private partnerships | 01 |
| Tablet possession | 47 | Agility of companies | 13 | ▶ Cyber security | 02 |
| Smartphone possession | 03 | Use of big data and analytics | 07 | Software piracy | 38 |
| Attitudes toward globalization | 17 | Knowledge transfer | 17 | Government cyber security capacity | 22 |
| | | Entrepreneurial fear of failure | 47 | ▷ Privacy protection by law content | 62 |

SINGAPORE

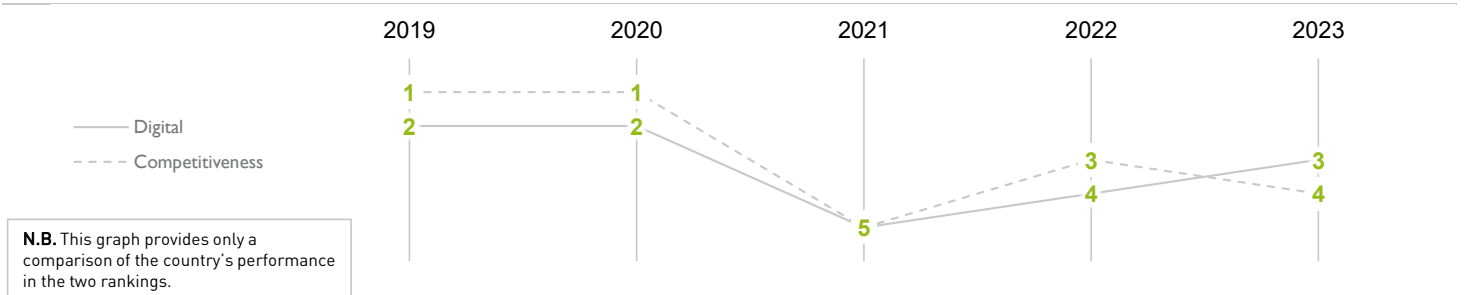
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

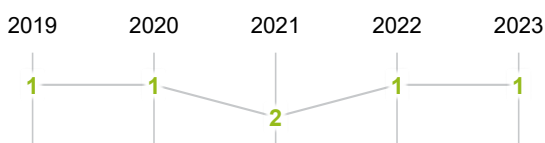
| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 02 | 02 | 05 | 04 | 03 |
| Knowledge | 03 | 02 | 04 | 05 | 03 |
| Technology | 01 | 01 | 03 | 01 | 01 |
| Future readiness | 11 | 12 | 11 | 10 | 10 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS < 20 MILLION (37 countries)



SINGAPORE

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 01 | 01 | 02 | 03 | 04 |
| Training & education | 04 | 07 | 13 | 09 | 09 |
| Scientific concentration | 22 | 10 | 11 | 11 | 11 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 02 |
| International experience | 11 |
| Foreign highly skilled personnel | 06 |
| Management of cities | 06 |
| Digital/Technological skills | 12 |
| Net flow of international students | 07 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 27 |
| ▷ Total public expenditure on education | 62 |
| ► Higher education achievement | 02 |
| Pupil-teacher ratio (tertiary education) | 26 |
| Graduates in Sciences | 03 |
| Women with degrees | - |

| Scientific concentration | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 18 |
| Total R&D personnel per capita | 15 |
| ▷ Female researchers | 45 |
| R&D productivity by publication | 42 |
| Scientific and technical employment | 22 |
| ► High-tech patent grants | 01 |
| Robots in Education and R&D | 30 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 02 | 01 | 05 | 01 | 01 |
| Capital | 08 | 11 | 14 | 11 | 15 |
| Technological framework | 01 | 01 | 02 | 02 | 02 |

| Regulatory framework | Rank |
|------------------------------------|------|
| Starting a business | 03 |
| ► Enforcing contracts | 01 |
| ▷ Immigration laws | 49 |
| Development & application of tech. | 11 |
| Scientific research legislation | 08 |
| Intellectual property rights | 09 |

| Capital | Rank |
|----------------------------------------|------|
| IT & media stock market capitalization | 28 |
| Funding for technological development | 04 |
| Banking and financial services | 06 |
| ► Country credit rating | 01 |
| Venture capital | 10 |
| ▷ Investment in Telecommunications | 58 |

| Technological framework | Rank |
|------------------------------|------|
| Communications technology | 23 |
| Mobile broadband subscribers | 22 |
| Wireless broadband | 06 |
| Internet users | 25 |
| ► Internet bandwidth speed | 01 |
| High-tech exports (%) | 03 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 19 | 20 | 11 | 17 | 13 |
| Business agility | 06 | 11 | 12 | 09 | 14 |
| IT integration | 04 | 03 | 07 | 08 | 11 |

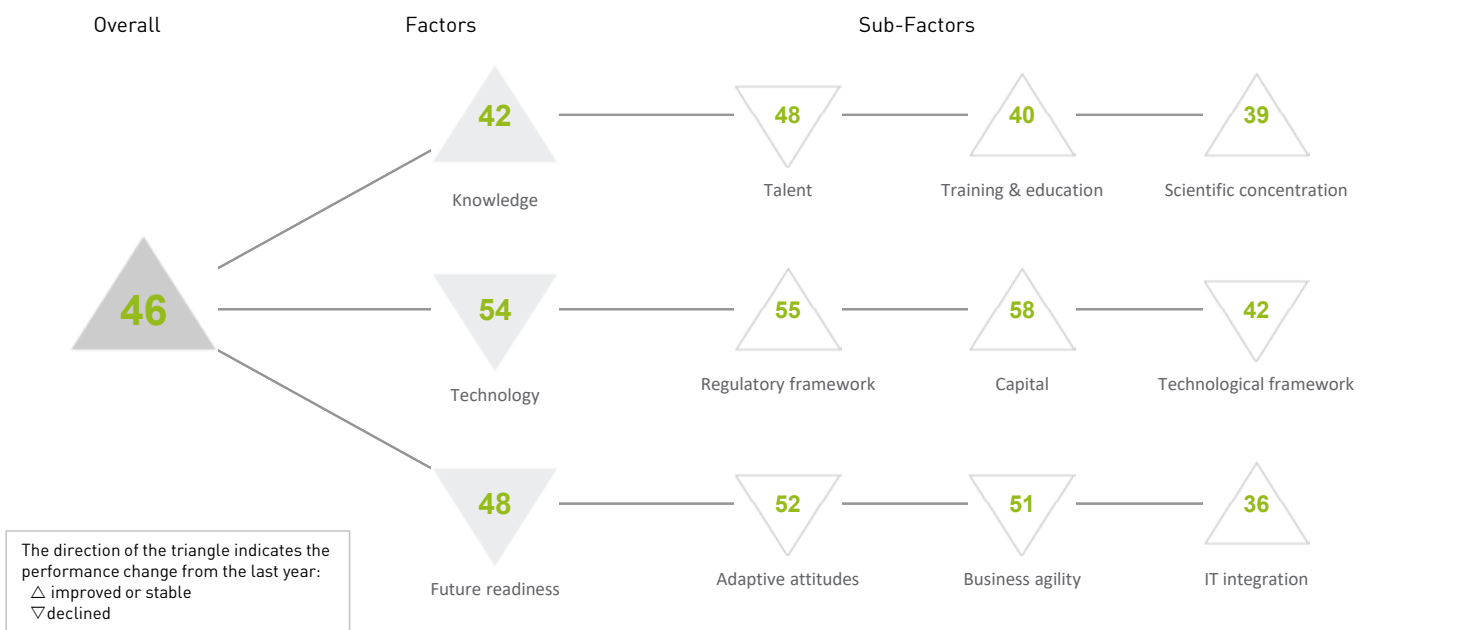
| Adaptive attitudes | Rank |
|--------------------------------|------|
| E-Participation | 03 |
| Internet retailing | 24 |
| Tablet possession | 15 |
| Smartphone possession | 38 |
| Attitudes toward globalization | 13 |

| Business agility | Rank |
|---------------------------------|------|
| Opportunities and threats | 16 |
| World robots distribution | 14 |
| Agility of companies | 24 |
| Use of big data and analytics | 11 |
| Knowledge transfer | 05 |
| Entrepreneurial fear of failure | - |

| IT integration | Rank |
|-------------------------------------|------|
| E-Government | 12 |
| Public-private partnerships | 08 |
| Cyber security | 08 |
| Software piracy | 17 |
| Government cyber security capacity | 10 |
| ▷ Privacy protection by law content | 50 |

SLOVAK REPUBLIC

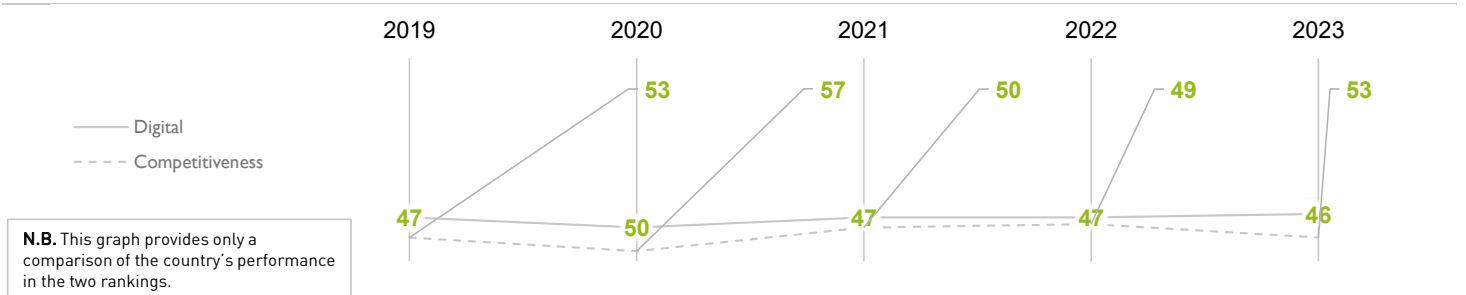
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 47 | 50 | 47 | 47 | 46 |
| Knowledge | 48 | 51 | 46 | 44 | 42 |
| Technology | 44 | 51 | 45 | 53 | 54 |
| Future readiness | 47 | 51 | 46 | 45 | 48 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



SLOVAK REPUBLIC

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 54 | 53 | 52 | 44 | 48 |
| Training & education | 52 | 52 | 49 | 43 | 40 |
| Scientific concentration | 36 | 38 | 40 | 39 | 39 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 30 | Employee training | 41 | Total expenditure on R&D (%) | 42 |
| International experience | 53 | Total public expenditure on education | 43 | Total R&D personnel per capita | 37 |
| ▷ Foreign highly skilled personnel | 58 | Higher education achievement | 42 | ▶ Female researchers | 24 |
| Management of cities | 45 | ▶ Pupil-teacher ratio (tertiary education) | 17 | R&D productivity by publication | 39 |
| ▶ Digital/Technological skills | 24 | Graduates in Sciences | 37 | Scientific and technical employment | 42 |
| Net flow of international students | 57 | Women with degrees | 39 | High-tech patent grants | 26 |
| | | | | Robots in Education and R&D | 32 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 58 | 61 | 60 | 58 | 55 |
| Capital | 43 | 47 | 42 | 58 | 58 |
| Technological framework | 37 | 38 | 39 | 40 | 42 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|------------------------------------------|------|------------------------------|------|
| Starting a business | 49 | ▷ IT & media stock market capitalization | 57 | Communications technology | 32 |
| Enforcing contracts | 34 | Funding for technological development | 57 | Mobile broadband subscribers | 36 |
| ▷ Immigration laws | 60 | Banking and financial services | 44 | Wireless broadband | 42 |
| Development & application of tech. | 56 | Country credit rating | 33 | Internet users | 32 |
| Scientific research legislation | 57 | Venture capital | 56 | Internet bandwidth speed | 45 |
| Intellectual property rights | 55 | Investment in Telecommunications | 28 | High-tech exports (%) | 44 |

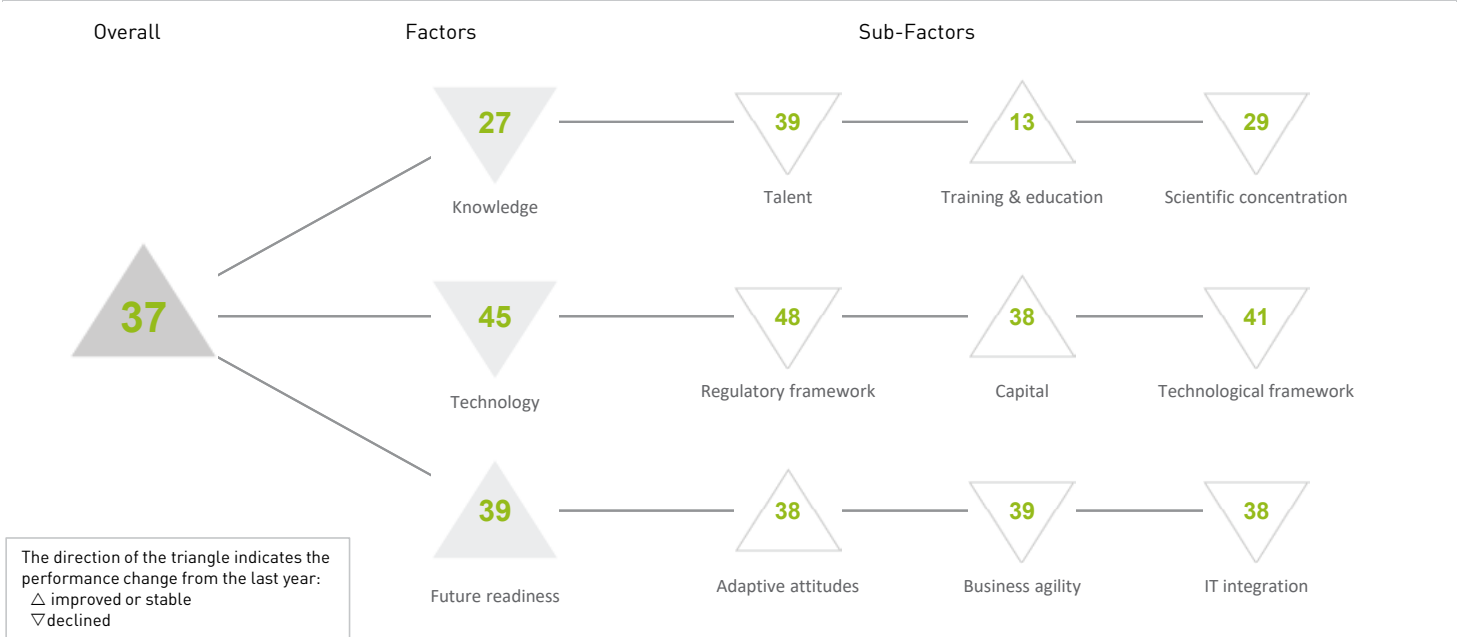
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 42 | 50 | 49 | 50 | 52 |
| Business agility | 61 | 62 | 60 | 50 | 51 |
| IT integration | 40 | 44 | 40 | 39 | 36 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|----------------------------------|------|---------------------------------|------|-------------------------------------|------|
| E-Participation | 57 | Opportunities and threats | 57 | E-Government | 41 |
| Internet retailing | 34 | World robots distribution | 28 | Public-private partnerships | 51 |
| Tablet possession | 26 | Agility of companies | 37 | ▶ Cyber security | 25 |
| Smartphone possession | 33 | Use of big data and analytics | 28 | Software piracy | 26 |
| ▷ Attitudes toward globalization | 60 | ▷ Knowledge transfer | 59 | Government cyber security capacity | 55 |
| | | Entrepreneurial fear of failure | 30 | ▶ Privacy protection by law content | 19 |

SLOVENIA

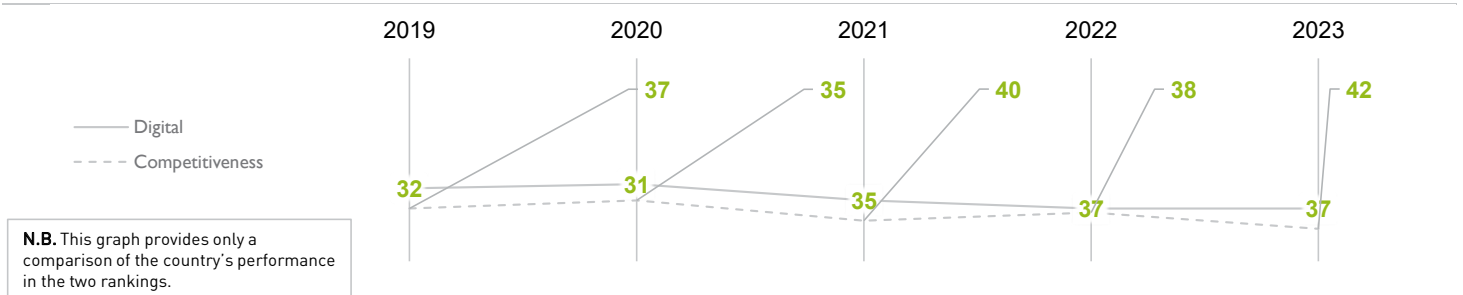
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 32 | 31 | 35 | 37 | 37 |
| Knowledge | 27 | 29 | 30 | 26 | 27 |
| Technology | 35 | 35 | 39 | 38 | 45 |
| Future readiness | 36 | 37 | 40 | 41 | 39 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



SLOVENIA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 33 | 35 | 37 | 38 | 39 |
| Training & education | 22 | 22 | 23 | 18 | 13 |
| Scientific concentration | 25 | 33 | 31 | 28 | 29 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|--------------------------------------------|------|---------------------------------------|------|
| ► Educational assessment PISA - Math | 13 | Employee training | 29 | Total expenditure on R&D (%) | 19 |
| International experience | 48 | Total public expenditure on education | 15 | Total R&D personnel per capita | 16 |
| ▷ Foreign highly skilled personnel | 59 | Higher education achievement | 27 | Female researchers | 38 |
| Management of cities | 33 | ► Pupil-teacher ratio (tertiary education) | 10 | ▷ R&D productivity by publication | 55 |
| Digital/Technological skills | 28 | ► Graduates in Sciences | 12 | ► Scientific and technical employment | 10 |
| Net flow of international students | 29 | Women with degrees | 25 | High-tech patent grants | 35 |
| | | | | Robots in Education and R&D | 33 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 37 | 38 | 45 | 43 | 48 |
| Capital | 31 | 28 | 39 | 38 | 38 |
| Technological framework | 33 | 34 | 33 | 35 | 41 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 24 | IT & media stock market capitalization | 45 | Communications technology | 37 |
| ▷ Enforcing contracts | 54 | Funding for technological development | 42 | Mobile broadband subscribers | 27 |
| ▷ Immigration laws | 58 | Banking and financial services | 43 | Wireless broadband | 39 |
| Development & application of tech. | 47 | Country credit rating | 31 | Internet users | 41 |
| Scientific research legislation | 36 | Venture capital | 50 | Internet bandwidth speed | 40 |
| Intellectual property rights | 37 | ► Investment in Telecommunications | 08 | High-tech exports (%) | 50 |

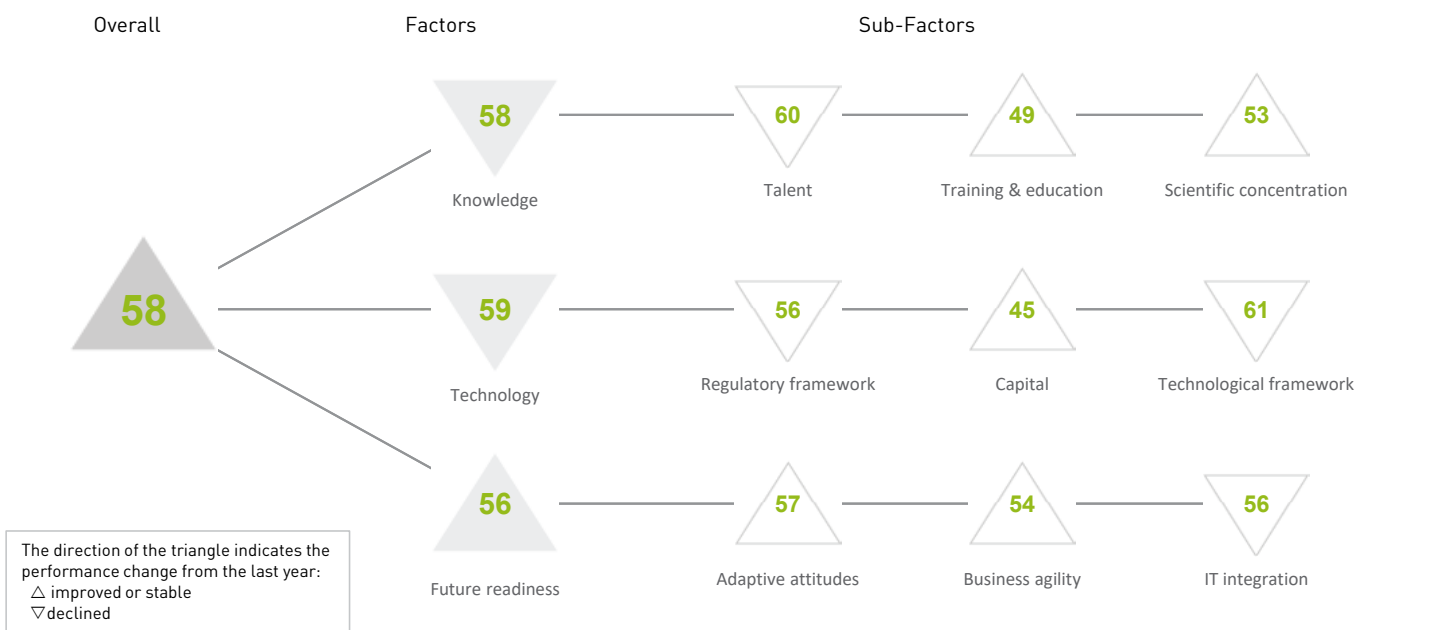
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 44 | 38 | 41 | 45 | 38 |
| Business agility | 34 | 31 | 40 | 33 | 39 |
| IT integration | 31 | 31 | 35 | 37 | 38 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | 22 | Opportunities and threats | 33 | E-Government | 20 |
| Internet retailing | 35 | World robots distribution | 33 | Public-private partnerships | 53 |
| Tablet possession | 22 | Agility of companies | 32 | Cyber security | 29 |
| Smartphone possession | 48 | Use of big data and analytics | 40 | Software piracy | 30 |
| Attitudes toward globalization | 51 | Knowledge transfer | 50 | ▷ Government cyber security capacity | 61 |
| | | Entrepreneurial fear of failure | 19 | Privacy protection by law content | 17 |

SOUTH AFRICA

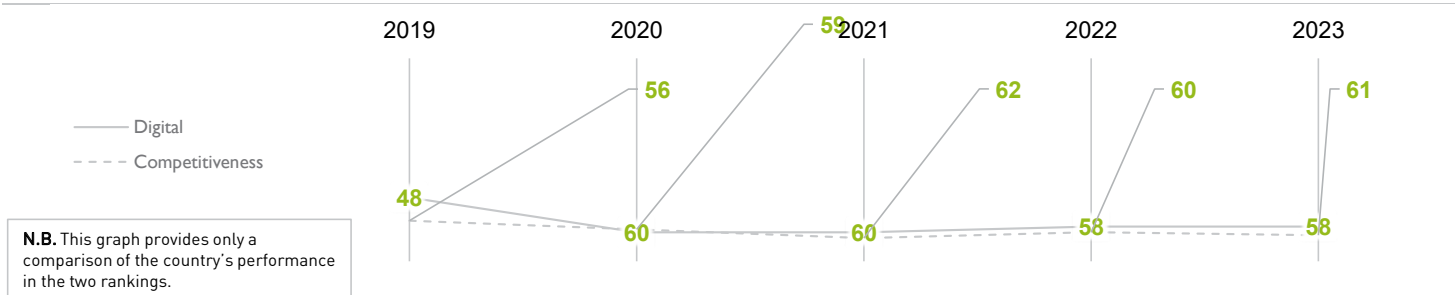
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 48 | 60 | 60 | 58 | 58 |
| Knowledge | 54 | 60 | 62 | 54 | 58 |
| Technology | 51 | 55 | 59 | 58 | 59 |
| Future readiness | 44 | 57 | 59 | 59 | 56 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (27 countries)



SOUTH AFRICA

▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 49 | 59 | 58 | 57 | 60 |
| Training & education | 58 | 60 | 62 | 50 | 49 |
| Scientific concentration | 48 | 53 | 53 | 53 | 53 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | - | Employee training | 54 | Total expenditure on R&D (%) | 48 |
| International experience | 58 | ▶ Total public expenditure on education | 02 | Total R&D personnel per capita | 53 |
| Foreign highly skilled personnel | 53 | Higher education achievement | 60 | ▶ Female researchers | 15 |
| ▷ Management of cities | 62 | Pupil-teacher ratio (tertiary education) | 40 | ▶ R&D productivity by publication | 20 |
| Digital/Technological skills | 57 | Graduates in Sciences | 56 | Scientific and technical employment | - |
| Net flow of international students | 35 | Women with degrees | 55 | High-tech patent grants | 55 |
| | | | | Robots in Education and R&D | 45 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 53 | 56 | 59 | 53 | 56 |
| Capital | 30 | 32 | 36 | 51 | 45 |
| Technological framework | 59 | 57 | 61 | 60 | 61 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|------------------------------------------|------|--------------------------------|------|
| Starting a business | 59 | ▶ IT & media stock market capitalization | 05 | Communications technology | 57 |
| Enforcing contracts | 51 | Funding for technological development | 58 | ▷ Mobile broadband subscribers | 62 |
| ▷ Immigration laws | 61 | Banking and financial services | 53 | Wireless broadband | 37 |
| Development & application of tech. | 55 | Country credit rating | 57 | ▷ Internet users | 62 |
| Scientific research legislation | 43 | Venture capital | 59 | Internet bandwidth speed | 59 |
| Intellectual property rights | 47 | ▶ Investment in Telecommunications | 12 | High-tech exports (%) | 54 |

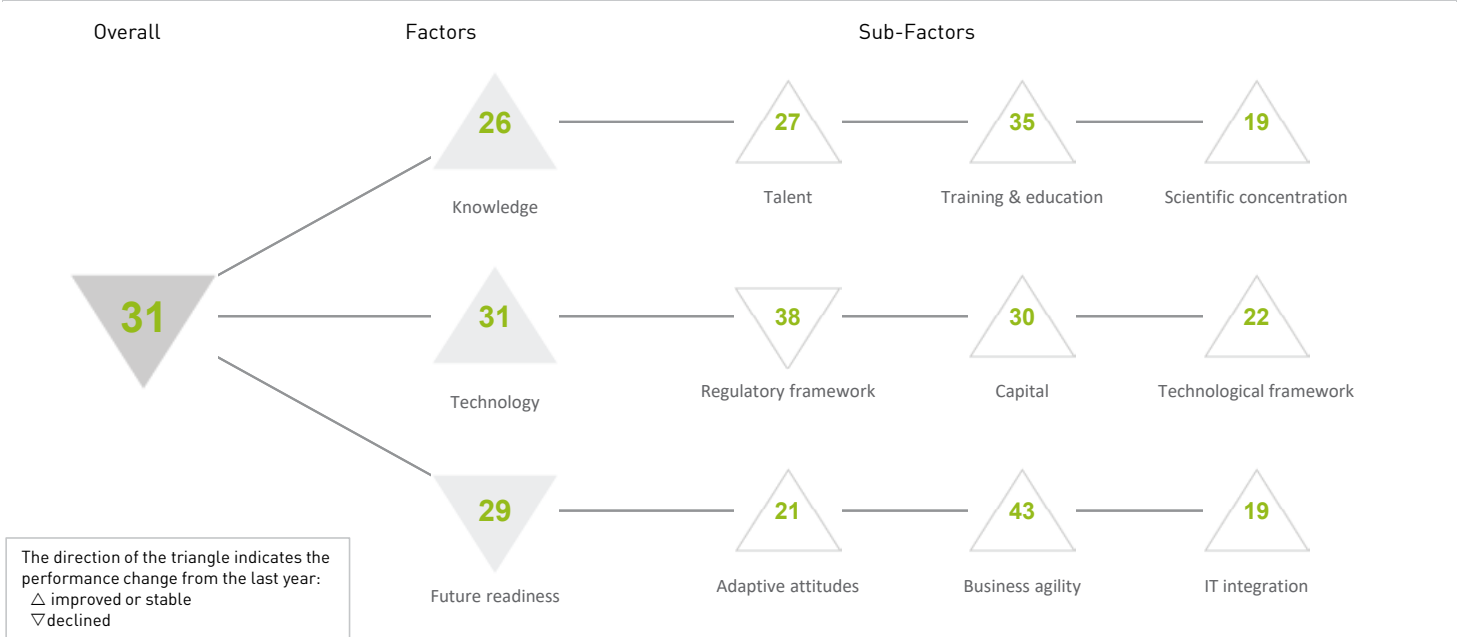
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 55 | 59 | 59 | 57 | 57 |
| Business agility | 40 | 58 | 59 | 57 | 54 |
| IT integration | 42 | 50 | 55 | 55 | 56 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 50 | Opportunities and threats | 36 | E-Government | 53 |
| Internet retailing | 57 | World robots distribution | 32 | ▷ Public-private partnerships | 62 |
| Tablet possession | 55 | Agility of companies | 47 | Cyber security | 55 |
| Smartphone possession | 28 | Use of big data and analytics | 33 | Software piracy | 20 |
| Attitudes toward globalization | 41 | Knowledge transfer | 56 | Government cyber security capacity | 47 |
| | | Entrepreneurial fear of failure | 46 | Privacy protection by law content | 49 |

SPAIN

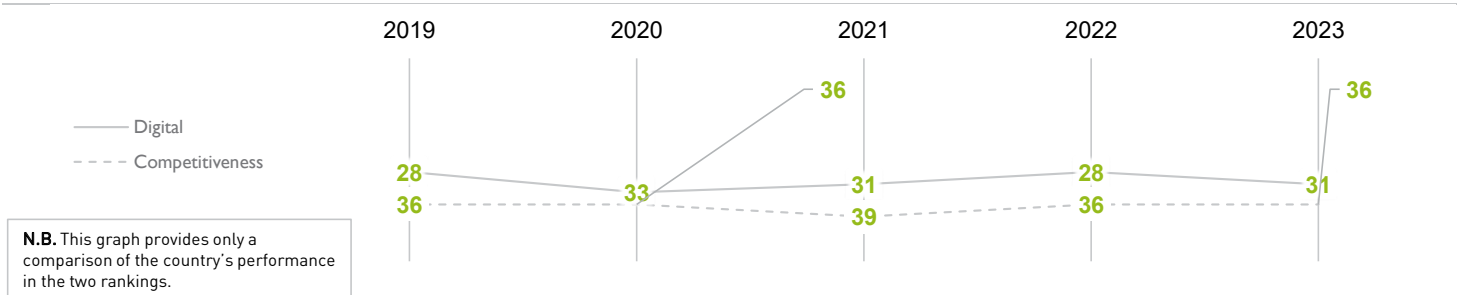
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 28 | 33 | 31 | 28 | 31 |
| Knowledge | 28 | 32 | 31 | 27 | 26 |
| Technology | 29 | 33 | 33 | 33 | 31 |
| Future readiness | 27 | 40 | 35 | 27 | 29 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (27 countries)



SPAIN

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 29 | 32 | 31 | 31 | 27 |
| Training & education | 40 | 42 | 40 | 35 | 35 |
| Scientific concentration | 20 | 20 | 23 | 20 | 19 |

Talent

| | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 32 |
| International experience | 31 |
| Foreign highly skilled personnel | 18 |
| Management of cities | 29 |
| Digital/Technological skills | 37 |
| Net flow of international students | 33 |

Training & education

| | Rank |
|------------------------------------------|------|
| Employee training | 40 |
| Total public expenditure on education | 38 |
| Higher education achievement | 26 |
| Pupil-teacher ratio (tertiary education) | 21 |
| ▷ Graduates in Sciences | 43 |
| Women with degrees | 27 |

Scientific concentration

| | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 31 |
| Total R&D personnel per capita | 31 |
| Female researchers | 23 |
| ► R&D productivity by publication | 08 |
| Scientific and technical employment | 24 |
| High-tech patent grants | 40 |
| ► Robots in Education and R&D | 07 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 34 | 36 | 37 | 35 | 38 |
| Capital | 33 | 34 | 34 | 31 | 30 |
| Technological framework | 23 | 27 | 24 | 28 | 22 |

Regulatory framework

| | Rank |
|------------------------------------|------|
| Starting a business | 41 |
| Enforcing contracts | 22 |
| Immigration laws | 30 |
| Development & application of tech. | 35 |
| ▷ Scientific research legislation | 54 |
| Intellectual property rights | 29 |

Capital

| | Rank |
|----------------------------------------|------|
| IT & media stock market capitalization | 21 |
| Funding for technological development | 39 |
| Banking and financial services | 33 |
| Country credit rating | 38 |
| Venture capital | 25 |
| Investment in Telecommunications | 24 |

Technological framework

| | Rank |
|------------------------------|------|
| Communications technology | 13 |
| Mobile broadband subscribers | 40 |
| Wireless broadband | 34 |
| Internet users | 18 |
| ► Internet bandwidth speed | 07 |
| ▷ High-tech exports (%) | 43 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 25 | 35 | 33 | 25 | 21 |
| Business agility | 38 | 48 | 49 | 44 | 43 |
| IT integration | 25 | 30 | 29 | 20 | 19 |

Adaptive attitudes

| | Rank |
|--------------------------------|------|
| E-Participation | 22 |
| Internet retailing | 30 |
| Tablet possession | 18 |
| ► Smartphone possession | 10 |
| Attitudes toward globalization | 34 |

Business agility

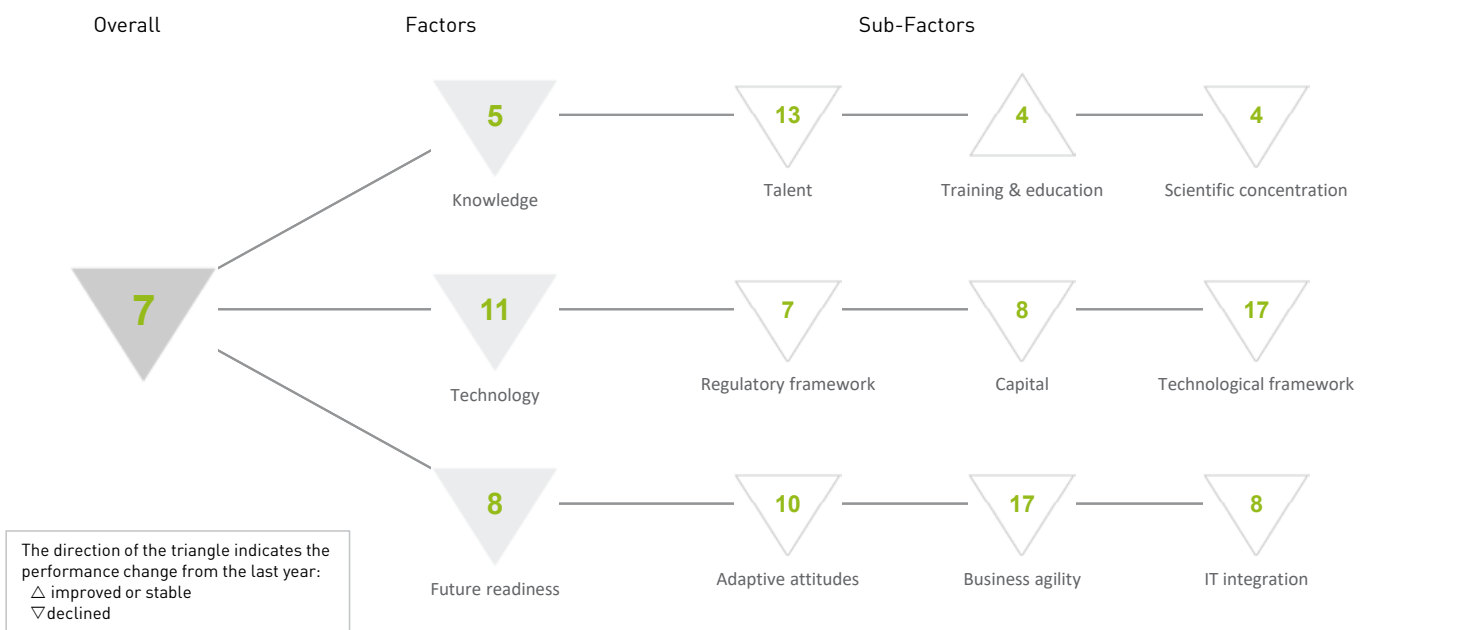
| | Rank |
|---------------------------------|------|
| Opportunities and threats | 34 |
| ► World robots distribution | 10 |
| Agility of companies | 34 |
| ▷ Use of big data and analytics | 58 |
| ▷ Knowledge transfer | 44 |
| Entrepreneurial fear of failure | 42 |

IT integration

| | Rank |
|------------------------------------|------|
| E-Government | 17 |
| Public-private partnerships | 24 |
| Cyber security | 41 |
| Software piracy | 32 |
| Government cyber security capacity | 12 |
| Privacy protection by law content | 13 |

SWEDEN

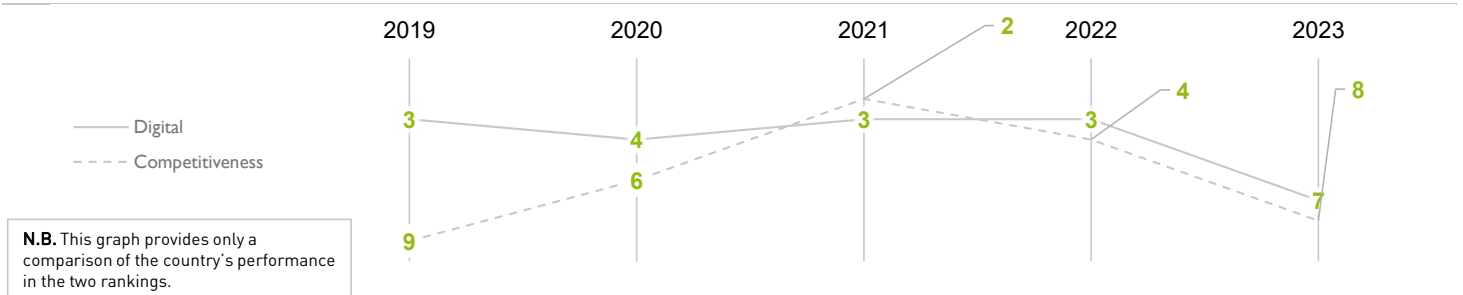
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 03 | 04 | 03 | 03 | 07 |
| Knowledge | 04 | 04 | 02 | 02 | 05 |
| Technology | 07 | 06 | 08 | 05 | 11 |
| Future readiness | 06 | 07 | 06 | 04 | 08 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



SWEDEN

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 08 | 09 | 07 | 06 | 13 |
| Training & education | 02 | 02 | 02 | 04 | 04 |
| Scientific concentration | 03 | 06 | 04 | 02 | 04 |

| Talent | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 16 |
| International experience | 14 |
| Foreign highly skilled personnel | 29 |
| Management of cities | 12 |
| Digital/Technological skills | 10 |
| Net flow of international students | 24 |

| Training & education | Rank |
|------------------------------------------|------|
| Employee training | 09 |
| Total public expenditure on education | 05 |
| Higher education achievement | 24 |
| Pupil-teacher ratio (tertiary education) | 20 |
| Graduates in Sciences | 19 |
| Women with degrees | 11 |

| Scientific concentration | Rank |
|---------------------------------------|------|
| ► Total expenditure on R&D (%) | 05 |
| Total R&D personnel per capita | 13 |
| ▷ Female researchers | 41 |
| ▷ R&D productivity by publication | 38 |
| ► Scientific and technical employment | 01 |
| High-tech patent grants | 08 |
| Robots in Education and R&D | 20 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 05 | 05 | 03 | 02 | 07 |
| Capital | 04 | 04 | 05 | 07 | 08 |
| Technological framework | 12 | 11 | 13 | 09 | 17 |

| Regulatory framework | Rank |
|--------------------------------------|------|
| Starting a business | 23 |
| Enforcing contracts | 30 |
| ▷ Immigration laws | 34 |
| ► Development & application of tech. | 04 |
| Scientific research legislation | 07 |
| Intellectual property rights | 06 |

| Capital | Rank |
|----------------------------------------|------|
| IT & media stock market capitalization | 24 |
| Funding for technological development | 11 |
| Banking and financial services | 10 |
| ► Country credit rating | 01 |
| Venture capital | 06 |
| ▷ Investment in Telecommunications | 49 |

| Technological framework | Rank |
|------------------------------|------|
| Communications technology | 16 |
| Mobile broadband subscribers | 16 |
| Wireless broadband | 29 |
| Internet users | 10 |
| Internet bandwidth speed | 20 |
| High-tech exports (%) | 31 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 08 | 08 | 05 | 07 | 10 |
| Business agility | 13 | 10 | 13 | 10 | 17 |
| IT integration | 12 | 04 | 05 | 04 | 08 |

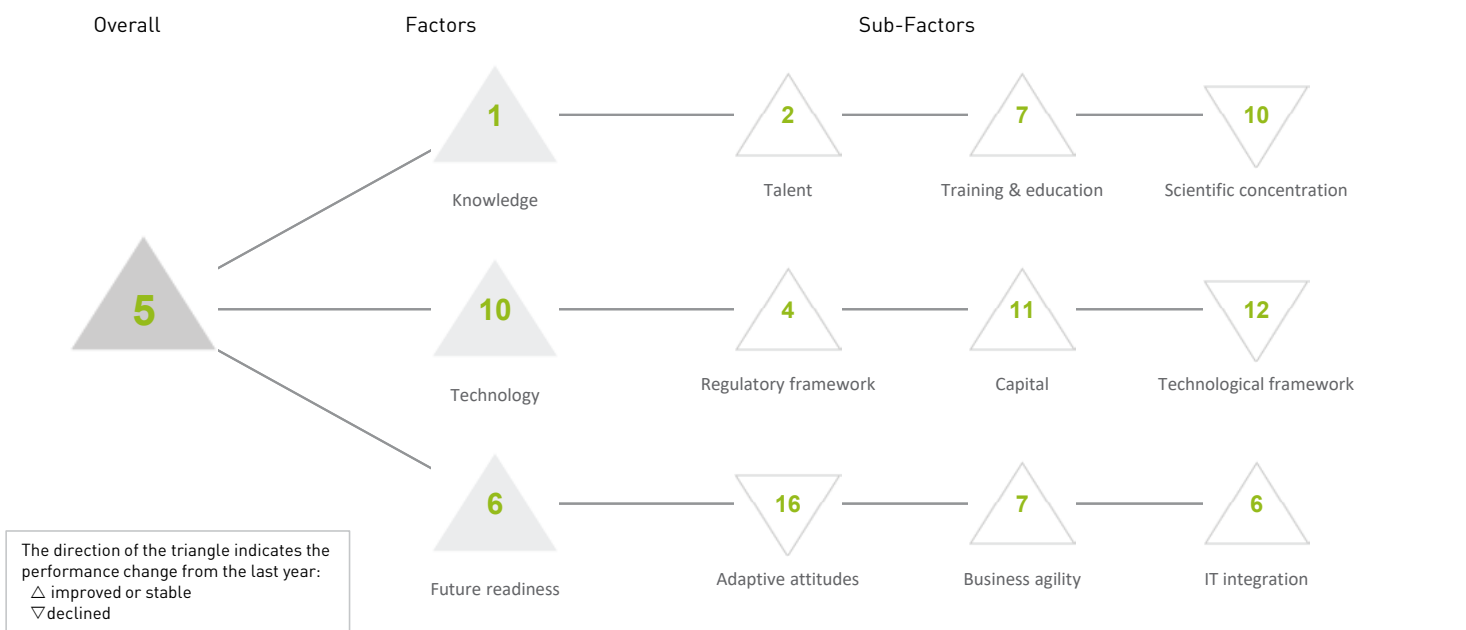
| Adaptive attitudes | Rank |
|--------------------------------|------|
| E-Participation | 29 |
| Internet retailing | 15 |
| ► Tablet possession | 01 |
| Smartphone possession | 41 |
| Attitudes toward globalization | 05 |

| Business agility | Rank |
|---------------------------------|------|
| Opportunities and threats | 32 |
| World robots distribution | 21 |
| Agility of companies | 11 |
| Use of big data and analytics | 09 |
| Knowledge transfer | 09 |
| Entrepreneurial fear of failure | 22 |

| IT integration | Rank |
|------------------------------------|------|
| E-Government | 05 |
| ▷ Public-private partnerships | 33 |
| Cyber security | 26 |
| Software piracy | 06 |
| Government cyber security capacity | 18 |
| Privacy protection by law content | 06 |

SWITZERLAND

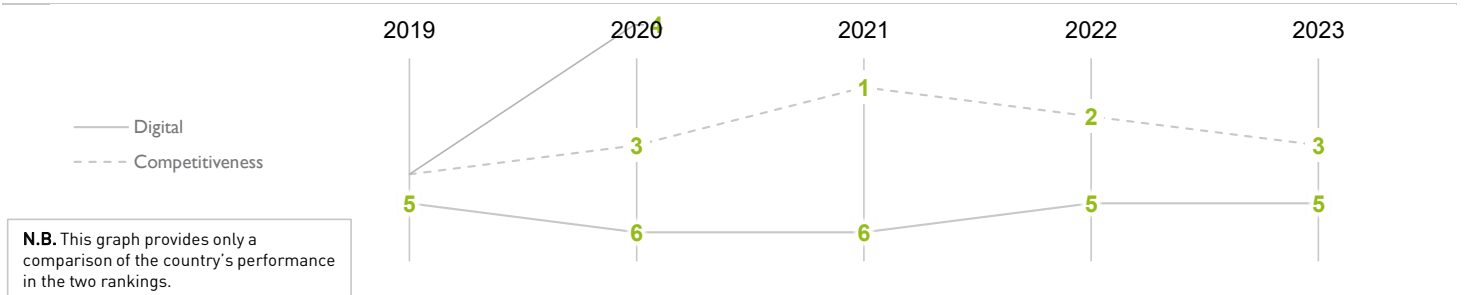
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 05 | 06 | 06 | 05 | 05 |
| Knowledge | 02 | 03 | 01 | 01 | 01 |
| Technology | 10 | 11 | 11 | 12 | 10 |
| Future readiness | 10 | 05 | 03 | 07 | 06 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



SWITZERLAND

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 02 | 02 | 03 | 02 | 02 |
| Training & education | 15 | 14 | 07 | 08 | 07 |
| Scientific concentration | 07 | 09 | 08 | 08 | 10 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 10 | Employee training | 04 | Total expenditure on R&D (%) | 08 |
| ► International experience | 01 | Total public expenditure on education | 14 | Total R&D personnel per capita | 08 |
| ► Foreign highly skilled personnel | 01 | Higher education achievement | 20 | Female researchers | 33 |
| Management of cities | 10 | Pupil-teacher ratio (tertiary education) | 06 | ▷ R&D productivity by publication | 35 |
| Digital/Technological skills | 16 | Graduates in Sciences | 27 | Scientific and technical employment | 06 |
| Net flow of international students | 09 | Women with degrees | 31 | High-tech patent grants | 24 |
| | | | | Robots in Education and R&D | 16 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 14 | 10 | 09 | 08 | 04 |
| Capital | 16 | 14 | 12 | 12 | 11 |
| Technological framework | 09 | 14 | 11 | 11 | 12 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|------------------------------------------|------|------------------------------|------|
| Starting a business | 36 | ▷ IT & media stock market capitalization | 50 | Communications technology | 07 |
| ▷ Enforcing contracts | 40 | Funding for technological development | 09 | Mobile broadband subscribers | 01 |
| Immigration laws | 16 | Banking and financial services | 08 | ▷ Wireless broadband | 47 |
| Development & application of tech. | 07 | Country credit rating | 01 | Internet users | 12 |
| ► Scientific research legislation | 01 | Venture capital | 18 | Internet bandwidth speed | 10 |
| ► Intellectual property rights | 01 | Investment in Telecommunications | 26 | High-tech exports (%) | 30 |

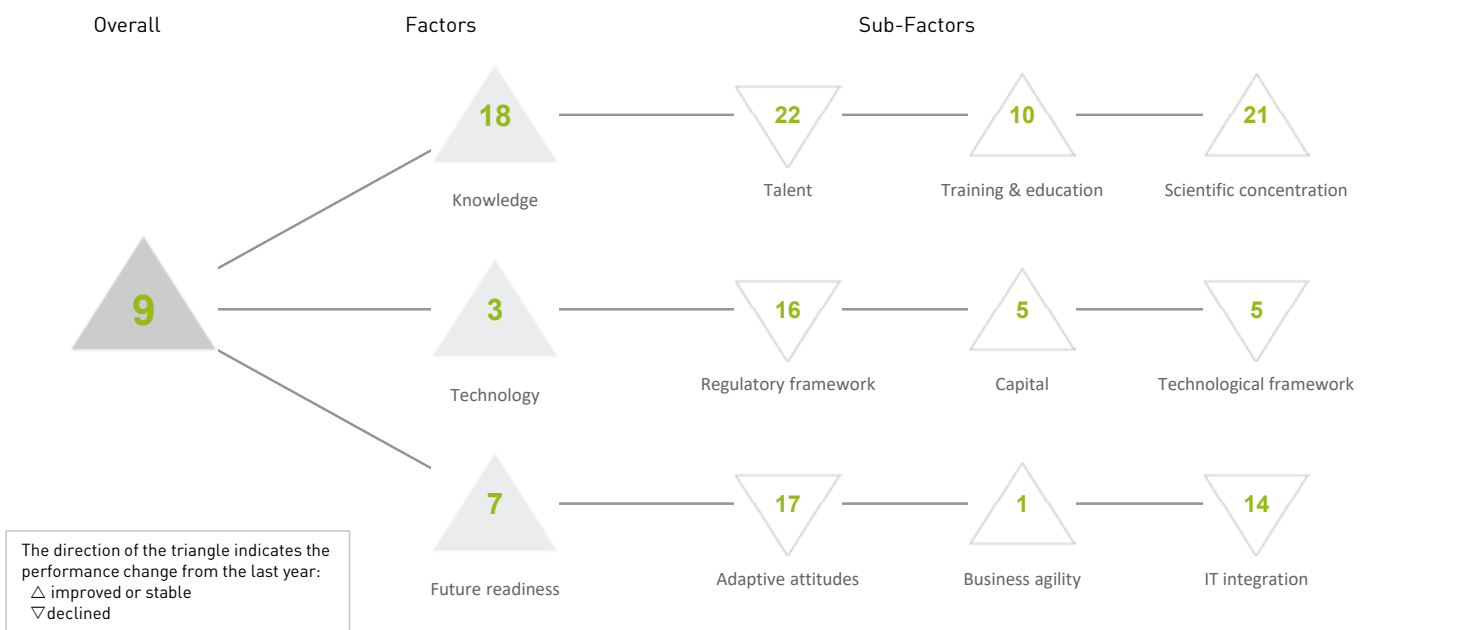
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 11 | 09 | 10 | 12 | 16 |
| Business agility | 14 | 06 | 04 | 07 | 07 |
| IT integration | 07 | 07 | 04 | 06 | 06 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| ▷ E-Participation | 38 | Opportunities and threats | 10 | E-Government | 22 |
| Internet retailing | 07 | World robots distribution | 24 | Public-private partnerships | 07 |
| Tablet possession | 07 | Agility of companies | 07 | Cyber security | 20 |
| Smartphone possession | 20 | Use of big data and analytics | 30 | Software piracy | 10 |
| Attitudes toward globalization | 21 | ► Knowledge transfer | 01 | Government cyber security capacity | 28 |
| | | Entrepreneurial fear of failure | 05 | Privacy protection by law content | 03 |

TAIWAN, CHINA

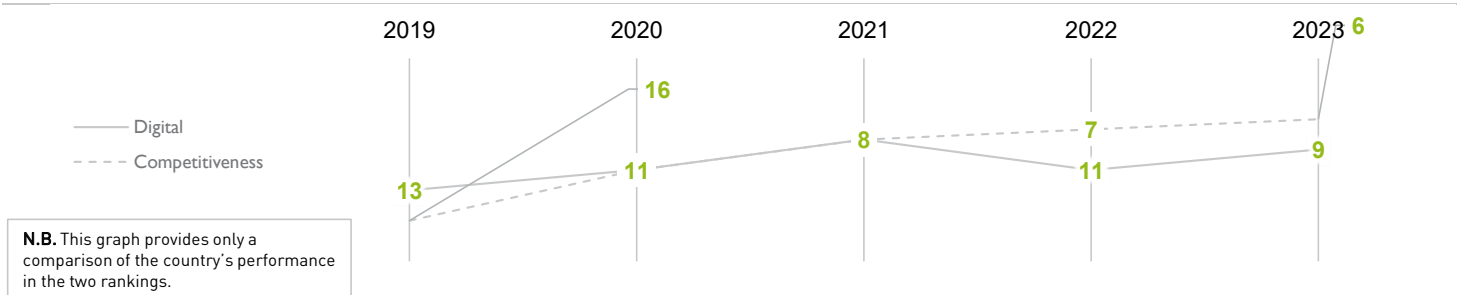
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 13 | 11 | 08 | 11 | 09 |
| Knowledge | 17 | 18 | 16 | 18 | 18 |
| Technology | 09 | 05 | 02 | 06 | 03 |
| Future readiness | 12 | 08 | 07 | 08 | 07 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



TAIWAN, CHINA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 21 | 18 | 17 | 21 | 22 |
| Training & education | 20 | 21 | 12 | 11 | 10 |
| Scientific concentration | 15 | 18 | 19 | 21 | 21 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|---------------------------------------|------|
| Educational assessment PISA - Math | 04 | Employee training | 07 | Total expenditure on R&D (%) | 03 |
| International experience | 40 | ▷ Total public expenditure on education | 52 | ▶ Total R&D personnel per capita | 01 |
| Foreign highly skilled personnel | 44 | Higher education achievement | 03 | ▷ Female researchers | 54 |
| Management of cities | 17 | ▷ Pupil-teacher ratio (tertiary education) | 50 | R&D productivity by publication | 32 |
| Digital/Technological skills | 32 | Graduates in Sciences | 07 | ▷ Scientific and technical employment | 47 |
| Net flow of international students | 13 | Women with degrees | 08 | High-tech patent grants | 20 |
| | | | | Robots in Education and R&D | 19 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 23 | 16 | 16 | 14 | 16 |
| Capital | 12 | 08 | 02 | 09 | 05 |
| Technological framework | 04 | 04 | 04 | 04 | 05 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|------------------------------------------|------|--------------------------------|------|
| Starting a business | 10 | ▶ IT & media stock market capitalization | 01 | Communications technology | 19 |
| Enforcing contracts | 11 | Funding for technological development | 18 | ▶ Mobile broadband subscribers | 01 |
| Immigration laws | 31 | Banking and financial services | 14 | Wireless broadband | 10 |
| Development & application of tech. | 25 | Country credit rating | 15 | Internet users | 22 |
| Scientific research legislation | 16 | Venture capital | 19 | Internet bandwidth speed | 13 |
| Intellectual property rights | 20 | ▷ Investment in Telecommunications | 46 | High-tech exports (%) | 04 |

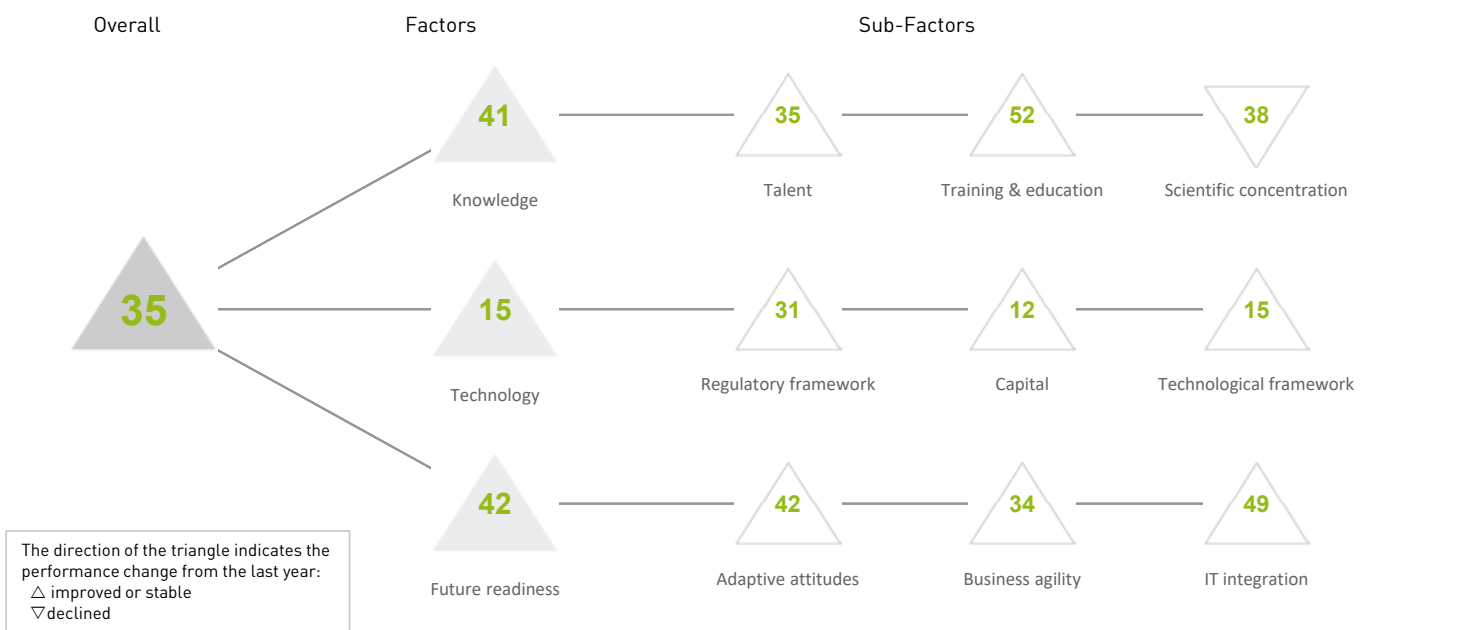
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 14 | 14 | 13 | 13 | 17 |
| Business agility | 03 | 01 | 02 | 05 | 01 |
| IT integration | 24 | 17 | 15 | 13 | 14 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | - | Opportunities and threats | 05 | E-Government | - |
| Internet retailing | 26 | World robots distribution | 07 | Public-private partnerships | 13 |
| Tablet possession | 20 | ▶ Agility of companies | 01 | Cyber security | 19 |
| Smartphone possession | 07 | ▶ Use of big data and analytics | 01 | Software piracy | 25 |
| Attitudes toward globalization | 06 | Knowledge transfer | 12 | Government cyber security capacity | 09 |
| | | Entrepreneurial fear of failure | 18 | Privacy protection by law content | 40 |

THAILAND

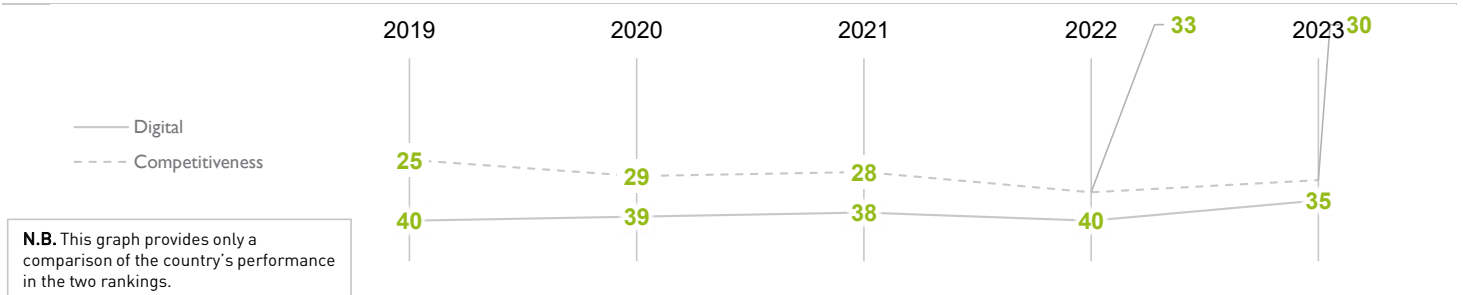
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 40 | 39 | 38 | 40 | 35 |
| Knowledge | 43 | 43 | 42 | 45 | 41 |
| Technology | 27 | 22 | 22 | 20 | 15 |
| Future readiness | 50 | 45 | 44 | 49 | 42 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

ASIA - PACIFIC (14 countries)



POPULATIONS > 20 MILLION (27 countries)



THAILAND

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 40 | 36 | 39 | 37 | 35 |
| Training & education | 50 | 55 | 56 | 57 | 52 |
| Scientific concentration | 35 | 37 | 36 | 36 | 38 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|--------------------------------------------|------|---------------------------------------|------|
| Educational assessment PISA - Math | 46 | Employee training | 20 | Total expenditure on R&D (%) | 34 |
| International experience | 23 | Total public expenditure on education | 51 | Total R&D personnel per capita | 44 |
| Foreign highly skilled personnel | 19 | Higher education achievement | 46 | Female researchers | 14 |
| Management of cities | 19 | ▷ Pupil-teacher ratio (tertiary education) | 54 | R&D productivity by publication | 30 |
| Digital/Technological skills | 36 | Graduates in Sciences | 38 | ▷ Scientific and technical employment | 57 |
| Net flow of international students | 41 | Women with degrees | 48 | High-tech patent grants | 31 |
| | | | | Robots in Education and R&D | 13 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 33 | 31 | 29 | 34 | 31 |
| Capital | 21 | 17 | 19 | 20 | 12 |
| Technological framework | 29 | 25 | 22 | 18 | 15 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 26 | IT & media stock market capitalization | 12 | Communications technology | 15 |
| Enforcing contracts | 28 | Funding for technological development | 26 | Mobile broadband subscribers | 28 |
| Immigration laws | 18 | Banking and financial services | 19 | Wireless broadband | 30 |
| Development & application of tech. | 30 | Country credit rating | 41 | Internet users | 45 |
| Scientific research legislation | 34 | Venture capital | 23 | ▷ Internet bandwidth speed | 05 |
| Intellectual property rights | 35 | ▷ Investment in Telecommunications | 05 | ▷ High-tech exports (%) | 11 |

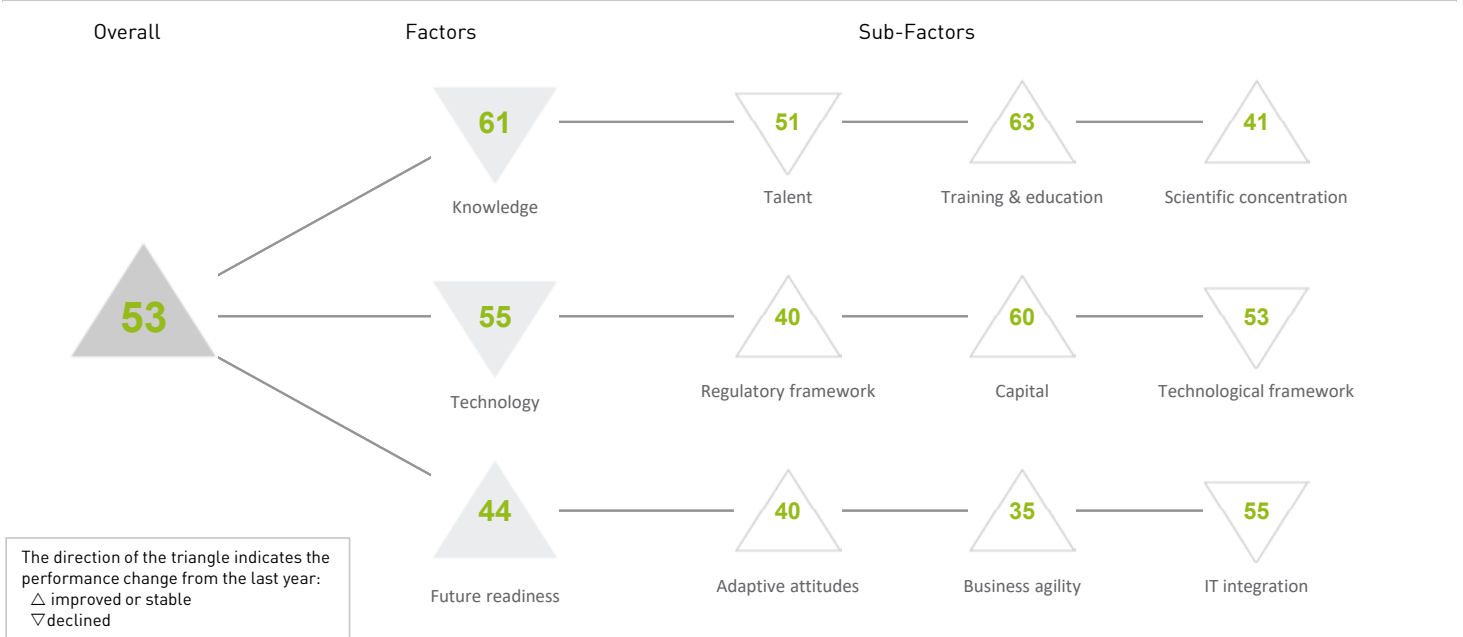
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 58 | 53 | 53 | 52 | 42 |
| Business agility | 30 | 44 | 34 | 41 | 34 |
| IT integration | 51 | 43 | 43 | 50 | 49 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|----------------------------------|------|---------------------------------|------|--------------------------------------|------|
| E-Participation | 17 | Opportunities and threats | 29 | E-Government | 48 |
| Internet retailing | 40 | ▷ World robots distribution | 11 | Public-private partnerships | 18 |
| ▷ Tablet possession | 57 | Agility of companies | 30 | Cyber security | 38 |
| Smartphone possession | 30 | Use of big data and analytics | 25 | ▷ Software piracy | 56 |
| ▷ Attitudes toward globalization | 10 | Knowledge transfer | 24 | ▷ Government cyber security capacity | 58 |
| | | Entrepreneurial fear of failure | 51 | Privacy protection by law content | 43 |

TURKEY

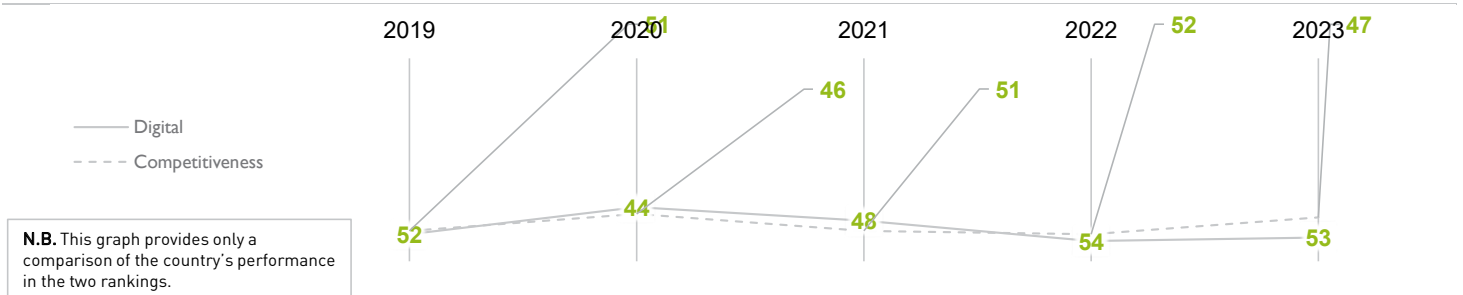
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 52 | 44 | 48 | 54 | 53 |
| Knowledge | 60 | 56 | 57 | 59 | 61 |
| Technology | 48 | 42 | 52 | 54 | 55 |
| Future readiness | 41 | 34 | 41 | 44 | 44 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (27 countries)



TURKEY

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 52 | 38 | 49 | 47 | 51 |
| Training & education | 63 | 62 | 63 | 63 | 63 |
| Scientific concentration | 43 | 45 | 41 | 41 | 41 |

Talent

| | Rank |
|------------------------------------|------|
| Educational assessment PISA - Math | 38 |
| International experience | 52 |
| Foreign highly skilled personnel | 51 |
| Management of cities | 52 |
| Digital/Technological skills | 47 |
| Net flow of international students | 25 |

Training & education

| | Rank |
|--------------------------------------------|------|
| Employee training | 48 |
| Total public expenditure on education | 35 |
| Higher education achievement | 41 |
| ▷ Pupil-teacher ratio (tertiary education) | 59 |
| ▷ Graduates in Sciences | 59 |
| Women with degrees | 49 |

Scientific concentration

| | Rank |
|-------------------------------------|------|
| Total expenditure on R&D (%) | 36 |
| Total R&D personnel per capita | 41 |
| Female researchers | 31 |
| ► R&D productivity by publication | 09 |
| Scientific and technical employment | 43 |
| High-tech patent grants | 50 |
| Robots in Education and R&D | 28 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 38 | 34 | 41 | 44 | 40 |
| Capital | 56 | 51 | 60 | 60 | 60 |
| Technological framework | 50 | 51 | 48 | 52 | 53 |

Regulatory framework

| | Rank |
|------------------------------------|------|
| Starting a business | 35 |
| Enforcing contracts | 20 |
| Immigration laws | 32 |
| Development & application of tech. | 50 |
| Scientific research legislation | 47 |
| Intellectual property rights | 53 |

Capital

| | Rank |
|----------------------------------------|------|
| IT & media stock market capitalization | 42 |
| Funding for technological development | 52 |
| Banking and financial services | 51 |
| ▷ Country credit rating | 62 |
| Venture capital | 51 |
| Investment in Telecommunications | 42 |

Technological framework

| | Rank |
|--------------------------------|------|
| Communications technology | 56 |
| ► Mobile broadband subscribers | 20 |
| Wireless broadband | 56 |
| Internet users | 47 |
| ▷ Internet bandwidth speed | 61 |
| ▷ High-tech exports (%) | 58 |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 38 | 32 | 34 | 42 | 40 |
| Business agility | 44 | 20 | 29 | 42 | 35 |
| IT integration | 48 | 42 | 47 | 54 | 55 |

Adaptive attitudes

| | Rank |
|--------------------------------|------|
| ► E-Participation | 17 |
| Internet retailing | 42 |
| Tablet possession | 51 |
| ► Smartphone possession | 16 |
| Attitudes toward globalization | 30 |

Business agility

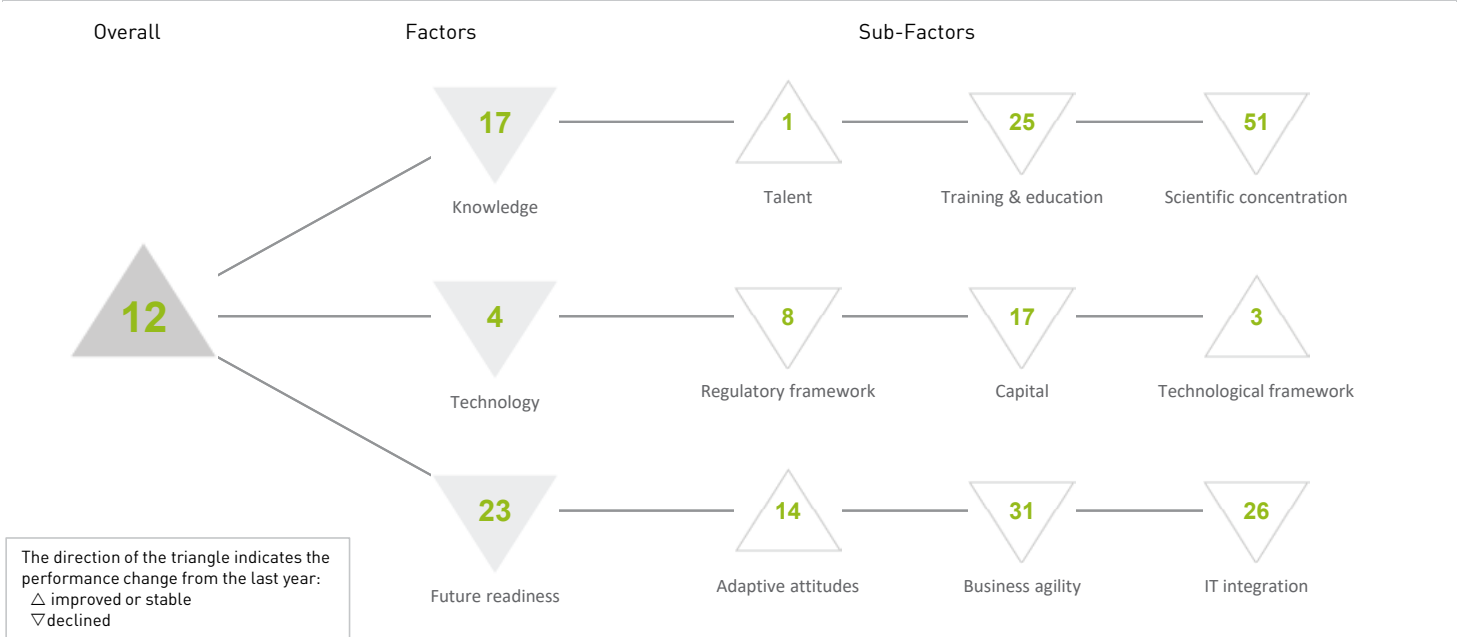
| | Rank |
|-----------------------------------|------|
| Opportunities and threats | 31 |
| World robots distribution | 18 |
| Agility of companies | 26 |
| Use of big data and analytics | 44 |
| Knowledge transfer | 48 |
| ► Entrepreneurial fear of failure | 16 |

IT integration

| | Rank |
|------------------------------------|------|
| E-Government | 42 |
| Public-private partnerships | 49 |
| Cyber security | 54 |
| Software piracy | 49 |
| Government cyber security capacity | 42 |
| Privacy protection by law content | 55 |

UAE

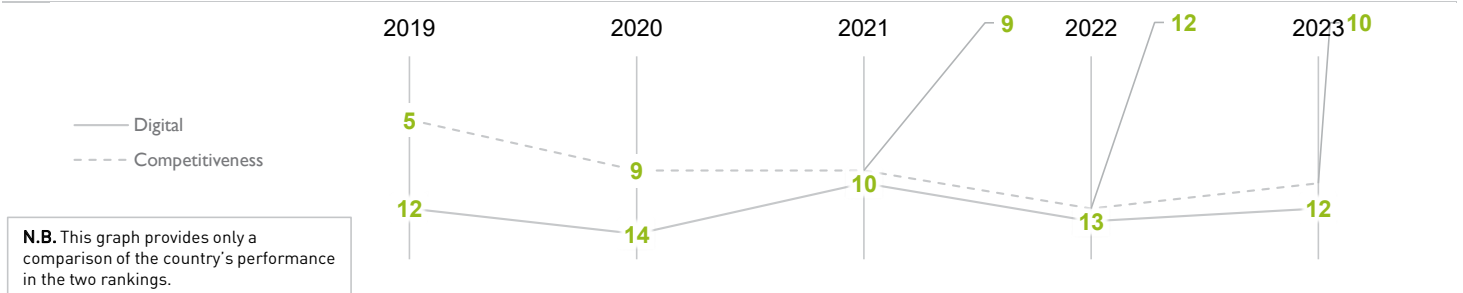
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 12 | 14 | 10 | 13 | 12 |
| Knowledge | 35 | 31 | 18 | 15 | 17 |
| Technology | 02 | 04 | 05 | 03 | 04 |
| Future readiness | 09 | 11 | 12 | 20 | 23 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS < 20 MILLION (37 countries)



▶ Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 05 | 05 | 01 | 01 | 01 |
| Training & education | 41 | 44 | 25 | 22 | 25 |
| Scientific concentration | 56 | 52 | 52 | 46 | 51 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 43 | Employee training | 44 | Total expenditure on R&D (%) | 27 |
| International experience | 04 | ▷ Total public expenditure on education | 48 | Total R&D personnel per capita | 36 |
| Foreign highly skilled personnel | 03 | Higher education achievement | 19 | Female researchers | 39 |
| ▶ Management of cities | 01 | Pupil-teacher ratio (tertiary education) | 43 | ▷ R&D productivity by publication | 50 |
| Digital/Technological skills | 19 | Graduates in Sciences | 06 | Scientific and technical employment | 32 |
| ▶ Net flow of international students | 01 | Women with degrees | 12 | High-tech patent grants | 23 |
| | | | | Robots in Education and R&D | 41 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 01 | 03 | 02 | 03 | 08 |
| Capital | 02 | 10 | 11 | 10 | 17 |
| Technological framework | 05 | 08 | 05 | 03 | 03 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 08 | IT & media stock market capitalization | 29 | Communications technology | 33 |
| Enforcing contracts | 09 | Funding for technological development | 19 | Mobile broadband subscribers | 18 |
| ▶ Immigration laws | 02 | Banking and financial services | 26 | ▷ Wireless broadband | 01 |
| Development & application of tech. | 16 | Country credit rating | 16 | ▶ Internet users | 01 |
| Scientific research legislation | 30 | Venture capital | 07 | Internet bandwidth speed | 19 |
| Intellectual property rights | 38 | Investment in Telecommunications | 33 | ▷ High-tech exports (%) | 46 |

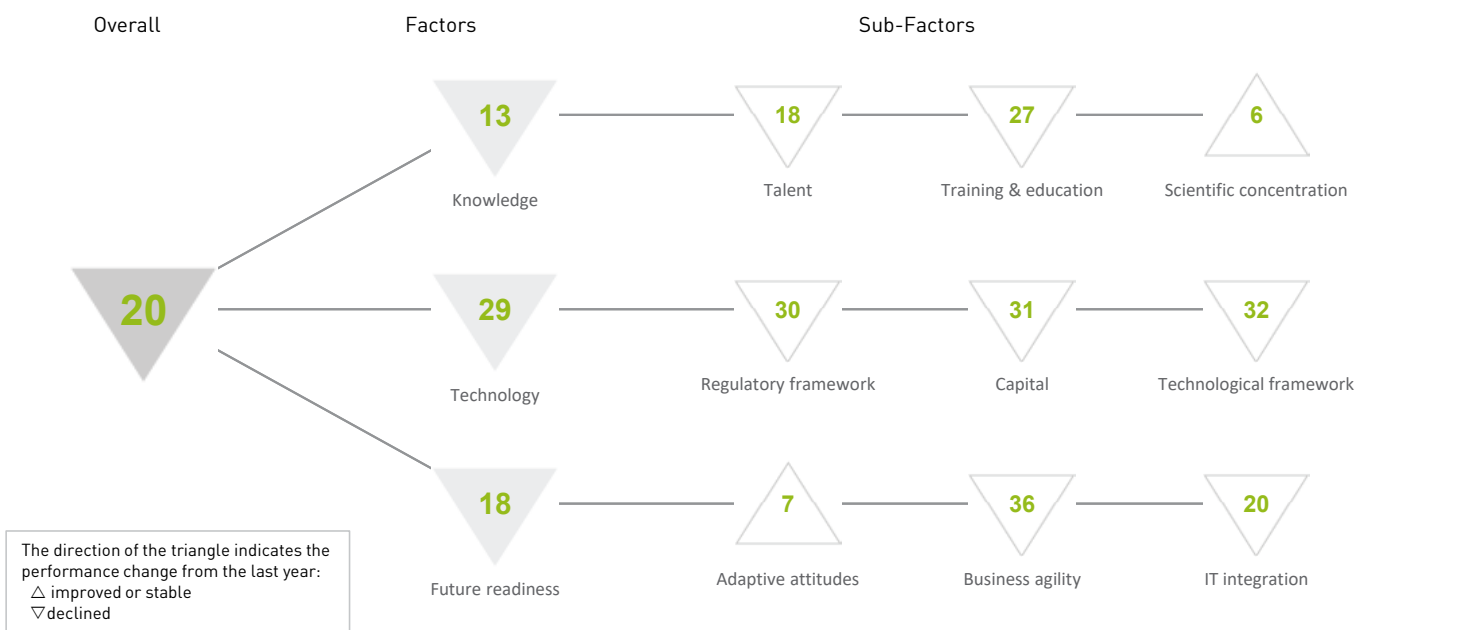
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 20 | 15 | 15 | 16 | 14 |
| Business agility | 04 | 12 | 10 | 26 | 31 |
| IT integration | 08 | 08 | 10 | 24 | 26 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|-------------------------------------|------|
| E-Participation | 17 | Opportunities and threats | 19 | E-Government | 13 |
| Internet retailing | 28 | ▷ World robots distribution | 50 | Public-private partnerships | 17 |
| Tablet possession | 08 | Agility of companies | 14 | Cyber security | 10 |
| Smartphone possession | 14 | Use of big data and analytics | 29 | Software piracy | 20 |
| Attitudes toward globalization | 02 | Knowledge transfer | 32 | Government cyber security capacity | 07 |
| | | Entrepreneurial fear of failure | 39 | ▷ Privacy protection by law content | 63 |

UNITED KINGDOM

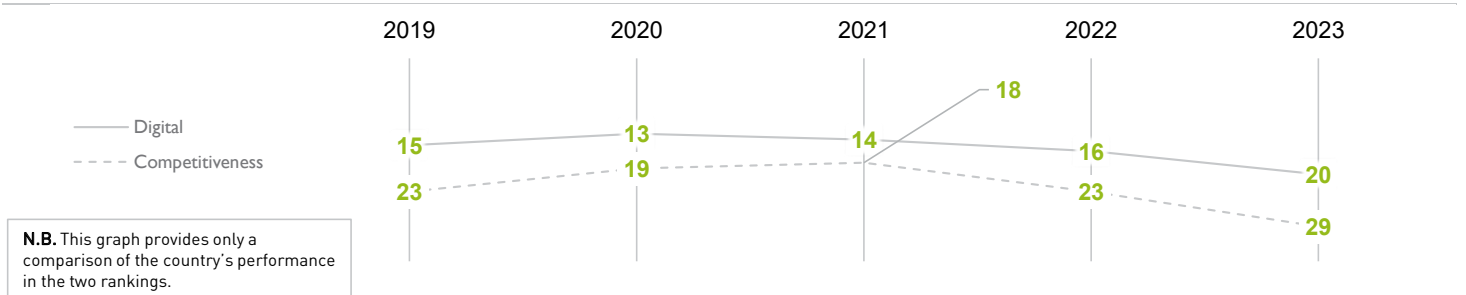
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 15 | 13 | 14 | 16 | 20 |
| Knowledge | 14 | 13 | 13 | 12 | 13 |
| Technology | 18 | 16 | 17 | 25 | 29 |
| Future readiness | 13 | 13 | 13 | 16 | 18 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

EUROPE - MIDDLE EAST - AFRICA (41 countries)



POPULATIONS > 20 MILLION (27 countries)



UNITED KINGDOM

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 17 | 10 | 11 | 15 | 18 |
| Training & education | 23 | 25 | 26 | 19 | 27 |
| Scientific concentration | 08 | 08 | 07 | 06 | 06 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|--------------------------------------|------|------------------------------------------|------|---------------------------------------|------|
| Educational assessment PISA - Math | 17 | ▷ Employee training | 50 | Total expenditure on R&D (%) | 12 |
| International experience | 37 | Total public expenditure on education | 21 | Total R&D personnel per capita | 23 |
| Foreign highly skilled personnel | 28 | Higher education achievement | 14 | Female researchers | 25 |
| Management of cities | 34 | Pupil-teacher ratio (tertiary education) | 28 | R&D productivity by publication | 11 |
| Digital/Technological skills | 26 | Graduates in Sciences | 35 | ▷ Scientific and technical employment | 07 |
| ▷ Net flow of international students | 03 | Women with degrees | 15 | High-tech patent grants | 16 |
| | | | | ▷ Robots in Education and R&D | 08 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 18 | 17 | 20 | 24 | 30 |
| Capital | 22 | 22 | 18 | 28 | 31 |
| Technological framework | 18 | 22 | 19 | 29 | 32 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 09 | IT & media stock market capitalization | 33 | Communications technology | 36 |
| Enforcing contracts | 26 | Funding for technological development | 25 | Mobile broadband subscribers | 32 |
| ▷ Immigration laws | 52 | Banking and financial services | 31 | Wireless broadband | 24 |
| Development & application of tech. | 28 | Country credit rating | 21 | Internet users | 37 |
| Scientific research legislation | 23 | Venture capital | 15 | Internet bandwidth speed | 38 |
| Intellectual property rights | 21 | ▷ Investment in Telecommunications | 48 | High-tech exports (%) | 13 |

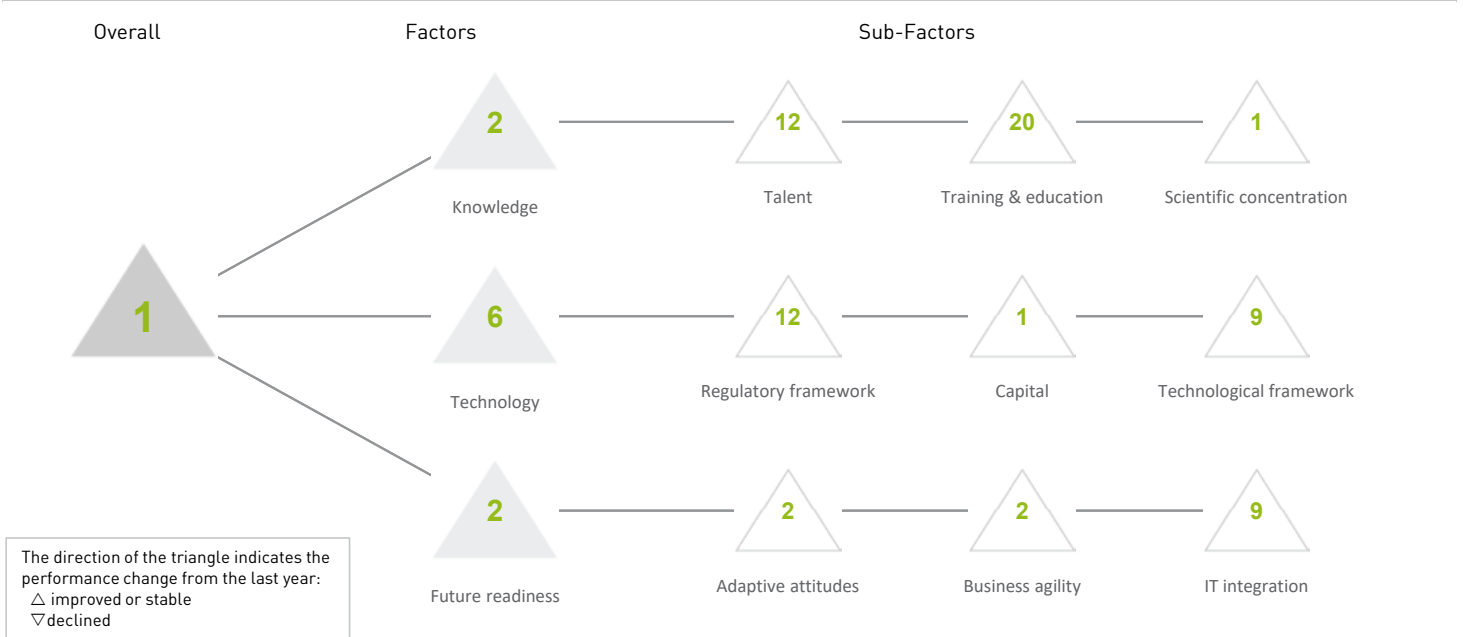
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 10 | 11 | 09 | 10 | 07 |
| Business agility | 26 | 25 | 23 | 28 | 36 |
| IT integration | 14 | 11 | 09 | 16 | 20 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|-------------------------------------|------|
| ▷ E-Participation | 06 | ▷ Opportunities and threats | 46 | E-Government | 11 |
| ▷ Internet retailing | 03 | World robots distribution | 15 | Public-private partnerships | 28 |
| Tablet possession | 14 | Agility of companies | 46 | Cyber security | 30 |
| Smartphone possession | 46 | Use of big data and analytics | 24 | Software piracy | 10 |
| Attitudes toward globalization | 44 | Knowledge transfer | 13 | Government cyber security capacity | 23 |
| | | Entrepreneurial fear of failure | 44 | ▷ Privacy protection by law content | 46 |

USA

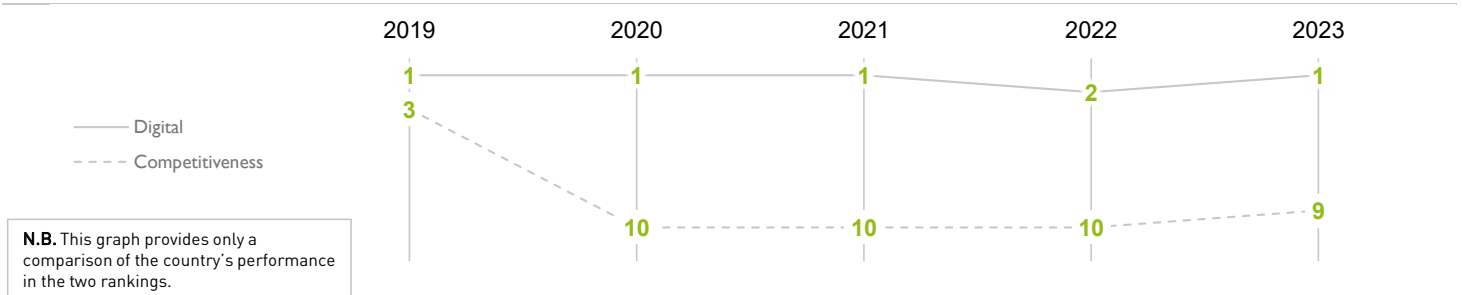
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 01 | 01 | 01 | 02 | 01 |
| Knowledge | 01 | 01 | 03 | 04 | 02 |
| Technology | 05 | 07 | 04 | 09 | 06 |
| Future readiness | 01 | 02 | 01 | 03 | 02 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 14 | 14 | 13 | 14 | 12 |
| Training & education | 25 | 24 | 24 | 23 | 20 |
| Scientific concentration | 01 | 01 | 02 | 01 | 01 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | 35 | Employee training | 28 | Total expenditure on R&D (%) | 04 |
| International experience | 17 | Total public expenditure on education | 09 | Total R&D personnel per capita | 22 |
| Foreign highly skilled personnel | 04 | Higher education achievement | 21 | Female researchers | - |
| Management of cities | 21 | Pupil-teacher ratio (tertiary education) | 18 | ► R&D productivity by publication | 03 |
| Digital/Technological skills | 09 | ▷ Graduates in Sciences | 46 | Scientific and technical employment | 18 |
| Net flow of international students | 16 | Women with degrees | 10 | High-tech patent grants | 04 |
| | | | | ► Robots in Education and R&D | 03 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 19 | 22 | 12 | 12 | 12 |
| Capital | 01 | 01 | 01 | 02 | 01 |
| Technological framework | 11 | 07 | 09 | 13 | 09 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| Starting a business | 29 | IT & media stock market capitalization | 06 | Communications technology | 35 |
| Enforcing contracts | 16 | Funding for technological development | 05 | Mobile broadband subscribers | 11 |
| ▷ Immigration laws | 41 | Banking and financial services | 18 | Wireless broadband | 09 |
| Development & application of tech. | 10 | Country credit rating | 11 | Internet users | 36 |
| Scientific research legislation | 05 | ► Venture capital | 02 | Internet bandwidth speed | 03 |
| Intellectual property rights | 17 | Investment in Telecommunications | 25 | High-tech exports (%) | 20 |

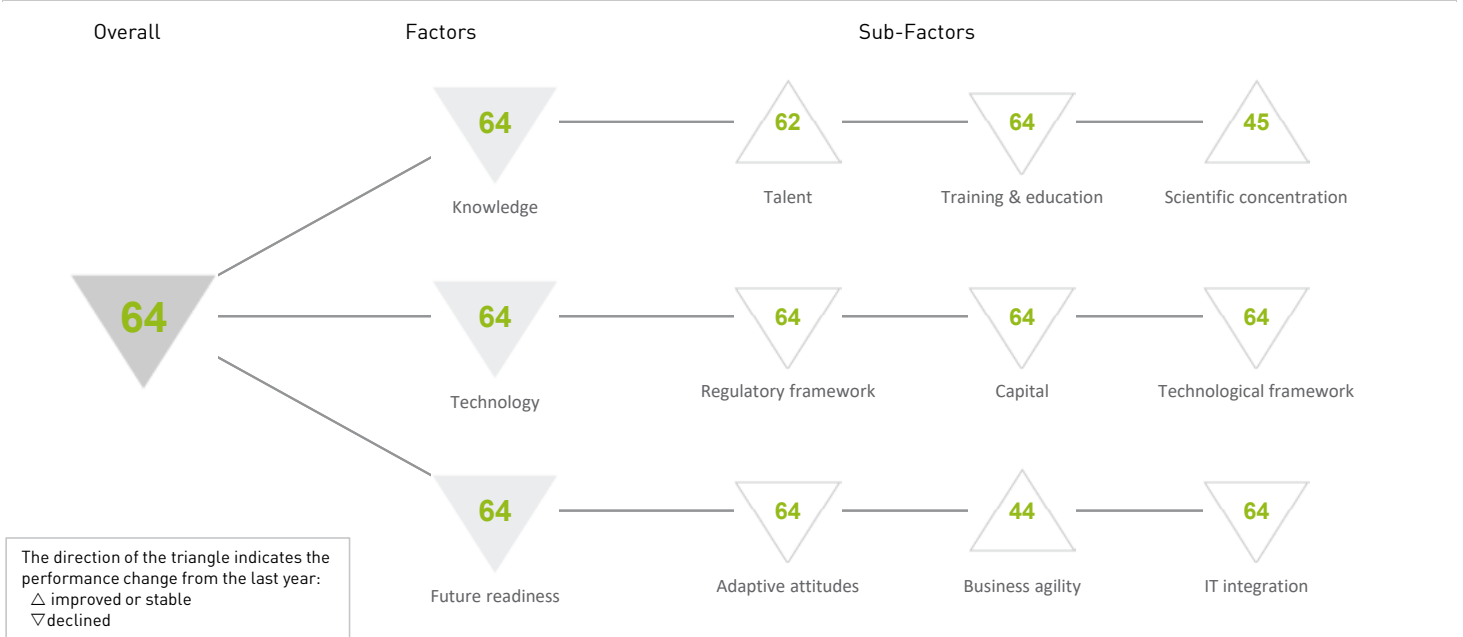
FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 02 | 03 | 01 | 04 | 02 |
| Business agility | 02 | 02 | 01 | 04 | 02 |
| IT integration | 05 | 10 | 03 | 10 | 09 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|----------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 10 | Opportunities and threats | 20 | E-Government | 10 |
| ► Internet retailing | 01 | World robots distribution | 04 | Public-private partnerships | 09 |
| Tablet possession | 16 | Agility of companies | 19 | Cyber security | 23 |
| ▷ Smartphone possession | 44 | Use of big data and analytics | 04 | ► Software piracy | 01 |
| ▷ Attitudes toward globalization | 50 | Knowledge transfer | 08 | Government cyber security capacity | 15 |
| | | Entrepreneurial fear of failure | 17 | Privacy protection by law content | 37 |

VENEZUELA

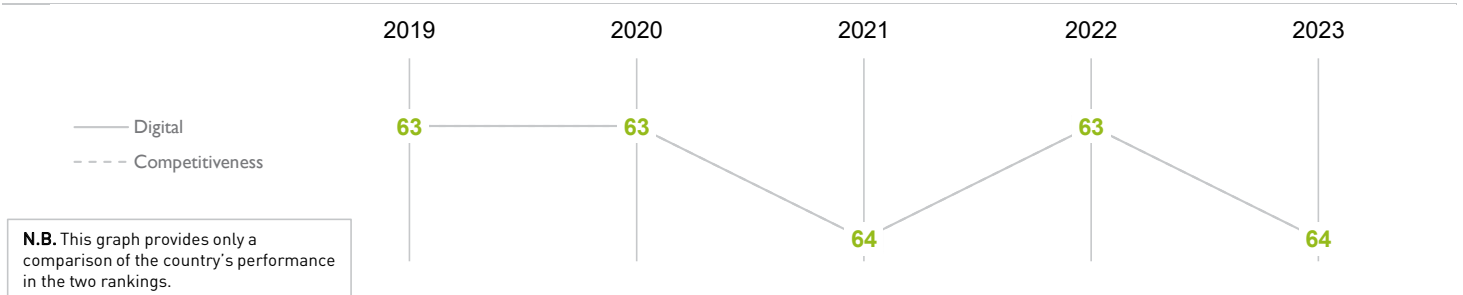
OVERALL PERFORMANCE (64 countries)



OVERALL & FACTORS - 5 years

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|------------------|------|------|------|------|------|
| OVERALL | 63 | 63 | 64 | 63 | 64 |
| Knowledge | 63 | 61 | 61 | 63 | 64 |
| Technology | 63 | 63 | 64 | 63 | 64 |
| Future readiness | 63 | 63 | 64 | 63 | 64 |

COMPETITIVENESS & DIGITAL RANKINGS



PEER GROUPS RANKINGS

THE AMERICAS (9 countries)



POPULATIONS > 20 MILLION (27 countries)



VENEZUELA

► Overall Top Strengths

▷ Overall Top Weaknesses

KNOWLEDGE

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|------|------|------|------|------|
| Talent | 63 | 63 | 64 | 63 | 62 |
| Training & education | 56 | 47 | 52 | 60 | 64 |
| Scientific concentration | 51 | 48 | 49 | 47 | 45 |

| Talent | Rank | Training & education | Rank | Scientific concentration | Rank |
|------------------------------------|------|------------------------------------------|------|-------------------------------------|------|
| Educational assessment PISA - Math | - | Employee training | 58 | Total expenditure on R&D (%) | - |
| International experience | 60 | ▷ Total public expenditure on education | 64 | Total R&D personnel per capita | - |
| Foreign highly skilled personnel | 64 | Higher education achievement | - | ▷ Female researchers | 03 |
| Management of cities | 64 | Pupil-teacher ratio (tertiary education) | - | R&D productivity by publication | - |
| Digital/Technological skills | 64 | Graduates in Sciences | - | Scientific and technical employment | - |
| Net flow of international students | - | Women with degrees | - | High-tech patent grants | 54 |
| | | | | Robots in Education and R&D | 54 |

TECHNOLOGY

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|------|------|------|------|------|
| Regulatory framework | 63 | 63 | 64 | 63 | 64 |
| Capital | 63 | 63 | 64 | 63 | 64 |
| Technological framework | 63 | 63 | 63 | 63 | 64 |

| Regulatory framework | Rank | Capital | Rank | Technological framework | Rank |
|------------------------------------|------|----------------------------------------|------|------------------------------|------|
| ▷ Starting a business | 64 | IT & media stock market capitalization | 60 | ▷ Communications technology | 64 |
| Enforcing contracts | 61 | Funding for technological development | 64 | Mobile broadband subscribers | 59 |
| Immigration laws | 59 | Banking and financial services | 64 | ▷ Wireless broadband | 64 |
| Development & application of tech. | 63 | ▷ Country credit rating | 64 | Internet users | 61 |
| Scientific research legislation | 64 | Venture capital | 64 | Internet bandwidth speed | 63 |
| Intellectual property rights | 64 | Investment in Telecommunications | - | High-tech exports (%) | - |

FUTURE READINESS

| Sub-Factors | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|------|------|------|------|------|
| Adaptive attitudes | 63 | 63 | 64 | 63 | 64 |
| Business agility | 49 | 49 | 52 | 55 | 44 |
| IT integration | 63 | 63 | 64 | 63 | 64 |

| Adaptive attitudes | Rank | Business agility | Rank | IT integration | Rank |
|--------------------------------|------|---------------------------------|------|------------------------------------|------|
| E-Participation | 62 | ▷ Opportunities and threats | 14 | E-Government | 62 |
| Internet retailing | - | World robots distribution | 56 | Public-private partnerships | 64 |
| Tablet possession | 48 | Agility of companies | 35 | Cyber security | 64 |
| Smartphone possession | 61 | Use of big data and analytics | 60 | Software piracy | 62 |
| Attitudes toward globalization | 42 | Knowledge transfer | 63 | Government cyber security capacity | 43 |
| | | Entrepreneurial fear of failure | - | Privacy protection by law content | 57 |

Appendices and Sources

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

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Background Statistics

| | |
|------------------|--------------------------------------------------------------|
| 0.0.1 [B] | Exchange Rate National currency per US\$ (average) |
| 0.0.2 [B] | Population - market size Estimates in millions |
| 0.0.3 [B] | GDP per capita US\$ per capita |

Factor I: Knowledge

1.1 Talent

| | |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1.1.1 | Educational assessment PISA - Math PISA survey of 15-year olds |
| 1.1.2 [S] | International experience International experience of senior managers is generally significant |
| 1.1.3 [S] | Foreign highly-skilled personnel Foreign highly-skilled personnel are attracted to your country's business environment |
| 1.1.4 [S] | Management of cities Management of cities supports business development |
| 1.1.5 [S] | Digital/Technological skills Digital/Technological skills are readily available |
| 1.1.6 | Net flow of international students Tertiary-level international students inbound minus students outbound (per 1000 people) |

1.2 Training & education

| | |
|------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 1.2.1 [S] | Employee training Employee training is a high priority in companies |
| 1.2.2 | Total public expenditure on education Percentage of GDP |
| 1.2.3 | Higher education achievement Percentage of population that has attained at least tertiary education for persons 25-34 |
| 1.2.4 | Pupil-teacher ratio (tertiary education) Number of pupils per teacher |
| 1.2.5 | Graduates in Sciences % of graduates in ICT, Engineering, Math & Natural Sciences |
| 1.2.6 | Women with degrees Share of women who have a degree in the population 25-65 |

1.3 Scientific concentration

| | |
|--------------|----------------------------------------------------------------------------------------------|
| 1.3.1 | Total expenditure on R&D (%) Percentage of GDP |
| 1.3.2 | Total R&D personnel per capita Full-time work equivalent (FTE) per 1000 people |

| | |
|--------------|----------------------------------------------------------------------------------------------------------|
| 1.3.3 | Female researchers % of total (headcount FT&PT) |
| 1.3.4 | R&D productivity by publication No. of scientific articles over R&D expenditure (as % GDP) |
| 1.3.5 | Scientific and technical employment % of total employment |
| 1.3.6 | High-tech patent grants % of all patents granted by applicant's origin (average 2017-2019) |
| 1.3.7 | Robots in Education and R&D number of robots |

Factor II: Technology

2.1 Regulatory framework

| | |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 2.1.1 | Starting a business Distance to Frontier |
| 2.1.2 | Enforcing contracts Distance to Frontier |
| 2.1.3 [S] | Immigration laws Immigration laws do not prevent your company from employing foreign labor |
| 2.1.4 [S] | Development & application of technology Development and application of technology are supported by the legal environment |
| 2.1.5 [S] | Scientific research legislation Laws relating to scientific research do encourage innovation |
| 2.1.6 [S] | Intellectual property rights Intellectual property rights are adequately enforced |

2.2 Capital

| | |
|------------------|--------------------------------------------------------------------------------------------------------------------|
| 2.2.1 | IT & media stock market capitalization % of total stock market capitalization |
| 2.2.2 [S] | Funding for technological development Funding for technological development is readily available |
| 2.2.3 [S] | Banking and financial services Banking and financial services do support business activities efficiently |
| 2.2.4 | Country credit rating Index (0-60) of three country credit ratings: Fitch, Moody's and S&P |
| 2.2.5 [S] | Venture capital Venture capital is easily available for business |
| 2.2.6 | Investment in Telecommunications Percentage of GDP |

2.3 Technological framework

| | |
|------------------|------------------------------------------------------------------------------------------------------------|
| 2.3.1 [S] | Communications technology Communications technology (voice and data) meets business requirements |
| 2.3.2 | Mobile Broadband subscribers 4G & 5G market, % of mobile market |
| 2.3.3 | Wireless broadband Penetration rate (per 100 people) |
| 2.3.4 | Internet users Number of internet users per 1000 people |
| 2.3.5 | Internet bandwidth speed Average speed |
| 2.3.6 | High-tech exports (%) Percentage of GDP |

Appendices and Sources

Factor III: Future Readiness

3.1 Adaptive attitudes

| | |
|------------------|----------------------------------------------------------------------------------------------------------------|
| 3.1.1 | E-Participation Use of online services that facilitate public's interaction with government |
| 3.1.2 | Internet retailing US\$ Per '000 People |
| 3.1.3 | Tablet possession % households |
| 3.1.4 | Smartphone possession % households |
| 3.1.5 [S] | Attitudes toward globalization Attitudes toward globalization are generally positive in your society |

3.2 Business agility

| | |
|------------------|----------------------------------------------------------------------------------------------------------------------------|
| 3.2.1 [S] | Opportunities and threats Companies are very good at responding quickly to opportunities and threats |
| 3.2.2 | World robots distribution Percentage share of world robots |
| 3.2.3 [S] | Agility of companies Companies are agile |
| 3.2.4 [S] | Use of big data and analytics Companies are very good at using big data and analytics to support decision-making |
| 3.2.5 [S] | Knowledge transfer Knowledge transfer is highly developed between companies and universities |
| 3.2.6 | Entrepreneurial fear of failure % indicating that fear of failure would prevent them from setting up a business |

3.3 IT integration

| | |
|------------------|-----------------------------------------------------------------------------------------------------------------------|
| 3.3.1 | E-Government Provision of online government services to promote access and inclusion of citizens |
| 3.3.2 [S] | Public-private partnerships Public and private sector ventures are supporting technological development |
| 3.3.3 [S] | Cyber security Cyber security is being adequately addressed by corporations |
| 3.3.4 | Software piracy % of unlicensed software installation |
| 3.3.5 | Government cyber security capacity The government's capability to mitigate harm from cyber security threats |
| 3.3.6 | Privacy protection by law content Extent of the legal framework to protect Internet users' privacy |

Notes and Sources by Criteria

The source of the survey criteria is always :

IMD World Competitiveness Center's Executive Opinion Survey 2023.

Which was conducted from mid-February to early May 2023, with a total number of 6'031 respondents.

Standard notes used in the data tables

When statistical data is not available or is too out-dated to be relevant for a particular economy, the name appears at the bottom of the statistical table and a dash is shown. When the data is older than the reference year, the year of the data is shown next to the criterion value.

Exchange Rate As most data are expressed in U.S. dollars, you will find the exchange rates used at the beginning of the Statistical Tables. The sources for the Exchange Rates are International Financial Statistics Online February 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.

Background

0.0.1 [B] Exchange Rate
International Financial Statistics Online February-March 2022 (IMF)
National sources

Period average.

0.0.2 [B] Population - market size
World Economic Outlook April 2022
National sources

Mid-year estimates. Croatia: new census in 2011 with a new methodology. India: break in series in 2011. Iceland, Romania as of January 1. Jordan: series have been revised according to the the new Population and Housing Census published in 2016. End of year population for 2019 and 2020. Lithuania: break in series 2011 -census revised population figure downwards by 10% (emigration to EU over past decade). Philippines: Projected population (medium assumption) excluding for 2015, which is based on the 2015 Census. Portugal: methodological change in 2011. Russia: including Crimea as of 2015. UAE: re-estimation of the national population was made by the National Bureau of Statistics in 2010 (consequent increase as of 2008).

0.0.3 [B] GDP per capita
OECD (2022), Main Economic Indicators -complete database
National sources

Provisional data or estimates for most recent year. Malaysia: Data for 2021 is sum of 4 quarters. Taiwan, China: 2019 and 2020 data are revised according to the annual revisions released by DGBAS in November 2021.

Knowledge

Talent

1.1.1 Educational assessment PISA - Math

PISA 2018 (OECD)

<http://www.oecd.org/pisa/>

The OECD's Programme for International Student Assessment (PISA) is a regular survey of 15-year olds which assesses aspects of their preparedness for adult life. PISA selects a sample of students that represents the full population of 15-year-old students in each participating country or education system, in both public and private schools. Mathematical literacy: an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen. Scientific literacy: an individual's scientific knowledge and use of that knowledge to identify questions, to acquire new knowledge, to explain scientific phenomena, and to draw evidence based conclusions about science-related issues, understanding of the characteristic features of science as a form of human knowledge and enquiry, awareness of how science and technology shape our material, intellectual, and cultural environments, and willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen. Hong Kong (China), Netherlands, Portugal and United States: Data did not meet the PISA technical standards but were accepted as largely comparable. China: limited regions (B-S-J-Z); the municipalities of Beijing and Shanghai and the provinces of Jiangsu and Zhejiang participated.

1.1.6 Net flow of international students

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

Net flow of internationally mobile students (inbound from abroad studying in a given country minus outbound from a given country), both sexes, in tertiary education. Data can refer to the school or financial year prior or after the reference year.

Training & education

1.2.2 Total public expenditure on education

IMF Government Finance Statistics

Eurostat March 2022

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

National sources

Total general (local, regional and central) government expenditure in educational institutions (current and capital). It excludes transfers to private entities such as subsidies to households and students, but includes expenditure funded by transfers from international sources to government. It includes pre-primary, primary, secondary all levels and tertiary public institutions. Chile and Jordan: Budgetary central government. Philippines: Includes expenditure for items other than basic and higher education such as vocational education, culture and sports.

1.2.3 Higher education achievement

OECD Education at a Glance 2021

National sources

Percentage of the population aged 25-34 that has attained tertiary-type B and tertiary-type A and advance research programs. Tertiary-type A education covers more theoretical programs that give access to advanced research programs and to professions with high general skills requirements. Tertiary-type B education covers more practical or occupationally specific programs that provide participants with a qualification of immediate relevance to the labor market. Hong Kong SAR: Figures starting from 2012 exclude post-secondary diploma or certificate and exclude foreign domestic helpers. Kazakhstan: The data were reviewed taking into account the inclusion of graduates in technical and vocational education organizations (2014-5). New-Zealand and Slovenia: break in series. Peru: Tertiary education type A refers to University tertiary level and tertiary education type B refers to Non-university tertiary level; for 25 years and more. Singapore: proportion of resident non-students aged 25-34 years with polytechnic, professional qualification or other diploma, or university qualification. Japan: Data for tertiary education include upper secondary or post-secondary non-tertiary programmes (less than 5% of adults are in this group).

Notes and Sources by Criteria

1.2.4 Pupil-teacher ratio (tertiary education)

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

Average number of pupils per teacher at a given level of education, based on headcounts of both pupils and teachers. Tertiary education (ISCED levels 5 to 8). Tertiary education builds on secondary education, providing learning activities in specialised fields of education. It aims at learning at a high level of complexity and specialisation. Tertiary education includes what is commonly understood as academic education but also includes advanced vocational or professional education. Czech Republic, France, Ireland and Poland: based on full-time equivalents. Philippines: Academic Year 2017-2018 data. Data includes students and faculty from both public and private tertiary educational institutions.

1.2.5 Graduates in Sciences

UNESCO
National sources

Share of graduates in Natural Sciences; Mathematics and Statistics; Information and Communication technologies; Engineering, manufacturing and construction. In tertiary education (ISCED2011 levels 5 to 8), both sexes (%). Japan: Data on information and communication technologies are included in other fields. Jordan: 2020 data used in 2019. Philippines: includes Medical and Allied Disciplines Graduates.

1.2.6 Women with degrees

OECD Education at a Glance 2021
National sources

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

Scientific concentration

1.3.1 Total expenditure on R&D (%)

OECD Main Science and Technology Indicators
UNESCO <http://stats.uis.unesco.org>
National sources

National estimates, projections or provisional data for the most recent year. Chile, Denmark, France, Japan, Korea, Netherlands, Portugal, Slovenia, Spain and Sweden: break in series. Hungary (up to 2003), Israel: defense excluded(all or mostly). Indonesia: Estimate based on target GERD by the Ministry of Science and Technology. Sweden: underestimated or based on underestimated data. USA: excludes most or all capital expenditure.

1.3.2 Total R&D personnel per capita

OECD Main Science and Technology Indicators
UNESCO <http://stats.uis.unesco.org>
National sources

National estimates, projections or provisional data for most recent year. Czech Republic, Colombia, Denmark, Finland, Korea, Mexico, Netherlands, Hungary, Japan, Portugal, Slovenia, Sweden and Taiwan, China: break in series. Mongolia: Total number of employees in science sector. United Kingdom: underestimated or based on underestimated data. Jordan, Philippines: based on headcount, not FTE.

1.3.3 Female researchers

UNESCO
OECD (2022), "Main Science and Technology Indicators", OECD Science, Technology and R&D Statistics (database)

Female researchers (headcount) who are mainly or partially employed in R&D. This includes staff employed both full-time and part-time. Expressed as a percentage of the total workforce (male + female)

1.3.4 R&D productivity by publication

NSF Science & Engineering Indicators 2021

Courtesy: National Science Foundation

National sources

The indicator is calculated as a ratio between the number of scientific articles by author's origin and the total expenditure in R&D as % GDP, which clearly include the input costs to produce research (e.g. researchers' salaries, equipment etc.). The result gives therefore the number of scientific articles published every year for a one percent (of GDP) expenditure in R&D activities. This measure can be consider as a proxy to assess the efficiency (or productivity) in producing high-level scientific research at country level.

1.3.5 Scientific and technical employment

Eurostat

OECD (2022), "Labour Force Statistics: Employment by activities and status", OECD Employment and Labour

Market Statistics ILOSTAT

National sources

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

1.3.6 High-tech patent grants

WIPO Statistics Database

<http://www.wipo.int/ipstats/en/statistics/patents/>

TIPO for Taiwan, China

High-Tech patent grants as a percentage of total patent grants (Direct and PCT national phase entries) by applicant's origin. Three year average to reduce volatility. Counts are based on the grant date. Country of origin refers to the country of residency of the first-named applicant in the application. Taiwan, China: data compiled by TIPO using data supplied by international patent offices (USPTO, JPO, EPO, KIPO, SIPO).

1.3.7 Robots in Education and R&D

World Robotics 2022

International Federation of Robotics (IFR)

Industrial robot as defined by ISO 8373:2012: an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications.

The primary source is data on robot installations by country, industry and application that nearly all industrial robot suppliers worldwide report to the IFR Statistical Department directly. Several national robot associations collect data on their national robot markets and provide their results as secondary data to the IFR. This data is used to validate and complete the IFR primary data.

IFR Statistical Departments estimates the operational stock assuming an average service life of 12 years with an immediate withdrawal from service afterwards.

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

World Robotics 2020

International Federation of Robotics (IFR)

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

Notes and Sources by Criteria

Technology

Regulatory framework

2.1.1 Starting a business

Doing Business 2020 -World Bank

The distance to frontier score aids in assessing the absolute level of regulatory performance and how it improves over time. This measure shows the distance of each economy to the “frontier,” which represents the best performance observed on each of the indicators across all economies in the Doing Business sample since 2005. This allows users both to see the gap between a particular economy’s performance and the best performance at any point in time and to assess the absolute change in the economy’s regulatory environment over time as measured by Doing Business. An economy’s distance to frontier is reflected on a scale from 0 to 100, where 0 represents the lowest performance and 100 represents the frontier. For example, a score of 75 in DB 2016 means an economy was 25 percentage points away from the frontier constructed from the best performances across all economies and across time. A score of 80 in DB 2017 would indicate the economy is improving. In this way the distance to frontier measure complements the annual ease of doing business ranking, which compares economies with one another at a point in time.

2.1.2 Enforcing contracts

Doing Business 2020 -World Bank

The distance to frontier score aids in assessing the absolute level of regulatory performance and how it improves over time. This measure shows the distance of each economy to the “frontier,” which represents the best performance observed on each of the indicators across all economies in the Doing Business sample since 2005. This allows users both to see the gap between a particular economy’s performance and the best performance at any point in time and to assess the absolute change in the economy’s regulatory environment over time as measured by Doing Business. An economy’s distance to frontier is reflected on a scale from 0 to 100, where 0 represents the lowest performance and 100 represents the frontier. For example, a score of 75 in DB 2016 means an economy was 25 percentage points away from the frontier constructed from the best performances across all economies and across time. A score of 80 in DB 2017 would indicate the economy is improving. In this way the distance to frontier measure complements the annual ease of doing business ranking, which compares economies with one another at a point in time.

Capital

2.2.1 IT & media stock market capitalization

Thomson One Banker
Thomson Data Stream

Datastream Telecom, Media and IT (TMT) Market Value in national currency.
Calculated as a percentage of Datastream Total Market Value in national currency.
Figures for close-of-business on the 29th March each year.

2.2.4 Country credit rating

Fitch, Moody’s and S&P

IMD WCC created index of the three country credit ratings Fitch, Moody’s and S&P. Each rating, including the outlook, is converted to a numerical score from 20-0 and totalled for each country.

2.2.6 Investment in Telecommunications

Passport
Source: © Euromonitor International
National sources

Investment refers to as the annual capital expenditure; this is the gross annual investment in telecom (including fixed, mobile and other services) for acquiring property and network. The term investment means the expenditure associated with acquiring the ownership of property (including intellectual and non-tangible property such as computer software) and plant. This includes expenditure on initial installations and on additions to existing installations where the usage is expected to be over an extended period of time. Note that this applies to telecom services that are available to the public, and exclude investment in telecom software or equipment for private use.

Technological framework

2.3.2 Mobile Broadband subscribers

Business Monitor International

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

2.3.3 Wireless broadband

Passport

Source: © Euromonitor International

The penetration rates of wireless broadband is calculated by dividing the number of Wireless Broadband subscribers by the total population and multiplying by 100. Wireless-broadband subscriptions refer to the sum of satellite broadband, terrestrial fixed wireless broadband and active mobile-broadband subscriptions to the public Internet. The indicator refers to total active wireless-broadband Internet subscriptions using satellite, terrestrial fixed wireless or terrestrial mobile connections. Broadband subscriptions are those with an advertised download speed of at least 256 kbit/s. In the case of mobile-broadband, only active subscriptions are included (those with at least one access to the Internet in the last three months or with a dedicated data plan). The service can be standalone with a data card, or an add-on service to a voice plan. The indicator does not cover fixed (wired)-broadband or Wi-Fi subscriptions. Both residential and business subscriptions should be included.

2.3.4 Internet users

ITU via World Bank

Internet World Stats www.internetworldstats.com

National sources

Average of available sources

2.3.5 Internet bandwidth speed

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

Ookla

OpenSignal

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

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

2.3.6 High-tech exports (%)

The World Bank (Development Data Group)

<http://databank.worldbank.org>

National sources

High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.

Notes and Sources by Criteria

Future readiness

Adaptive attitudes

3.1.1 E-Participation

UN E-Government Knowledge Database

The e-participation index (EPI) measures the use of online services to facilitate provision of information by governments to citizens (“e-information sharing”), interaction with stakeholders (“e-consultation”), and engagement in decision-making processes (“e-decision making”).

3.1.2 Internet retailing

Passport

Source: © Euromonitor International

National sources

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

3.1.3 Tablet possession

Passport

Source: © Euromonitor International

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

3.1.4 Smartphone possession

Passport

Source: © Euromonitor International

Percentage of households having at least one item. A smartphone is a cellular telephone with an integrated computer and other features not originally associated with telephones, such as an operating system, Web browsing, music and movie player, camera and camcorder, GPS navigation, voice dictation for messaging, the ability to run software applications, etc.

Business agility

3.2.2 World robots distribution

World Robotics 2022

International Federation of Robotics (IFR)

Industrial robot as defined by ISO 8373:2012: an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications.

The primary source is data on robot installations by country, industry and application that nearly all industrial robot suppliers worldwide report to the IFR Statistical Department directly. Several national robot associations collect data on their national robot markets and provide their results as secondary data to the IFR. This data is used to validate and complete the IFR primary data.

IFR Statistical Departments estimates the operational stock assuming an average service life of 12 years with an immediate withdrawal from service afterwards.

3.2.6 Entrepreneurial fear of failure

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

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

IT integration

3.3.1 E-Government

UN E-Government Knowledge Database

The E-Government Development Index presents the state of E-Government Development of the United Nations Member States. Along with an assessment of the website development patterns in a country, the E-Government Development index incorporates the access characteristics, such as the infrastructure and educational levels, to reflect how a country is using information technologies to promote access and inclusion of its people. The EGD I is a composite measure of three important dimensions of e-government, namely: provision of online services, telecommunication connectivity and human capacity.

3.3.4 Software piracy

BSA Global Software Survey

The BSA Global Software Survey calculates unlicensed installations of software that runs on PCs – including desktops, laptops, and ultra-portables, such as netbooks. A key component of the BSA Global Software Survey is a global survey of more than 20,000 home and enterprise PC users, conducted by IDC. In addition, a parallel survey was carried out among 2,200 IT managers in 22 countries. Please consult the original report for a more detailed explanation of the methodology.

3.3.5 Government cyber security capacity

Digital Society Project

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

1: Not really. The government has the resources to combat only unsophisticated cyber attacks.

2: Somewhat. The government has the resources to combat moderately sophisticated cyber attacks.

3: Mostly. The government has the resources to combat most sophisticated cyber attacks.

4: Yes. The government has the resources to combat sophisticated cyber attacks, even those launched by highly skilled actors.

3.3.6 Privacy protection by law content

Digital Society Project

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

0: ...any type of personal data on the Internet.

1: ...most types of personal data on the Internet.

2: ...many types of personal data on the Internet.

3: ...only a few types of personal information on the Internet.

4: ...personal information on the Internet only in extraordinary circumstances.

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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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