

Benchmark of fifth-generation collaborative digital regulation



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The collaborative regulation work stream is led by the Regulatory and Market Environment Division of the ITU Telecommunication Development Bureau (BDT). For more information, please visit the G5 Accelerator (gen5.digital) or contact us at treg@itu.int.

The initial results of this work were discussed during the Global Symposium for Regulators 2021 (itu.int/gsr21) and submitted to an independent multi-stakeholder review board. Following an extensive review process, the feedback of the board members was integrated in this final report and in the refined design of the G5 Benchmark.

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Foreword



I am proud to present the expert report on the first full edition of the novel Benchmark for Fifth Generation Collaborative Digital Regulation, or the G5 Benchmark in short.

The pilot edition of the G5 Benchmark was launched in 2020 and quickly became the gold standard for fast-track collaborative, cross-sector regulation.

Based on the important feedback received on the pilot version through extensive consultations, we took up the challenge to further enhance it and build a comprehensive, practical tool to help regulators and policy makers navigate the digital transformation. A multi-stakeholder Review Board was convened to examine the methodology of the tool and scrutinize the results contained here. The Board was made up of world-class experts, notably academics, data specialists from international organizations, regional industry and regulatory associations, and a think-tank. They all contributed their wisdom and experience to the new tool.

The 2021 G5 Benchmark measures the state of collaborative digital regulation in 193 countries worldwide. Today, the digital economy is critical both to economic growth and job creation. Coherent and forward-looking cross-sector policy and regulation are no longer a choice, but an imperative. The quicker the digital economy develops, the sooner countries can reap its benefits. Policy-makers need to ensure continued investments in ICT infrastructure, increasing and diversifying the talent pool, strengthening innovation, promoting local digital industries, and fostering digital transformation of enterprises across the economy more broadly. The new G5 Benchmark captures how countries are addressing these needs via an active policy agenda that expands well beyond the ICT scope, through collaboration with agencies and ministries in other sectors, such as education, industrialization, and rural development.

The Benchmark recognizes that there is no single approach to digital regulation and various national approaches can pave the way through the digital transformation. The framework allows to measure countries' levels of preparedness for the digital transformation and help national stakeholders leverage its challenges and opportunities. The Benchmark can be used as a canvas for establishing roadmaps for policy and regulatory uplift and inclusive digital transformation across all sectors of the economy.

I hope that the expert report will prove invaluable to all national stakeholders, but especially to ICT regulators and policy-makers.

A handwritten signature in black ink, appearing to be 'DB' with a stylized flourish.

Doreen Bogdan-Martin
Director, ITU Telecommunication Development Bureau

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Executive summary

The International Telecommunication Union (ITU) is advocating a new collaborative approach to ICT regulation. Collaborative regulation or 5th generation regulation (G5) broadly defined is based on the concept of generations of ICT regulation, with successive generations evolving from an initial command and control approach for public monopolies, to one of collaboration across institutions and stakeholders to oversee the development of collaborative regulation for a digital economy.

The Benchmark of fifth-generation collaborative regulation (G5 Benchmark) measures the evolution of regulatory and policy frameworks and helps countries establish roadmaps to navigate the era of digital transformation to develop a competitive digital economy.

The benchmark is calculated based on 70 indicators grouped around four pillars. Each pillar focuses on specific institutional, process, and framework of regulation and policy making:

- **Pillar I: National collaborative governance** measures the breadth and depth of cross-institution collaboration between regulatory authorities as well as the level of cooperation with policy makers. Pillar I factors in the institutional set-up (agencies and their mandate) as well as formal and informal practices around regulatory collaboration.
- **Pillar II: Policy design principles** focuses on the design of frameworks and what keeps them together. Today's effective regulators aim to rely on sound policy principles, moving from infrastructure investment to consumer protection to data privacy.
- **Pillar III: Digital development toolbox** focuses on the tools needed by regulators to stimulate development of a sustainable digital economy. It considers consumer needs, business models and market dynamics within the digital ecosystem.
- **Pillar IV: Digital economic policy agenda** focuses on policies and interventions taken by a country to promote the development of the digital economy. These range from an innovation framework to digital transformation, and from sector taxation to international linkages.

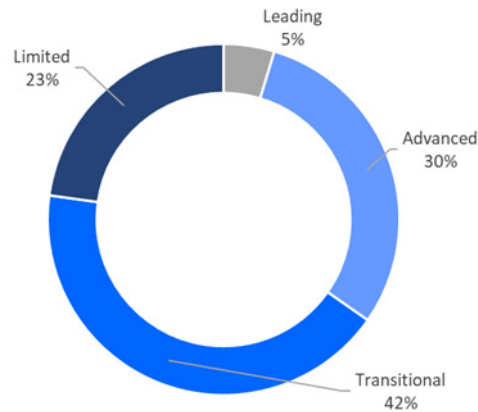
The G5 Benchmark was calculated for 193 countries. Country positions were benchmarked in terms of score thresholds and transition towards the fifth generation of regulatory and policy collaboration indicated in four levels of readiness for digital transformation:

- Leading (scores between 80 and 100);
- Advanced (scores between 60 and 80);
- Transitional (scores between 30 and 60);
- Limited (scores under 30).

As Figure A shows, nine countries (5 per cent of 193 countries) have a G5 Benchmark position that corresponds to a score between 80 and 100 (leading), 58 countries (30 per cent) were placed with a benchmark score between 60 and 80 (advanced), 82 countries (42 per cent) were with a benchmark score between 30 and 60 (transitional), and 44 countries (23 per cent) had a score under 30 (limited).

While a sizable group of countries have reached leading and advanced G5 Benchmark scores (67 countries or 34 per cent of the sample), most countries still need to fulfil the conditions required for those levels of readiness for digital transformation.

Figure A: G5 Benchmark: Country readiness for digital transformation



Source: ITU

From an aggregate regional perspective, only countries in the Europe region and North America are the only regions with an average G5 Benchmark in the have a leading or advanced G5 Benchmark threshold average, indicating the existence of national collaboration mechanisms and institutions, highly developed policy design principles, as well as digital economy enabling frameworks and a digitalization development agenda (see Table A).

Table A: G5 Benchmark thresholds by region and their respective level of readiness for digital transformation¹

	Leading	Advanced	Transitional	Limited	Total
Africa region	0	5	27	12	44
Americas region (North America)	1	1	0	0	2
Americas region (Latin America and the Caribbean)	0	9	16	8	33
Arab States region	0	3	11	8	22
Asia-Pacific region	3	10	13	12	38
CIS region	0	0	6	3	9
Europe region	5	30	9	1	45
Total	9	58	82	44	193

Source: ITU

Some regions exhibit scores at the pillar level that are close to those of Europe and North America. For example, Latin America and the Caribbean depicts high scores in collaborative governance (indicating the existence of strong formal collaboration). On the other hand, all

¹ For the purposes of the analysis here and throughout this report, the Americas region has been sub-divided into North America, and Latin America and the Caribbean.

emerging nations exhibit a low score in digital economy policy agenda pillar, highlighting the urgent need to improve the performance in this domain (see Table B).

Table B: G5 Benchmark averages (2021) by region

	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development Toolbox	Pillar IV: Digital economy policy agenda
Africa region	39.96	14.94	8.00	9.83	7.19
Americas region (North America) ¹	81.41	21.76	17.13	24.92	17.59
Americas region (Latin America and the Caribbean) ¹	45.74	15.54	10.30	11.29	8.60
Arab States region	38.40	12.21	7.37	10.77	8.05
Asia-Pacific region	44.36	14.40	9.33	11.67	8.95
CIS region	39.64	10.29	9.36	10.77	9.22
Europe region	67.60	20.37	13.97	18.74	14.52

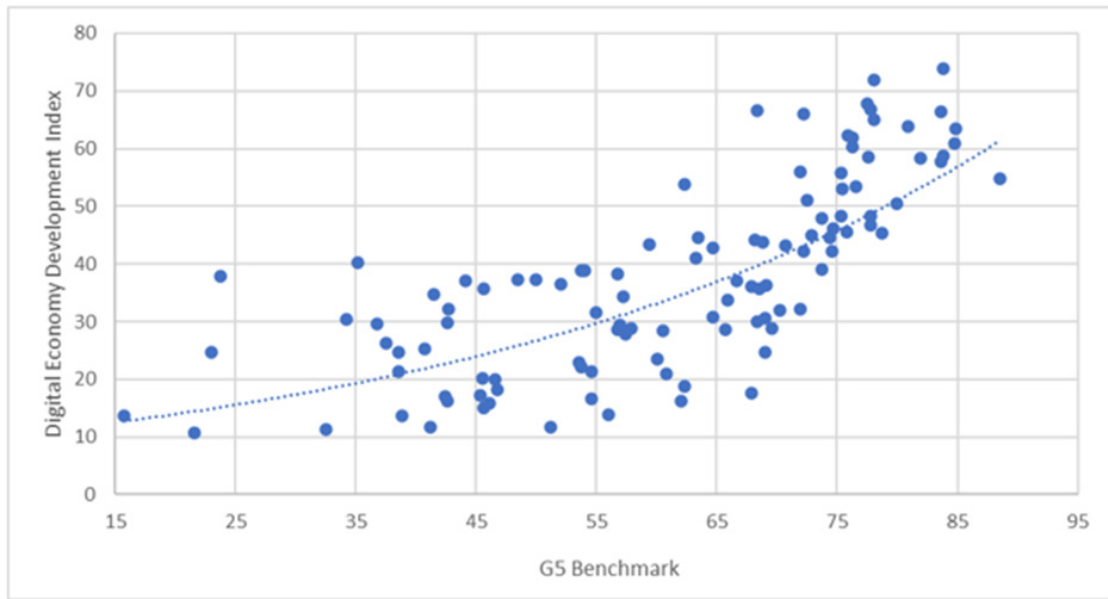
Source: ITU

A key question regarding the need to progress along this development path is the assessment of its potential benefit. In other words, what are the returns on migrating to an advanced or leading level of collaborative regulation in terms of the development of the digital economy? The answer, at an aggregate level, and as expected, is that a high G5 Benchmark position is associated with high digital economy development.

Figure B illustrates the correlation between the G5 Benchmark and the Digital Economy Index.²

² DEI is a Strategy&-PwC composite index, based on 86 indicators structured around five pillars: (i) Digital Foundations, which consists of investments in Information and Communications infrastructure, increased connectivity relating to digital coverage, broadband service quality and affordability, and enabling digital regulations; (ii) Digital Talent measures human capital development initiatives; (iii) Digital Innovation relates to the scale of research and development (R&D), and the prevalence of successful start-ups and incubation ecosystems, including adequate availability of funding sources, mentoring, and service providers; (iv) Digital Adoption measures the adoption of services, devices and online platforms by individuals, enterprises and governments; (v) Digital Localization refers to the level of domestically generated digital products and services, as well as digital content and apps. This is measured through the importance of locally developed Internet platforms and content as well as the export of digital goods and services.

Figure B: G5 Benchmark and Digital Economy Index correlation



Source: ITU

The development of a national digital economy is, to a large degree, dependent on implementing a collaborative digital regulatory and policy framework. The lack of cross-institutional coordination represents a critical barrier to the development of policy coherence and regulatory consistency.

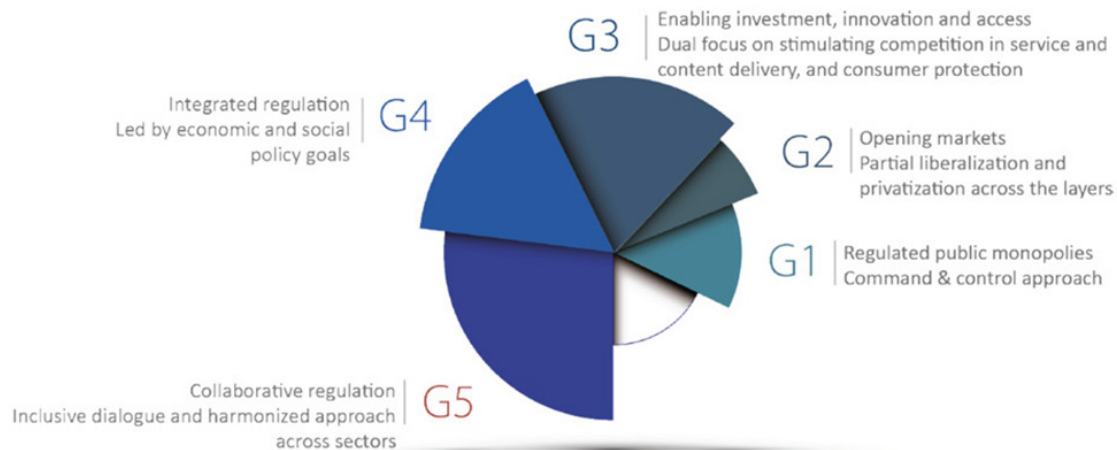
The G5 Benchmark provides not only a tool to assess where a country stands in terms of the development of this critical capability, but it also provides a roadmap on how to evolve and emphasises areas of which to focus. Considering the challenges posed by COVID-19, cross-institutional coordination and collaboration highlights the need to build a single policy and regulatory focus in the digital economy domain. As the benchmark indicates, there is no single path to the collaboration and cross-institutional coordination objective. However, governments need to recognize that if the development of the digital economy is a policy objective, they should explore institutional approaches to reach this objective.

1. Introduction

The International Telecommunication Union (ITU) has been advocating a new approach to ICT regulation, moving from the command-and-control approach that regulated public monopolies to a collaborative approach across institutions and stakeholders to oversee the development of a competitive digital economy.

The collaborative approach to regulation referred to as fifth generation collaborative regulation is a broad notion that ITU has defined based on the concept of generations of ICT regulation. It marks a fundamental shift in the way regulation is executed, emphasizing its holistic policy ground and the stakeholders that it brings together from policy-makers, single-sector and cross-sector regulators to market players of any size (see Figure 1).

Figure 1: Generations of regulation: Conceptual framework



Source: ITU

The underlying premise of such an approach is the imperative for countries to migrate to a holistic, principle-based regulatory and policy framework based on the collaboration among multiple sectors and cross-sector regulators within a scope that expands beyond the ICT space into that of the digital economy. In this context, as part of its 2020 Global ICT Regulatory Outlook, ITU launched a pilot version of the G5 Benchmark with the objective of tracking the evolution of regulatory frameworks and helping countries establish roadmaps towards the new paradigm.

The pilot edition of the G5 Benchmark covered more than 80 countries and has proven, so far, to be a powerful and straightforward tool for policymakers and regulators that sets new goals for regulatory excellence. More importantly, the benchmark has become a reference in topics such as collaboration amongst regulators, and a design tool of policy and legal instruments seeking to maximize digital transformation across all sectors of the economy.

As a result of the feedback received after publishing the pilot version, ITU has conducted a re-evaluation of the G5 Benchmark. While the objectives and scope remain the same, the refined G5 Benchmark is based on an evolved metric structure, a larger number of indicators, and a wider range of data sources. As part of the development process, the new Benchmark has been

examined by a multi-stakeholder review board.¹ The feedback of Review Board members has been incorporated in the current document.

This report presents the new version of the G5 Benchmark. Chapter 2 provides a review of the research literature on regulatory and policy metrics in the ICT and digital economy domains. Its purpose is to provide a basis upon which the refined Benchmark has been constructed. Chapter 3 details the three dimensions that need to be addressed in the new Benchmark: (i) an expanded measurement scope moving from ICT into the digital economy, (ii) the consequent need of collaborative cross-institutional regulation, and (iii) the need for governments to develop a digital economy policy agenda. After formalizing the new requirements, Chapter 4 presents the structure of the benchmark and its methodology of construction. It also includes several robustness tests that validate the methodology. Chapter 5 presents and analyses the results of the G5 Benchmark. Finally, Chapter 6 provides a discussion of implications and outlines an agenda for further Benchmark development. The annexes present all supporting materials in terms of the methodology followed for the development of the benchmark.

The G5 Benchmark is based on self-reported information gathered via official ITU surveys to Member State administrations, datasets compiled by international organizations, as well as desktop research based on official government sources and direct outreach to national telecommunication and ICT regulatory authorities. Official data received from Member State administrations has been verified to the extent reasonably feasible. The research team tried to ensure the accuracy of data to the greatest extent possible; nevertheless, in rare cases it may be incomplete or include irregular or odd values.

¹ See members of the review board in Annex A. The review board member feedback has been incorporated into this report.

2. Research on regulatory and policy indices in ICT and the digital economy

The development of regulatory and policy metrics dealing with the telecommunication, information, and digital economy sectors has been evolving since 2000, gradually encompassing wider areas of impact, and progressing in sequence across three bodies of work: (i) the assessment of trade barriers in telecommunication services, (ii) the development of telecommunication regulatory frameworks, and (iii) the expansion of scope of regulation to include the Internet and digital sectors.

2.1 Indices measuring trade barriers in telecommunication services

One of the first efforts in the measurement of trade barriers in telecommunication services was conducted in 2000 by Tony Warren, a researcher at the Australian National University, who developed a policy index aimed at measuring the impediments to trade and investment in the sector. The author defined five pillars composing the policy index: (i) trade, which captures policies that discriminate against all potential entrants seeking to supply cross-border telecommunication services, (ii) investment (fixed), assessing policies that discriminate against all potential entrants seeking to supply fixed network services via investment in the country at issue; (iii) investment (mobile) measuring policies that discriminate against all potential entrants seeking to supply cellular mobile services via investment in the country; (iv) trade policies that discriminate against potential foreign entrants seeking to supply cross-border telecommunication services; and (v) investment policies that discriminate exclusively against potential foreign entrants seeking to supply fixed or mobile telecommunication services through participating in the domestic sector.

Following on from Warren's analysis, Lim et al. (2009) measured the height of barriers to trade and investment in the telecommunication sector in the Asia Pacific Economic Cooperation (APEC) countries. While the authors ranked the countries in the region using the methodology proposed by Warren (2000), they also developed a regulatory index using information from the World Trade Organization (WTO). This index was composed of five pillars: (i) competitive safeguards, which specified the prevention of anticompetitive activities such as cross subsidization, use of information obtained by competitors, and withholding of technical or commercial information; (ii) interconnection policy; (iii) universal service index; (iv) licensing; and (v) the existence of an independent regulator. After calculating each section score, the index was generated assuming equal weights and normalized to a 0-1 scale.

Within the same body of work of assessing trade in telecommunication services, Nordas et al. (2014) developed the Services Trade Restrictiveness Index focused on telecommunication services, including fixed, mobile, and broadband services. The index was a calculation of 64 indicators, taking values between zero and one, zero representing an open market and one a market completely closed to foreign services providers. The index was calculated for the 34 OECD members in 2013, including Brazil, China, India, Indonesia, the Russian Federation, and South Africa. The scores ranged between 0.06 and 0.61, with a sample average of 0.22. Barriers to competition, reflecting inadequate regulation of incumbents with significant market power,

and state ownership in some countries made the largest contribution to the index value, followed by restrictions on foreign entry. As it can be seen, many indicators used in the calculation of the index were related to the assessment of the telecommunication regulatory framework, which is the subject of the second body of index work described in the section below.

2.2 Indices measuring the development of telecommunications regulatory and policy frameworks

Within the second body of research, the European competitive telecommunications association (ECTA) regulatory scorecard was launched in 2001, with the objective of comparing the regulatory environment in European Union Member States, Norway and Turkey in the electronic communications sector and its effectiveness in promoting the objectives of the European Union regulatory framework. The scorecard was structured around five pillars: (i) overall institutional environment, (ii) key enablers for market entry and network roll out, (iii) the regulatory process followed by a national regulatory agency (NRA), (iv) the application of regulation by the NRA, and (v) regulatory and market outcomes. Each question was answered using a maximum, intermediate and minimum scale. To aggregate the pillars, a weighted addition sum was used. Most questions were weighted 'medium', equivalent to a maximum possible score for each question of 4.7, to signify that, in the absence of any evidence to the contrary, it is assumed that they have an equal contribution to the effectiveness of regulation. A 'high' (9.5 points) or 'low' (2.4 points) weight was applied to balance the weightings in a particular section, such that there is neutrality in the weightings amongst the type of questions asked.

Along the same body of research, Gutierrez (2003) developed an index measuring the development of the regulatory framework in telecommunications. This index in this case, was based on three pillars. The first one assessed whether there is a separation between the telecommunications service provider and regulatory activities, although not necessarily whether there is a specialized and separate regulatory body. The second pillar provided a value to four features of independent telecommunications regulatory agencies: (i) whether the regulatory body is autonomous (e.g., whether there is budgetary independence or limits on government's ability to freely replace regulators), (ii) its accountability, measured by existence of mechanism to resolve disputes between regulators and operators, (iii) the clarity of the regulators' roles in terms of ability to set tariffs and fine or penalize operators, and (iv) transparency and participation in the regulatory process. The last dimension assessed whether the creation of the regulatory body (or the separation of the operating and regulatory activities) was backed by law or some norm, such as a presidential decree. The pillars were weighted and summed by assigning equal value to every component. For example, the first and third pillars, with just one component, had a weight of about 16.6 per cent each, as did each of the four components of the second dimension. The index reflected a continuous growth to the extent that countries adopted new regulatory legislation.

Zenhausern et al. (2007) developed a Regulatory Density Index with the objective of comparing the intensity of regulatory environments in 27 European countries. The regulatory index was based on four pillars: (i) price regulation, (ii) quantity regulation, (iii) market-entry regulation, and (iv) miscellaneous regulations relevant to investment incentives. Each pillar was based on several indicators which were assigned a value on a scale ranging from weak to strong intervention and were weighted differently from the ECTA scorecard. For example, quantitative standards received even greater weight and approval obligations were weighted the heaviest. To determine a weighting scheme for each indicator with enough robustness, additional

scenarios were calculated: a basic one where all areas weighted equally (25 per cent) and four more where the weight of one section was twice that of the other three. The five scenarios were compared among themselves, and the authors found the results (and therefore, the index) not being sensitive to the aggregation rule.

2.3 Indices measuring the development of regulatory and policy frameworks applied to the digital economy

The extension of metrics focused on telecommunications and/or ICT sectors to the digital economy is a relatively recent trend. Most of the work in this area has been generated in the context of the development of digital economy indices², with regulation and policy representing only one of the index pillars or sub-pillars. Consequently, there is no index capturing exclusively the development of regulatory and policy frameworks applied to the digital sector.

The IMD World Digital Competitiveness (IMD, 2020) developed by researchers at the IMD World Competitiveness Center is structured around three pillars (called “factors”): (i) knowledge, (ii) technology, and (iii) future readiness.

Within the technology pillar, a regulatory framework sub-pillar is a composite of six indicators of areas conducive to the development of a digital economy (for example, immigration laws, scientific research legislation, and intellectual property rights). Those six indicators (some of which are based on survey responses) are combined with another forty-six indicators from the other pillars within an equal weight framework.

The Digital Intelligence Index (Chakravorti, 2021), developed within the Fletcher School at Tufts University combines two indices: the digital evolution scorecard (based on 160 indicators), and the digital trust (combining 198 indicators). Within the digital trust, the institutional environment is based on three components: accountability, privacy, and security, all components required to advance a digitization agenda. As in the previous case, the institutional environment is evaluated in the context of the composite index, which prevents a targeted understanding of the policy framework in the digital ecosystem.

The Network Readiness Index 2020³ contains a regulation sub-pillar composed of five indicators: (i) regulatory quality, (ii) ICT regulatory environment, (iii) legal framework adaptability to emerging technologies, (iv) e-commerce legislation, and (v) privacy protection by law content. The regulatory quality indicator captures perceptions of the ability of governments to formulate and implement sound policies as reported by the World Bank Worldwide Governance Indicators. The ICT regulatory environment is based on the ITU Regulatory Tracker. The adaptability of the legal framework and privacy protection indicators are based on survey responses, while the e-commerce legislation indicator is reported by UNCTAD.

In a similar vein, the CAF Digital Ecosystem Development Index (2020) developed by Telecom Advisory Services has a pillar labelled Public Policies and Regulation, which is composed of two sub-pillars: (i) regulatory framework and (ii) concentration of digital industries. The regulatory framework sub-pillar is a composite index of the ITU Regulatory Tracker clusters and the Global Cybersecurity Index.

² For example, the Digital Economy Society Index relies on 24 indicators organized around five pillars (called “dimensions”) to measure the development of the digital economy. No policy or regulatory indicators are included in the index structure.

³ <https://networkreadinessindex.org/>

2.4 Focus on policy, regulation, and governance metrics

In reviewing the research on measurement metrics of regulatory and policy frameworks in the ICT and digital economy sectors, three conclusions can be drawn.

First, there is no comprehensive metric addressing the complete regulation and policy framework. Each of the ten ICT indices reviewed above focuses on specific areas: ECTA (2001) is more focused in assessing the regulatory and institutional framework, while Gutierrez (2003) measures only institutional strength. Similarly, Zenhausern et al. (2007) focuses on the regulatory and policy framework, while (Warren (2000), Lim et al. (2009) and Nordas et al. (2014) address only trade restrictions in telecommunication services, with an occasional spill-over on the regulatory framework. Conversely, CAF (2020), IMD (2020), Chakravorti (2021), and Dutta et al. (2020) focus either on ICT regulation or digital economy policies (see Table 1).

Second, contrary to indices measuring sector performance (such as adoption, pricing, capital investment, productivity), the development of metrics for policy and regulatory frameworks, entail the potential challenge of implicit measurement subjectivity. In fact, the assumptions of the metric developer could be guiding the measurement of a particular policy. As an example, if a country has enacted sub-loop unbundling (question 99 of the ECTA scorecard), the score received is 1 (and conversely, zero (0) if unbundling does not exist). This decision assumes that network unbundling is the more favoured policy in the development of broadband competition.

Recognizing the potential subjectivity bias, indices measuring the development of policy and regulation are particularly useful when addressing the progress of a country toward a certain state that favours the overall development of the sector and less so in comparing countries. Along those lines, when assessing the impact of specific policies, it would be recommended to consider the policy or regulation individually within a specific country context rather than considering the effect of that policy in the calculation of aggregate index results. A similar recommendation could be made against overly relying on a ranking system based on such indices. In another dimension of subjectivity, some indices are based on expert responses to a survey questionnaire. Indicators constructed around the development of questions and their answers could be influenced by a potential response bias.

Third, while the ICT sector is evolving toward an integration within a digital economy scope, there is still no metric focused specifically on addressing the measurement of the regulation and policy framework of this universe. Indices focused on the digital economy tackle the regulatory dimension as a pillar or sub-pillar within an overall assessment of sector development.

These three conclusions have been considered in the development of the new G5 Benchmark, and by focusing exclusively on the policy, regulatory and governance domain, the G5 Benchmark addresses a gap in the research literature. In addition, the benchmark strives to mitigate the biased evaluation and scoring that characterizes some of the metrics discussed above (see section 4).

Table 1: Specificity of ICT/digital economy regulatory and policy indices

	ECTA scorecard (2001)	Index of regulatory density (Zenhausen et al., 2007)	Gutiérrez (2003)	Index of telecommunications trade policy (Warren, 2000)	Index of telecommunications trade barriers (Lim et al. (2009)	Index of telecommunications trade restrictiveness (Nordas et al. (2014)	CAF Digital Ecosystem Development Index (2020)	IMD World digital competitiveness (2020)	Digital Intelligence Index (Chakravorti, 2021)	Network Readiness Index (Dutta et al., 2020)
Telecommunication/ICT institutional framework	X		X							
ICT regulatory intensity	X	X		X	X		X			X
Telecommunication trade and FDI regulation				X	X	X				
Digital economy policy framework								X	X	

Source: ITU

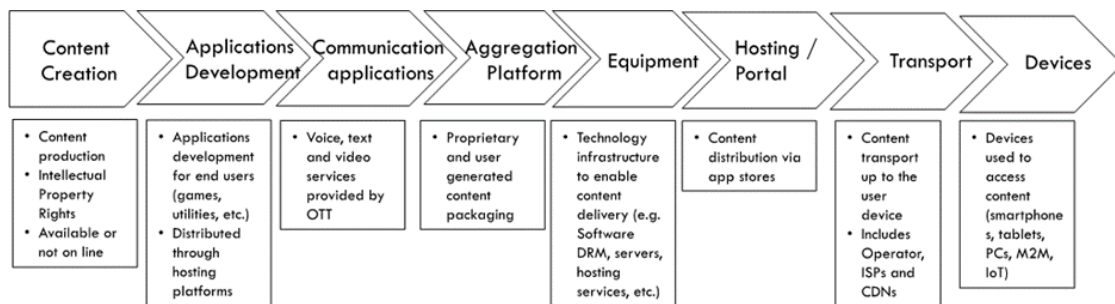
3. The current industry context requires a new regulatory and policy metric

3.1 The transition to a digital economy

The digital economy has been generally conceptualized and measured through two basic approaches. The more common approach has been to measure the output generated by industries that are part of the digital ecosystem, comprising the Information and Communications Technology sector (telecommunications, IT, and content industries), online platforms, electronic commerce, and collaborative/sharing platforms.⁴ A more expansive approach includes all consumption of intermediate goods (telecommunication and information technology solutions) by the production sector of the economy. Following the second approach, the concept of digital economy encompasses two dimensions: (i) industries involved in the production of digital goods and services, (ii) the spillovers of digital technology on all economic sectors of a given country.

The first dimension is based on the output of industries that are part of the domestic digital ecosystem (telecommunications, IT, media, digital platforms, e-commerce, and collaborative/sharing platforms). In general terms, the concept involves all firms operating in the following production chain⁵ (see Figure 2).

Figure 2: Production chain of the digital economy



Source: Katz, R. (2015). El ecosistema y la economía digital en America Latina. Madrid: Fundacion Telefonica

The digital economy production chain comprises firms operating within an ecosystem delivering content, applications and digital services to consumers, businesses, and governments.⁶ The

⁴ Ahmad, Nadim, and Jennifer Ribarsky, 2017, Issue Paper on a Proposed Framework for a Satellite Account for Measuring the Digital Economy. and Abraham K., J. Haltiwanger, K. Sandusky K., and J. Spletzer, 2017, Measuring the Gig Economy: Current Knowledge and Open Issues.

⁵ In this case, the concept of production chain originally developed by Stigler in his seminal article "The division of labor is limited by the extent of the market" *The Journal of Political Economy*, vol. 59, No. 3 (June 1951), pp. 185-193. While a linear structure, such as the one presented above, can be misleading when it comes to addressing multiple feedback loops, the presence of "specialists" and vertical integration trends, it is useful to capture all production chain roles.

⁶ While less mentioned, digital services represent a critical approach to improving the delivery of public services and improve the efficiency of government administrative procedures.

first three stages are focused in developing raw content, providing applications, and offering communications services. In the far left of the chain in Figure 2, content creation firms assume responsibility for developing and/or offering news, videos (e.g., YouTube), music (e.g., Spotify), etc. In the next step, several players develop applications and services, such as games (e.g., Zynga), electronic commerce (e.g., Amazon), and other utilities. In the next stage, the developers of communications applications operate private messaging (e.g., WhatsApp), VoIP (e.g., Skype) and video conferencing (e.g., Zoom) platforms. The aggregation platforms, located in the fourth stage, are either social and professional networks (e.g., Facebook, LinkedIn) or search platforms (e.g., Google, Bing, Baidu) that are a point of access to content, utilities and communications applications operating in the first three stages. The equipment stage comprises firms providing technology inputs to service providers, while the hosting stage of the production chain comprises a range of infrastructure companies supporting the ecosystem: data centre operators, hosting services (e.g., IBM, Amazon Web Services), and companies that offer back-office services (such as authentication, billing, marketing, and analytics). The transport stage comprises traditional telecommunication operators providing connectivity, while the device suppliers are the manufacturers of smartphones, PCs, tablets, and associated software. While the weight of the digital sector of a country's gross domestic product (GDP) is a function of the size of the economy, it typically represents between 4 and 8 per cent of a country's GDP.

Beyond the digital ecosystem output, digital spillovers reflect the multiplier effect that digital technology and business models have on the overall economy, through digital transformation effects. This includes productivity gains across different business units, gains across players in the value chain, and faster growth among players in the digital sector. Spillovers also capture the multiplier effect from digital investments, leading to the development of new business models. For example, by matching demand with supply through mobile connectivity, business models based on the 'gig' economy, in which people work flexibly, facilitate higher utilization and productivity. Spillovers increase with digital consumption of enterprises, from agriculture to logistics. The contribution of digital technologies to all sectors may reach up to 25 per cent of the economy in some countries⁷, although some econometric modelling would indicate that this percentage is expected to increase because of a "return to scale" effect.⁸ Beyond the strict economic impact, the digital economy contributes to the efficiency of public administration and delivery of public services and in terms of enhanced consumer welfare.

The transition to digital economies is prompting governments to consider the need of an expansion of the conventional ICT regulatory and policy agenda. Given the fact that the economic and social impact of the digital economy production chain transcends that of ICT, the future regulatory interventions to be addressed within a policy metric must encompass other domains, ranging from content production to equipment manufacturing. In addition, based on externalities of the digital ecosystem, the assessment of policy and regulatory agendas needs to consider areas related to the promotion of innovation and digital transformation.

3.2 The need of a digital policy agenda

Either through the output of digital industries or its spillovers, the digital economy represents a significant contribution to a country's economy. An econometric model, developed to estimate

⁷ Garcia Herrero, Alicia, and Jianwei Xu, 2017, *How big is China's Digital Economy?* Presented at the 5th IMF Statistical Forum.

⁸ Katz, R. and Jung, J. (2021). *The economic impact of broadband and digitization through the COVID-19 pandemic: Econometric modelling*. Geneva: International Telecommunication Union (June).

the contribution of the digital economy to economic growth, indicates that a 10 per cent increase in the Digital Economy Index⁹ is associated with a 2.64 per cent rise in GDP per capita. In other words, the model indicates that there is an economic return for a country that concentrates on developing its digital industries and promoting the digital transformation of the entire economy.

Moreover, by running the economic growth model for three groups of countries ranked by the development of their Digital Economy Index, the research indicated that the economic benefit of the digital economy is statistically significant and higher for more advanced countries. In short, the higher the level of the digital economy, the more important is its contribution to economic growth. This return to scale effect supports the notion that countries should accelerate their development of the digital economy to maximize its impact.

A second econometric model, run to estimate the impact of the digital economy on job creation, concluded that a 10 per cent increase in the Digital Economy Index increases employment by 1.07 per cent. Notwithstanding the potential social disruptions implied by the transition to a digitally intensive economy (such as job reskilling, and the disappearance of certain occupations), the aggregate level of employment appears to increase. However, when running the economic growth model by level of development of the Digital Economy Index, contrary to the return to scale found on the economic impact model described above, the contribution to employment in lesser developed countries is slightly higher than in more advanced ones. This is explained by the fact that, considering the lower cost of labour in less developed digital countries, digitalization does not immediately result in a loss of jobs due to automation. However, when considering the declining costs of digital technologies, research indicates that many developing countries would reach a point of equilibrium in terms of capital-labour substitution.¹⁰

If the digital economy is critical to economic growth and job creation, its development is no longer a choice, but an imperative for any country. Beyond this natural growth, countries need to accelerate the development of their digital economy to achieve the goal of diversification, increase competitiveness in the global economy, meet burgeoning demand, and ensure economic resilience. In this context, policymakers need to act decisively, with particular emphasis in areas such as increasing capital spending in ICT infrastructure, deepening the talent pool, strengthening innovation, promoting the local development of digital industries, and fostering the digital transformation of enterprises in the rest of the economy. All these interventions point to the need of an active policy agenda that expands well beyond the ICT scope, through a collaboration with agencies and ministries involved in other sectors, such as logistics, industrialization, rural development, health care, education. A metric capturing what countries are doing in this domain is necessary.

3.3 The need for measuring cross-sector collaboration

The growing importance of the digital economy in a nation's GDP, and the consequent development of regulatory and policy approaches that go beyond the traditional scope of ICT, is prompting the need to implement cross-sector collaboration. Countries at the forefront of digital regulation are recognizing the need to transition away from regulatory interventions

⁹ The Digital Economy Index (DEI) is structured around five pillars: digital foundation (that is to say, digital infrastructure), digital talent (which encompasses human capital), digital innovation (measuring innovative capacity and output), digital adoption among consumers and enterprises, and digital localization (economic weight of local digital industries). All five pillars are composite sub-indices of 86 indicators.

¹⁰ Katz, R., Callorda, F. and Jung, J. (2020). "The impact of automation on employment and its social implications: Evidence from Chile". *Economics of Innovation and New Technology* (in progress).

and policies discussed and implemented in silos within one agency or ministry. Going forward, regulatory and policy development frameworks will need to be implemented through cross-sector collaboration. Regulation of the ICT sector is increasingly being consolidated across several adjacent sectors, such as media and the Internet, and future coordination with other infrastructures will identify further opportunities for cross-sectoral proactive intervention.

As in the case of many other domains, cross-sector and cross-institutional collaboration is determined by the natural interconnectedness of policy goals. For example, the 2030 United Nations Agenda “rests on the interconnectedness and indivisible nature of its 17 Sustainable Development Goals and the related 169 targets”, compelling governments to approach them not “as a menu list of individual goals” but as an entire development strategy. The difficulty in their implementation for some countries is based on the lack of coordination and common focus (Renda, 2021).

Collaboration should be defined in terms of breadth and depth. Breadth of collaboration refers to whether the ICT or telecommunication regulator coordinates with authorities in charge of competition, consumer protection, finance, energy, broadcasting, spectrum, management, and Internet issues. Depth of collaboration considers whether regulators have engaged in informal, formal collaboration, or have put in place other hybrid mechanisms.

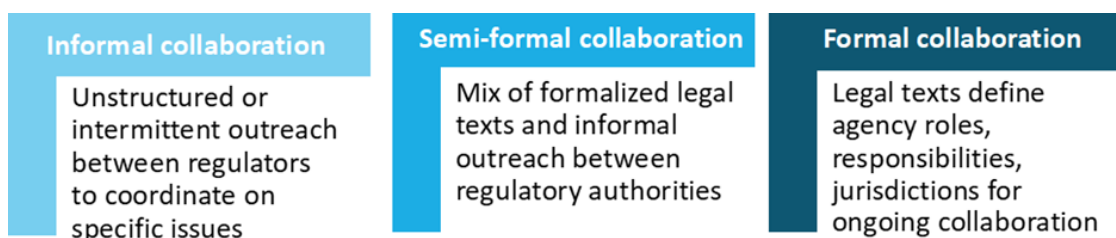
Collaboration within government involves various agencies working together on a common issue. This often entails the ICT regulator sharing responsibilities or creating strategies that overlap with other sectoral agency jurisdictions or developing a holistic digital transformation strategy with all relevant stakeholders involved (involved both in creating the strategy and in implementing it). As digitalization impacts and becomes an integral component of other sectors (such as logistics and energy), inter-institutional collaboration becomes crucial to ensuring regulatory certainty and continuity across all industries.

One important feature that cannot be captured by simply looking at inter-institutional collaboration is central coordination in the cabinet office or similar. As pointed by Renda (2021), interconnectedness implies an “unprecedented effort” in achieving institutional coherence. Institutional coherence requires government agencies to aim for a consistent policy agenda, and the capacity to address trade-offs between different alternatives.¹¹

There is no single approach to collaboration mechanisms, as indicated in Figure 3, they can range from informal to formal approaches.

¹¹ Policy definition entails trade-off of different options, and the corresponding maximization of social and economic impact once the trade-offs are assessed. A familiar example is the one related for taxation of digital goods and services. While imposition of taxes on digital goods and services could be driven by the need to collect revenues for the delivery of public services, the imposition of levies in the sector could hamper either consumer adoption of digital technologies or limit infrastructure deployment, with the consequent negative externalities.

Figure 3: Collaborative mechanisms



Source: ITU

Collaboration comes in many shapes and forms, in different countries and across various agencies. There is no uniform approach for collaboration to work and deliver a positive outcome. Sometimes, informal collaboration (such as ad-hoc coordination meetings) stands out with its flexibility but may also bring uncertainty regarding results. On the other hand, formal collaboration (such as developing cross-ministerial committees) brings a degree of stability but may prove rigid under certain circumstances. The relevance of inter-agency collaboration is prompting the need to develop a metric that measures its intensity within the development of regulation and policy making in the digital economy. Another possible form of institutional innovation is the creation of horizontal, agile processes and/or structures in charge of helping all ministries or departments in the country's digital transformation.

Box 1: A word on policy coherence and the role of the executive branch

The G5 Benchmark, in its current version, addresses inter-institutional coordination as a key requirement for policy and regulatory coherence. It should be added, though, that policy coherence is not only fulfilled by cross-institutional coordination but also through a proactive action of the executive branch at its highest level. In some countries, the President, the Prime Minister, or a collegial body reporting to the maximum level of government proactively pulls the different agencies together through agenda setting, goal formulation, and implementation monitoring processes. This political commitment at the highest level (Renda, 2021) brings all agencies and institutions together in fulfilling collaboration. This dimension is expected to be captured in greater detail in the analysis based on the benchmark and the broader narrative around it.

4. The G5 Benchmark

As explained above, the development of the G5 Benchmark was prompted by the need to measure how countries transition to a holistic, collaborative digital regulation and policy making in the digital economy. The review of the research literature on metrics measuring ICT regulation and policy making showed how they have gradually evolved from a very circumscribed notion of telecommunications trade regulation to an ICT sector view, while still having limitations in terms of addressing the digital economy policy framework. The development of ICT markets and the emergence of the digital economy as an all-encompassing sector that has taken place in the past two decades has put increased pressure to update the existing indices. Among the most important trends are:

- The State has often moved out of market operations to allow private sector initiatives to shape market dynamics, although this trend might be somewhat tempered by a re-emergence of the State because of a pandemic-induced intervention.
- Separate regulators have been created to oversee sector markets (e.g., energy, financial services) although this trend might have started three decades ago.
- In many cases, regulations are evolving from obligation-based to incentive-based.
- The decision-making processes have become more inclusive, incorporating perspectives from consumers, the private sector, and civil society.
- Consumer welfare and the impact of ICT on economic development, in addition to market concentration, have come into the centre of regulator attention.
- There is an intention to introduce data-driven evidence as the basis of policy and decision-making.
- The future impact of regulation has become a primary consideration in regulatory processes, although this is not a universal trend.

In this context, ITU seeks to define a metric that allows countries to understand their position in the transition to the next frontier in the regulatory and policy-making ICT environment. Following this requirement, the Fifth Generation Regulation (G5) was developed with the following objectives:

- to serve as a tool for policymakers and regulators that captures the essence of collaborative regulation and sets new goals for regulatory excellence;
- to measure collaboration amongst regulators and reference standards for policy and regulatory design to maximize digital transformation across the economy; and
- to enhance the ICT Regulatory Tracker by focusing on the digital economy, rather than only the telecommunication ICT sector.

The Benchmark offers perspectives on the regulatory road already travelled as well as on future pathways. Considering this, by assigning a score it aims at providing a perspective on generations of regulation and policy making, from limited inter-institutional collaboration to intense formal communication. In addition, it aims to reveal regulatory gaps, and help with building custom roadmaps for navigating the digital transformation. In doing so, it facilitates the high-value debate on the future of markets and regulation. The intention is not to measure quality of regulation, but to point to policy formulation and regulation implementation capacity. Along those lines, to avoid subjectivity in benchmark design, the identification of indicators is based on the Regulatory Best Practice Guidelines adopted by the global community of

regulators at the Global Symposium of Regulators (2003 to 2021) and the United Nations Rule of Law regarding transparency, code of conduct and freedom of expression.

The tool makes it possible to benchmark the performance of a country against trends in digital economy policy making and regulatory frameworks and to identify potential gaps, providing the bases for further reform. The benchmark does not measure the performance of the regulatory and policy frameworks or the level of development of the digital economy. It only assesses the level of framework evolution against best practices,¹² excluding any indicators related to levels of development of the digital economy.

4.1 Benchmark design

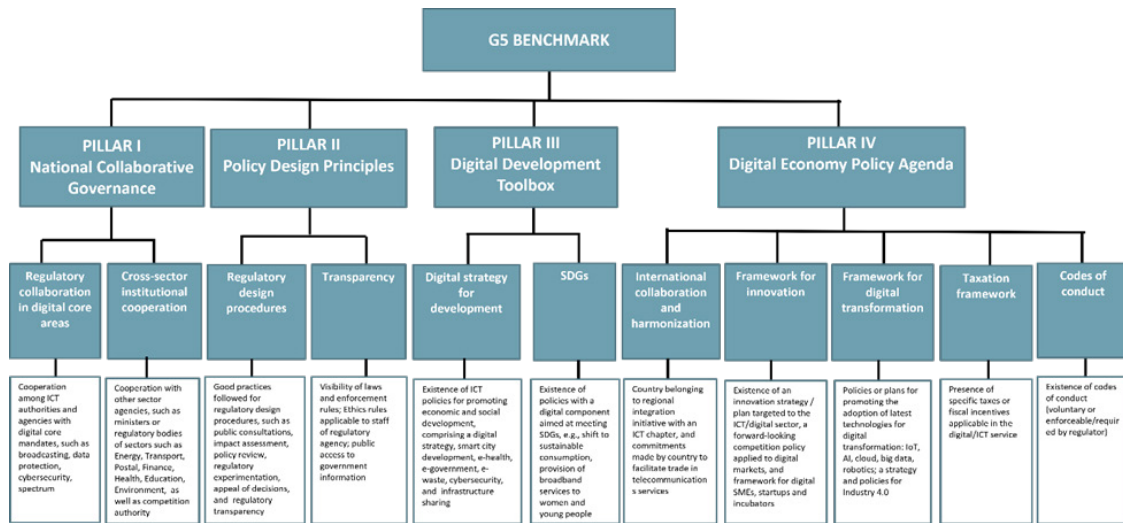
The benchmark calculates an overall score based on sixty-six indicators grouped around four pillars:

- **Pillar I: National collaborative governance** measures the breadth and depth of cross-institution collaboration between the ICT regulator and its peers. The pillar factors in the institutional set-up (agencies and their mandate) as well as practices around regulatory collaboration, formal and informal.
- **Pillar II: Policy design principles** focuses on the design of frameworks and what keeps them together. Today's effective regulators aim to rely on sound policy principles, moving from infrastructure investment to consumer protection to data privacy.
- **Pillar III: Digital development toolbox** focuses on the tools needed by regulators to stimulate development of a sustainable digital economy. It considers the new consumer needs, business models and market dynamics within the digital ecosystem.
- **Pillar IV: Digital economic policy agenda** focuses on policies and interventions taken by a country to promote the development of the digital economy. They range from an innovation framework to digital transformation, to sector taxation, and international linkages.

Each pillar is composed in turn of sub-components, all of them focused on policy and regulatory frameworks within the digital economy (see Figure 4).

¹² It is important to note that, while a set of regulatory best practices has been approved by ITU Member States at the 2021 Global Symposium of Regulators, their implementation should be considered within specific country context: in other words, some variance might occur.

Figure 4: G5 Benchmark design



Source: ITU

Each sub-component combines multiple indicators. In total, the benchmark comprises 70 indicators, although some are aggregated within an interim subcomponent, ultimately becoming 54 indicators (see Table 2).

Table 2: G5 Benchmark component structure

Pillars	Components	Sub-components	Indicators
Pillar I: National collaborative governance	Regulatory collaboration in digital core areas	Collaboration with (independent) Spectrum Authority	
		Collaboration with (independent) Broadcasting (content) Authority	
		Collaboration with cybersecurity agency	
		Collaboration with CERT (Computer Emergency Response Team)	
		Collaboration with (Independent) Data Protection Authority	
		Collaboration between ICT ministry OR ICT regulator AND Digital (Transformation) Agency/ National Agency in charge of (coordination of) the implementation of digital policies/strategies	
	Cross-sector institutional cooperation	Collaboration between ICT policy body and (independent) Finance Regulator	
		Collaboration between ICT policy body and energy regulatory authority	
		Collaboration between ICT policy body and transport regulatory authority	
		Collaboration between ICT policy body and (independent) competition authorities	
		Collaboration between ICT policy body and postal regulatory authority	
		Collaboration between ICT policy body and (independent) Consumer Protection Authority, Data Protection Authority	
		Collaboration between ICT policy body and ministry responsible for health (e-health)	
		Collaboration between ICT policy body and ministry responsible for education (e-education)	
Collaboration between ICT policy body and ministry responsible for the environment (e-waste)			
Collaboration between ICT policy body and ministry responsible for economic development OR similar focusing on a single or a subset of economic sector/s, e.g., industry, agriculture, fisheries)			

Table 2: G5 Benchmark component structure (continued)

Pillars	Components	Sub-components	Indicators	
Pillar II: Policy design principles	Regulatory design procedures	Are public consultations designed as a tool to gather feedback from national stakeholders and guide regulatory decision-making?		
		Is there a formal requirement for regulatory impact assessment before regulatory decisions are made?		
		Are the decisions of the regulatory authority (entity in charge of regulation) subject to a general administrative procedures law?		
		Can affected parties request reconsideration or appeal adopted regulations to the relevant administrative agency (all sectors)?		
		Are national policy and regulatory frameworks technology and service-neutral?		
		Regulatory experimentation	Are there mechanisms for experimentation in ICT/digital regulation?	
			Are there regulatory sandboxes for addressing digital financial services?	
		Policy reviews	Do ministries/regulatory agencies conduct ex-post policy reviews?	
			Do ministries/regulatory agencies conduct policy rolling reviews and commission monitoring reports?	
		Transparency	Are the laws (all sectors) that are currently in effect available on a single website managed by the government?	
	Is public access to information ensured and fundamental freedoms protected, in accordance with national legislation and international agreements?			
	Are there ethics rules in place that apply to the staff, including Head/Chairperson and Members/Commissioners of a national regulatory agency?			

Table 2: G5 Benchmark component structure (continued)

Pillars	Components	Sub-components	Indicators
Pillar III: Digital development toolbox	Digital strategy for development	Strategy design and implementation	Is there an overarching digital strategy in place?
			The digital strategy has mechanisms for implementation/ operational objectives and targets?
		Is broadband considered as part of universal access/service definition?	
		Is there a digital identity framework in place?	
		Is there an e-gov/ digital first for government/ national e- government strategy or equivalent?	
		Has your country adopted e-waste regulations or e-waste management standards?	
		Does a regulatory framework exist for ICT accessibility for persons with disabilities?	
		Is there a legislation/regulation for child online protection?	
		Public services	Has your country adopted any policy/legislation/regulation related to Smart Cities?
			Has your country adopted any policy/legislation/regulation related to e-Health or Smart Health?
			Has your country adopted any policy/legislation/regulation related to e-applications and/or m-applications on Education and Learning?
		Cybersecurity	Is there cybersecurity legislation or regulation?
			Has your country signed or ratified the Budapest convention on cybersecurity?
		Data protection	Are there formal data protection rules (e.g., law, regulations)?
			Has your country signed on international agreements determining jurisdiction and/or managing cross border flows on data privacy?
		Emergency tele-communications	Has your country signed or ratified the Tampere Convention for communications in emergency situations?
			Does a national emergency (telecommunications) plan exist?
		Infrastructure sharing	Does an official register or a mapping exist in your country of all tele-communication/ICT infrastructure?
			Is there any cross-sector (ICT, energy, rail and other) infrastructure sharing or fibre co-deployment regulations/ agreements/promotion initiatives in your country?
		SDGs	Is the digital strategy explicitly SDG-oriented OR has a specific mention of or reference to SDGs or other international development goals (e.g., MDGs, WSIS goals, EU strategic objectives)?
	Are there policy instruments aimed at supporting the shift to sustainable consumption and production, or coordination mechanism for sustainable consumption and production?		
	Is there a developed and operationalized global strategy for youth employment and to implement the Global Jobs Pact of the ILO?		
	Strategies for targeted groups		Broadband plan / initiative includes the promotion of the provision of broadband services to women and girls
			Broadband plan / initiative includes the promotion of the provision of broadband services to persons with disabilities
			Broadband plan / initiative includes the promotion of the provision of broadband services to youth people

Table 2: G5 Benchmark component structure (continued)

Pillars	Components	Sub-components	Indicators	
Pillar IV: Digital economy policy agenda	International collaboration and harmonization	Does your country belong to regional integration initiatives with ICT chapters?		
		Has your country made commitment to facilitate trade in telecommunication services?		
	Framework for innovation	Is there a holistic innovation policy/strategy or one tailored to the ICT/digital sector?		
		Is there a forward-looking competition policy, law or regulation applied to digital markets?		
	Framework for digital transformation	Has your country adopted a forward-looking or innovative national strategy, policy or initiative focusing on spectrum (e.g., IMT-2000, 5G, FWA, satellite, HAPS, 6 GHz)?		
		Are there policies and regulations for e-commerce/e-transactions?		
		Digital skills	Does universal service/access definition include connectivity for community telecentres or schools (primary, secondary post-secondary)?	
			Has the Universal Service Fund (USF) financed projects for connecting schools (primary, secondary, post-secondary, universities, specialized training, institutions, etc.) or multi-purpose telecentres?	
			Does the digital strategy include the educational sector?	
		Policies for specific sectors Industry 4.0	Does the digital strategy include specific mentions of multiple sectors of the economy?	
			Has your country adopted any policy/legislation/regulation related to e-apps and/or m-apps linked to agriculture/science/financial services?	
			Does it include a strategy, policy or initiative focusing on the Internet of Things (IoT)? Or are any measures applied regarding spectrum management and availability for IoT?	
			Has your country adopted a generic policy/legislation/regulation related to cloud and edge computing?	
		Taxation framework	Are there specific taxes on the telecom/digital sector OR on Internet services/devices/SIM cards/airtime recharge?	
	Are there regulatory incentives targeted at network operators or other digital market players?			
	Codes of conduct	Do codes of conduct exist (voluntary or enforceable/required by regulator)?		

Source: ITU

Box 2: A word on taxation

The G5 Benchmark, in its current version, covers the issue of digital economy taxation in two ways: the imposition of specific taxes on the telecommunication/digital sectors or on Internet services, and the existence of fiscal incentives, such as exemptions, whose aim is to promote capital spending and/or consumer adoption. From a scoring standpoint, the first area places a negative score on the existence of specific taxes and a positive one on the presence of incentives. This evidently simplifies the issue of fiscal policy. First, the indicator does not address the diversity of taxes imposed on firms and consumers within the digital economy, ranging from import duties on equipment, taxes on consumer devices and services, from cellular telecommunications to video-streaming. Second, by oversimplifying the issue, the indicators do not address key questions such as:

- What is the appropriate level of taxation on capital equipment purchased by telecommunication operators?
- How should Internet sales be taxed?
- How should consumption of digital goods be taxed?
- Should the consumer purchasing wireless devices and personal computers be taxed?
- Should the providers of digital platforms be taxed at the country where revenues are generated, or should they benefit from international rules that allow them to take corporate tax exemptions in certain locations?
- Should Internet service providers pay taxes the same way as telecommunication carriers?

These dimensions should be captured in greater detail in the analysis based on the benchmark and the broader narrative around it.

4.2 Benchmark construction methodology

As is the case in the development of any composite metric, the construction of the G5 Benchmark entailed addressing three main technical issues: scoring, weighting, and aggregation:

- Scoring relates to how regulatory and policy measures are transformed from qualitative to quantitative information.
- Weighting captures the relative importance of each indicator.
- The aggregation method determines how weights are applied to scores for calculating the index number.

In the case of scoring, each indicator was assigned a code between 0 and 2, where 2 is the best possible scenario based on internationally recognized best practices. Those were laid out in the 2019 and 2020 Global Symposium of Regulators Best Practices Guidelines (“Fast forward digital connectivity for all” and “The gold standard for digital regulation”), as well as the series of GSR best practice guidelines adopted by the global community of ICT regulators since 2003.

The source of qualitative data used for scoring was self-reported information compiled from the answers to the ITU World Telecommunications Regulatory Survey¹³, desktop research, World Bank sources, the United Nations sources (UNCTAD, UNCTC), World Trade Organization (WTO), the Consultative Group to Assist the Poor (CGAP) and the Council of Europe, complemented with direct outreach to ICT regulatory authorities. The score for each indicator was determined according to the detailed methodology included in Annex B. In the case data is not available for

¹³ The G5 Benchmark is based on self-reported information gathered via official surveys to ITU Member State administrations, datasets compiled by international organizations as well as desktop research based on official government sources and direct outreach to national telecommunication/ICT regulatory authorities. Official data from Member State administrations has been verified to the extent reasonably feasible. It is understandable that self-reported responses can be affected by a subjectivity bias, nevertheless, respondents should have the ability to make appropriate judgement. That being said, the responses were validated, to the extent possible, by desk-based research.

a particular indicator in each country, the score is treated as zero. While this penalizes countries with omitted values, it also assumes that non-available data and no answer to a survey question indicates that the country has not adopted the given policy instrument.

The aggregation of the final score is calculated by summing up the scores of each pillar. Given that each pillar has a different composition in terms of indicators, implicitly their relative importance over the overall score is determined by the number of indicators within. The score is normalized to reach values between zero and 100, according to the following formula:

$$Overall\ Score = \left(\frac{\sum_{i=1}^{i=4} Score\ Pillar_i}{Max\ possible\ score} \right) * 100$$

Based on the scoring methodology, the maximum score attainable by a country is 100 and would be composed of the pillar scores given in Table 3.

Table 3: Maximum scores for each pillar

Pillars	Component	Maximum component score	Maximum pillar score	Maximum score	Maximum score (normalized)
Pillar I: National collaborative governance	Cooperation among ICT bodies	12	32	108	100
	Cooperation with other sector agencies	20			
Pillar II: Policy design principles	Regulatory design procedures	14	20		
	Transparency	6			
Pillar III: Digital development toolbox	Digital strategy for development	24	32		
	SDGs	8			
Pillar IV: Digital economy policy agenda	International collaboration	4	24		
	Framework for innovation	4			
	Framework for digital transformation	10			
	Taxation framework	4			
	Code of conduct	2			

Source: ITU

The G5 Benchmark was calculated for 193 countries for 2021. Once calculated, the final G5 Benchmark score was split into four stages of collaborative digital regulation (see Table 4 for an indicative summary of the characteristics of each stage).

Table 4: Fulfilment of G5 Benchmark thresholds (by pillar) corresponding to the level of readiness for digital transformation

Readiness level	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda	Maximum score	Minimum score
Limited	<ul style="list-style-type: none"> No collaboration No entity in charge 	<ul style="list-style-type: none"> Public consultations are not undertaken or required by law No formal requirement for a regulatory impact assessment The decisions of the regulatory authority are not subject to a general administrative procedures law Affected parties may not request reconsideration or appeal of regulations adopted by the administrative agency Authorization/operating licences or spectrum, are not technology and service neutral No mechanisms for regulatory experimentation or sandboxes exist No ex-post regulatory policy reviews 	<ul style="list-style-type: none"> No overarching digital strategy in place No digital identity framework No e-government strategy in place No existence of policy/legislation/regulation for smart cities, e-health, and applications for education and learning No cybersecurity/cybercrime legislation and/or regulation in existence There is neither a data protection law nor a data protection agency No national emergency telecommunications plan 	<ul style="list-style-type: none"> No holistic innovation strategy tailored to the ICT sector No forward-looking competition policy, law or regulation applied to digital markets No policies and regulations for e-commerce transactions in place No strategy, policy or initiative focusing on IoT Taxes on the telecommunication and digital sector exist 	30	0

Table 4: Fulfilment of G5 Benchmark thresholds (by pillar) corresponding to the level of readiness for digital transformation (continued)

Readiness level	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda	Maximum score	Minimum score
Transitioning	<ul style="list-style-type: none"> Activities carried under the same ministry Informal collaboration 	<ul style="list-style-type: none"> Public consultations exist but there is no requirement/it is unclear what the timeline and process is and whether the regulator incorporates results in their decision-making/ there is no obligation to consider/respond to all comments Regulatory Impact Assessment is required but it is not consistently applied to all decisions There is an administrative review by the regulatory body Authorization/operating licences or spectrum, are either technology or service neutral (with exceptions) 	<ul style="list-style-type: none"> Overarching digital strategy expired, or being planned, is part of a broader development strategy, only covering specific plans or not clearly implemented Partial measures regarding cybersecurity and cybercrime regulation Data protection law exists but a data protection agency has not been established 	<ul style="list-style-type: none"> Forward looking competition policy, law or regulation applied to digital markets, or spectrum management processes in the process of definition Rules at regional level exist but country has not yet formulated national rules to match them, or no monitoring and enforcement of rules exist or, if they do, they have limited provisions 	60	30

Table 4: Fulfilment of G5 Benchmark thresholds (by pillar) corresponding to the level of readiness for digital transformation (continued)

Readiness level	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda	Maximum score	Minimum score
Advanced	<ul style="list-style-type: none"> Formal collaboration (Joint Program of Committee) 	<ul style="list-style-type: none"> Public consultations designed as a tool to gather feedback from national stakeholders and guide most regulatory decision-making Regulatory Impact Assessment is required for some decisions The decisions of the regulatory authority are subject to a general administrative procedures law Affected parties may request reconsideration or appeal of regulations adopted by the administrative agency to the judiciary Authorization, operating licences, and spectrum are technology and service neutral Frequent ex-post policy reviews Laws that are currently in effect available on multiple websites managed by the government 	<ul style="list-style-type: none"> Existing of current digital strategy in place Digital identity framework in place Existence of a national e-government strategy or equivalent Existence of policy/legislation/regulation for some areas of digital economy Full cybersecurity and cybercrime legislation and regulatory framework Existence of a law and data protection agency Existence of a National Emergency Telecommunications Plan Mention of SDG or other international development goals mentioned in the digital strategy 	<ul style="list-style-type: none"> Holistic but general innovation strategy Competition policy, law or regulation applied to digital markets or spectrum management processes Regulations for e-commerce transactions in place Strategy, and initiative focusing on IoT Selective tax exemptions for the telecommunications and digital sectors 	80	60

Table 4: Fulfilment of G5 Benchmark thresholds (by pillar) corresponding to the level of readiness for digital transformation (continued)

Readiness level	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda	Maximum score	Minimum score
Leading	<ul style="list-style-type: none"> Formal collaboration (Joint Program of Committee) with regular meetings and high level participation 	<ul style="list-style-type: none"> Public consultations designed as a tool to gather feedback from national stakeholders and guide all regulatory decision-making Regulatory Impact Assessment is required for all major decisions The decisions of the regulatory authority are subject to a general administrative procedures law Affected parties may request reconsideration or appeal of regulations adopted by the administrative agency to an independent body or the judiciary Authorization, operating licences, and spectrum are technology and service neutral Mechanisms for regulatory experimentation or sandboxes exist Systematic ex-post policy reviews Laws that are currently in effect available on a single website managed by the government 	<ul style="list-style-type: none"> Existing of current and updated digital strategy in place Digital identity framework in place Existence of a national e-govern- ment strategy or equivalent Existence of policy/legislation/ regulation for Smart Cities, e-Health, and applications for education and learning Full cybersecurity and cybercrime legislation and regulatory frame- work Existence of a law and data pro- tection agency Existence of a National Emergency Telecommunications Plan Mention of SDG or other inter- national development goals mentioned in the digital strategy 	<ul style="list-style-type: none"> Holistic innovation strategy tailored to the ICT sector Forward looking com- petition policy, law or regulation applied to digital markets or spec- trum management processes Policies and regulations for e-commerce transac- tions in place Strategy, policy, or initia- tive focusing on IoT Overarching tax exemptions for the tele- communications and digital sectors 	100	80

Note: The Table depicts likely scenarios to illustrate the various stages. Country circumstances may differ from the outline provided above.

Source: ITU

4.3 Test of benchmark robustness

In this section, the G5 Benchmark is analysed from a statistical viewpoint to assess the theoretical coherence of the conceptual framework and the impact of its key assumptions on the final country scores and rankings. The procedures to be followed in this section are based on the analysis carried out by ITU (2020) for the ICT Regulatory Tracker and in Nordas et al. (2014) for the OECD. The results presented herein suggest that the benchmark is sound, coherent, and robust, from a conceptual and statistical position.

4.3.1 Benchmark framework

The G5 Benchmark is composed of 54 indicators (some of them being an aggregation of multiple indicators in a composite one), grouped into four pillars: i) National collaborative governance, ii) Policy design principles, iii) Digital development, and iv) Digital economy policy agenda. The distribution of indicators and maximum scores by pillars is presented in Table 5. The overall score is the sum of the four pillar scores. Every pillar contributes to the score proportionally to the number of indicators it contains. The sum of the maximum pillar scores equals 100 (after normalization), which is the maximum theoretical score any country can achieve.

Table 5: Distribution of indicators by pillar and maximum scores

Pillar	Name	Number of indicators	Max score	Max score (over 100)
I	National collaborative governance	16	32	29.63
II	Policy design principles	10	20	18.52
III	Digital development	16	32	29.63
IV	Digital economy policy agenda	12	24	22.22
G5 Benchmark		54	108	100

Source: ITU

4.3.2 Data availability and missing values

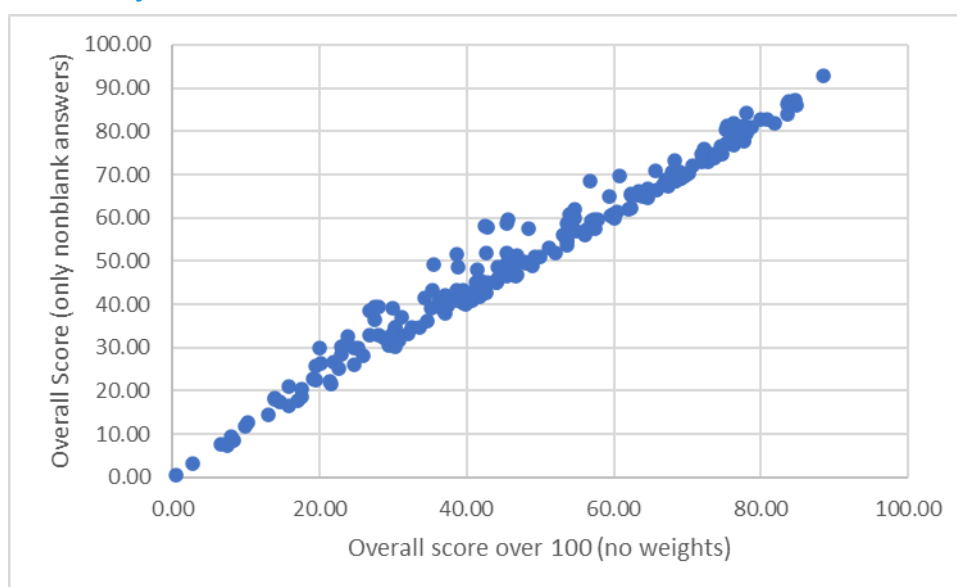
To deal with missing values, the criteria followed was to implicitly treat cells with missing values as if a zero value had been imputed. Given that most information comes from country surveys and desktop research, the control procedure is two-fold:

- On the one hand, a no answer from a country questionnaire can be reasonably interpreted as a 'no'. As pointed out in ITU (2020) for the case of the Regulatory Tracker, it is probably correct to assume that missing values are equal to zero, since for example some survey respondents may prefer leaving blanks rather than stating that their country has not adopted a given policy instrument and implicitly, does not comply with international best practices.
- On the other hand, if no further evidence can be found in the additional desktop research, then it seems appropriate to consider that the respective condition stipulated in the indicator is not verified for that country.

To check an alternative procedure, the benchmark score was calculated by relying only in the available information. The score was computed assuming that the maximum value (100)

can be attributed to a certain country if it reaches the maximum score on each of the non-blank responses (normalization by the number of non-blank observations). However, when comparing this result with that of the original procedure (Figure 5), important distortions are produced. Several points lie outside the diagonal line, which suggest that the results will change considerably. This provides support to considering missing information as zero.

Figure 5: Comparison of score assuming missing data as zero and score calculated only with non-blank observations.



Source: ITU

As shown in Table 6, most of the missing values in the data set are concentrated in indicators I06, I16, II06b, II07a, II07b, III03, III08c, III15, III16a, III16c, IV07a, IV07c and IV8b, where missing values account for over 20 per cent. This compilation of missing observations will allow to focus data collection and reporting efforts in future versions of the benchmark.

Table 6: Missing observations by indicator

Pillar I: National collaborative governance			Pillar II: Policy design principles			Pillar III: Digital development toolbox			Pillar IV: Digital economy policy agenda		
Indicator	Number missing	% Missing	Indicator	Number missing	% Missing	Indicator	Number missing	% Missing	Indicator	Number missing	% Missing
I01	5	2.59%	II01	4	2.07%	III01a	22	11.40%	IV01	0	0.00%
I02	4	2.07%	II02	0	0.00%	III01b	37	19.17%	IV02	0	0.00%
I03	16	8.29%	II03	22	11.40%	III02	24	12.44%	IV03	20	10.36%
I04	33	17.10%	II04	15	7.77%	III03	47	24.35%	IV04	18	9.33%
I05	1	0.52%	II05	10	5.18%	III04	1	0.52%	IV05	12	6.22%
I06	41	21.24%	II06a	14	7.25%	III05	11	5.70%	IV06	14	7.25%
I07	0	0.00%	II06b	115	59.59%	III06	5	2.59%	IV07a	61	31.61%
I08	1	0.52%	II07a	49	25.39%	III07	26	13.47%	IV07b	14	7.25%

Table 6: Missing observations by indicator (continued)

Pillar I: National collaborative governance			Pillar II: Policy design principles			Pillar III: Digital development toolbox			Pillar IV: Digital economy policy agenda		
Indicator	Number missing	% Missing	Indicator	Number missing	% Missing	Indicator	Number missing	% Missing	Indicator	Number missing	% Missing
I09	27	13.99%	II07b	49	25.39%	III08a	12	6.22%	IV07c	70	36.27%
I10	1	0.52%	II08	5	2.59%	III08b	14	7.25%	IV08a	26	13.47%
I11	11	5.70%	II09	0	0.00%	III08c	46	23.83%	IV08b	47	24.35%
I12	5	2.59%	II10	31	16.06%	III09a	3	1.55%	IV09a	11	5.70%
I13	24	12.44%				III09b	0	0.00%	IV09b	10	5.18%
I14	28	14.51%				III10a	16	8.29%	IV09c	10	5.18%
I15	2	1.04%				III10b	0	0.00%	IV10	12	6.22%
I16	48	24.87%				III11a	0	0.00%	IV11	3	1.55%
						III11b	21	10.88%	IV12	24	12.44%
						III12a	3	1.55%			
						III12b	26	13.47%			
						III13	29	15.03%			
						III14	0	0.00%			
						III15	75	38.86%			
						III16a	71	36.79%			
						III16b	35	18.13%			
						III16c	72	37.31%			

Source: ITU

Country inclusion is decided based on the available data while providing a reasonable depiction of the situation. Following a criterion similar to that of the ICT Regulatory Tracker, countries are included if the available data covers at least 50 per cent of data required for each of the four pillars. Following the experience of ITU in the Regulatory Tracker, the use of thresholds provides for a robust metric of the benchmark. Considering this criteria, 193 countries were included in the sample, as detailed in Table 7.

Table 7: Countries included in the G5 Benchmark

Afghanistan	Chad	Ghana	Liberia	Norway	South Sudan
Albania	Chile	Greece	Libya	Oman	Spain
Algeria	China	Grenada	Liechtenstein	Pakistan	Sri Lanka
Andorra	Colombia	Guatemala	Lithuania	Palestine*	Sudan
Angola	Comoros	Guinea	Luxembourg	Panama	Suriname

Table 7: Countries included in the G5 Benchmark (continued)

Antigua and Barbuda	Congo (Rep. of the)	Guinea-Bissau	Madagascar	Papua New Guinea	Sweden
Argentina	Costa Rica	Guyana	Malawi	Paraguay	Switzerland
Armenia	Côte d'Ivoire	Haiti	Malaysia	Peru	Syrian Arab Republic
Australia	Croatia	Honduras	Maldives	Philippines	Tajikistan
Austria	Cuba	Hong Kong, China	Mali	Poland	Tanzania
Azerbaijan	Cyprus	Hungary	Malta	Portugal	Thailand
Bahamas	Czech Republic	Iceland	Marshall Islands	Qatar	Timor-Leste
Bahrain	Dem. Rep. of the Congo	India	Mauritania	Romania	Togo
Bangladesh	Denmark	Indonesia	Mauritius	Russian Federation	Tonga
Barbados	Djibouti	Iran (Islamic Republic of)	Mexico	Rwanda	Trinidad and Tobago
Belarus	Dominica	Iraq	Micronesia	Saint Kitts and Nevis	Tunisia
Belgium	Dominican Rep.	Ireland	Moldova	Saint Lucia	Turkey
Belize	Ecuador	Israel	Monaco	Saint Vincent and the Grenadines	Turkmenistan
Benin	Egypt	Italy	Mongolia	Samoa	Tuvalu
Bhutan	El Salvador	Jamaica	Montenegro	San Marino	Uganda
Bolivia	Equatorial Guinea	Japan	Morocco	Sao Tome and Principe	Ukraine
Bosnia and Herzegovina	Eritrea	Jordan	Mozambique	Saudi Arabia	United Arab Emirates
Botswana	Estonia	Kazakhstan	Myanmar	Senegal	United Kingdom
Brazil	Eswatini	Kenya	Namibia	Serbia	United States of America
Brunei Darussalam	Ethiopia	Kiribati	Nauru	Seychelles	Uruguay
Bulgaria	Fiji	Korea (Rep. of)	Nepal (Republic of)	Sierra Leone	Uzbekistan
Burkina Faso	Finland	Kuwait	Netherlands	Singapore	Vanuatu
Burundi	France	Kyrgyzstan	New Zealand	Slovakia	Venezuela

Table 7: Countries included in the G5 Benchmark (continued)

Cabo Verde	Gabon	Lao P.D.R.	Nicaragua	Slovenia	Viet Nam
Cambodia	Gambia	Latvia	Niger	Solomon Islands	Yemen
Cameroon	Georgia	Lebanon	Nigeria	Somalia	Zambia
Canada	Germany	Lesotho	North Macedonia	South Africa	Zimbabwe
Central African Rep.					

Source: ITU

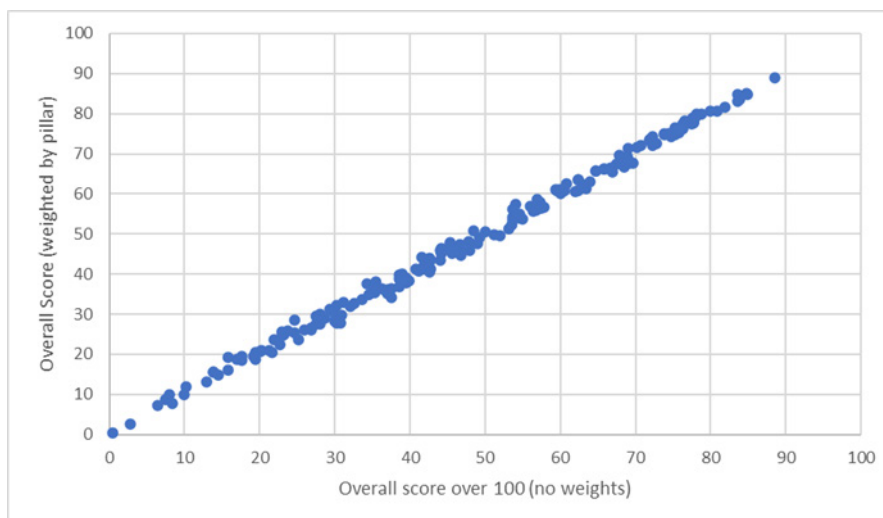
Note: The status of the State of Palestine in ITU is governed by Resolution 99 (Rev. Dubai, 2018) of the ITU Plenipotentiary Conference.

4.3.3 Normalization and weighting

To check the robustness of the results, each of the four pillar scores could be normalized according to the min-max formula. Thus, the raw pillar score for any given country, can be scaled into a normalized pillar score by subtracting from the raw pillar the theoretical minimum score for that pillar (zero) and dividing by the difference between the theoretical maximum and the theoretical minimum value for the pillar. By following this procedure, each of the four pillars would now have a minimum of zero, and a maximum of 100, and then calculate the overall score as the weighted average of those normalized pillar scores.

The original score can then be compared with a normalized and weighted score, to assess if substantial changes occur. The weights to be used for this calculation can be, for instance, equal to each pillar: 25 per cent each. This marks a departure from the original scoring procedure without weights, as each pillar had a relative importance according to the number of indicators included within each one. As shown in Figure 6, the overall scores following this approach are very close to the original scores.

Figure 6: Comparison of score without weights and score with equally weighted pillars



Source: ITU

4.3.4 Statistical coherence

To check the statistical coherence of the results, a correlation analysis was carried out to evaluate whether the indicators fit statistically in their respective pillar. As expected, results in Table 8 confirm that the grouping of indicators into pillars is statistically coherent, since individual indicators tend to be more correlated to their own pillar than to any other.

Table 8: Correlation matrix among indicators and pillars

Indicators	Pillar I	Pillar II	Pillar III	Pillar IV
I01	0.50	0.28	0.28	0.24
I02	0.48	0.43	0.34	0.35
I03	0.35	0.18	0.18	0.12
I04	0.66	0.54	0.57	0.62
I05	0.59	0.47	0.46	0.53
I06	0.52	0.26	0.26	0.25
I07	0.20	0.13	0.10	0.12
I08	0.52	0.32	0.41	0.37
I09	0.50	0.34	0.41	0.41
I10	0.55	0.52	0.49	0.44
I11	0.48	0.31	0.42	0.39
I12	0.54	0.38	0.40	0.40
I13	0.72	0.34	0.44	0.42
I14	0.73	0.36	0.47	0.47
I15	0.65	0.28	0.39	0.39

Table 8: Correlation matrix among indicators and pillars (continued)

Indicators	Pillar I	Pillar II	Pillar III	Pillar IV
I16	0.54	0.20	0.18	0.23
II01	0.39	0.60	0.41	0.42
II02	0.29	0.61	0.32	0.31
II03	0.36	0.57	0.37	0.33
II04	0.08	0.42	0.21	0.26
II05	0.59	0.61	0.56	0.49
II06a	0.22	0.47	0.43	0.50
II06b	0.72	0.76	0.79	0.80
II07a	0.37	0.50	0.41	0.53
II07b	0.24	0.32	0.26	0.29
II08	0.28	0.63	0.43	0.44
II09	0.29	0.60	0.43	0.41
II10	0.50	0.55	0.44	0.42
III01a	0.37	0.30	0.50	0.46
III01b	0.29	0.32	0.42	0.36
III02	0.34	0.25	0.52	0.38
III03	0.20	0.20	0.36	0.27
III04	0.47	0.65	0.72	0.76
III05	0.51	0.59	0.67	0.63
III06	0.33	0.48	0.66	0.55
III07	0.35	0.27	0.58	0.39
III08a	0.25	0.37	0.52	0.46
III08b	0.26	0.28	0.43	0.35
III08c	0.17	0.25	0.42	0.30
III09a	0.33	0.35	0.53	0.49
III09b	0.45	0.54	0.58	0.56
III10a	0.25	0.42	0.51	0.43
III10b	0.29	0.37	0.34	0.38
III11a	0.17	0.24	0.35	0.26
III11b	0.26	0.28	0.36	0.33
III12a	0.31	0.48	0.52	0.50
III12b	0.28	0.44	0.52	0.47
III13	0.36	0.32	0.50	0.40
III14	0.33	0.40	0.54	0.48
III15	0.53	0.56	0.66	0.59

Table 8: Correlation matrix among indicators and pillars (continued)

Indicators	Pillar I	Pillar II	Pillar III	Pillar IV
III16a	0.00	0.00	0.13	-0.03
III16b	0.16	0.14	0.42	0.26
III16c	0.02	0.02	0.22	0.02
IV01	0.36	0.37	0.41	0.49
IV02	0.42	0.49	0.51	0.65
IV03	0.49	0.56	0.69	0.76
IV04	0.38	0.57	0.58	0.65
IV05	0.37	0.60	0.68	0.73
IV06	0.08	0.31	0.31	0.32
IV07a	-0.17	-0.15	-0.17	-0.13
IV07b	-0.12	-0.02	-0.02	-0.10
IV07c	0.12	0.18	0.10	0.15
IV08a	0.55	0.36	0.55	0.58
IV08b	0.09	0.23	0.36	0.24
IV09a	0.27	0.45	0.62	0.60
IV09b	0.16	0.24	0.32	0.32
IV09c	0.25	0.40	0.53	0.49
IV10	0.40	0.19	0.26	0.42
IV11	0.46	0.40	0.40	0.55
IV12	0.36	0.43	0.50	0.61

Source: ITU

The four pillars are also strongly correlated to each other and to the overall score, which suggests that the benchmark is well balanced in its four pillars (Table 9).

Table 9: Correlation matrix among pillars and overall score

	Pillar I	Pillar II	Pillar III	Pillar IV	Overall
Pillar I	1	0.58	0.67	0.69	0.85
Pillar II	0.58	1	0.73	0.74	0.83
Pillar III	0.67	0.73	1	0.87	0.93
Pillar IV	0.69	0.74	0.87	1	0.93
Overall	0.85	0.83	0.93	0.93	1

Source: ITU

4.3.5 Impact of modelling assumptions

In this section, the extent to which the final ranks would be affected by changes in the weights assigned to each pillar has been assessed. Table 10 shows the different sources of uncertainty considered for the analysis. The 2 000 simulated scenarios used in the analysis result from the randomly generated weights within an interval of +/- 20 per cent of the reference values provided by the original scoring procedure.

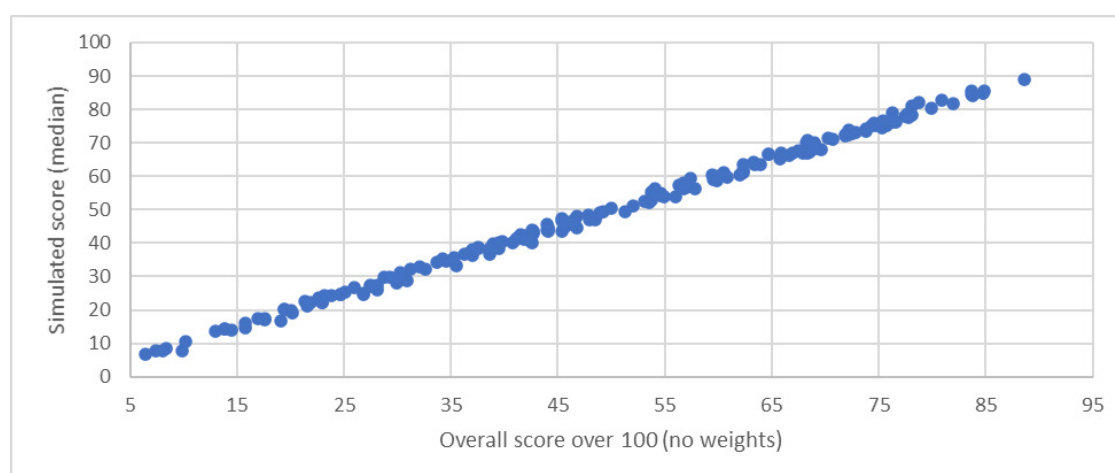
Table 10: Conditions for uncertainty analysis

Pillar	Indicators	Reference values (based on number of indicators per pillar)	Confidence interval	
			Min	Max
Pillar I	16	29.6%	23.7%	35.6%
Pillar II	10	18.5%	14.8%	22.2%
Pillar III	16	29.6%	23.7%	35.6%
Pillar IV	12	22.2%	17.8%	26.7%

Source: ITU

By comparing the overall score of each country for the baseline scenario and the median score of the 2 000 simulated values, it seems clear in Figure 7 that the results seem to be consistent, reaching almost identical scores.

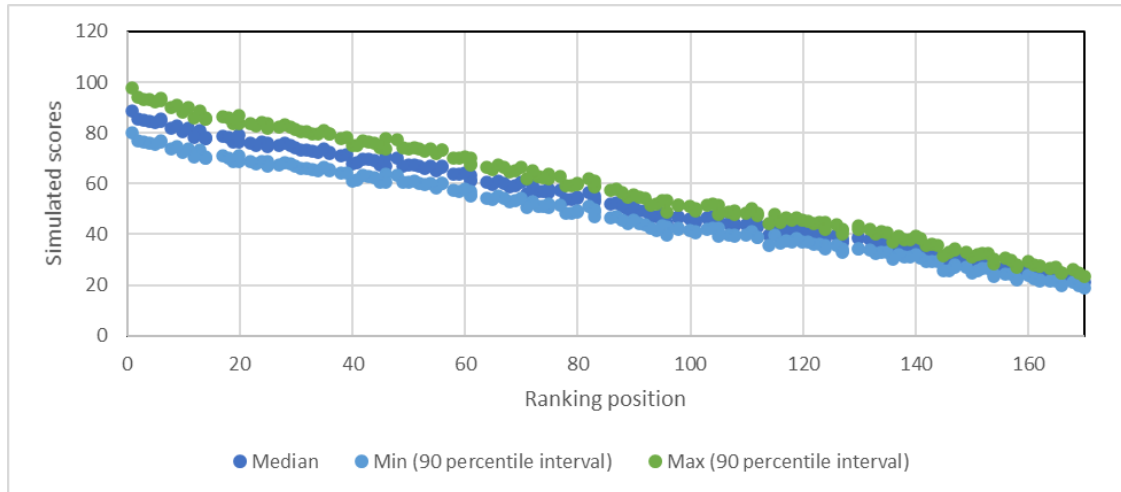
Figure 7: Comparison of score from the baseline procedure and median score from 2 000 simulations



Source: ITU

Figure 8 reflects the uncertainty analysis by including median ranks and 90 per cent confidence intervals computed across the simulated 2 000 scenarios. With very few exceptions, the width of the confidence intervals is narrow enough. Only 12 per cent of the country's present confidence interval widths over 15 points in terms of the final score.

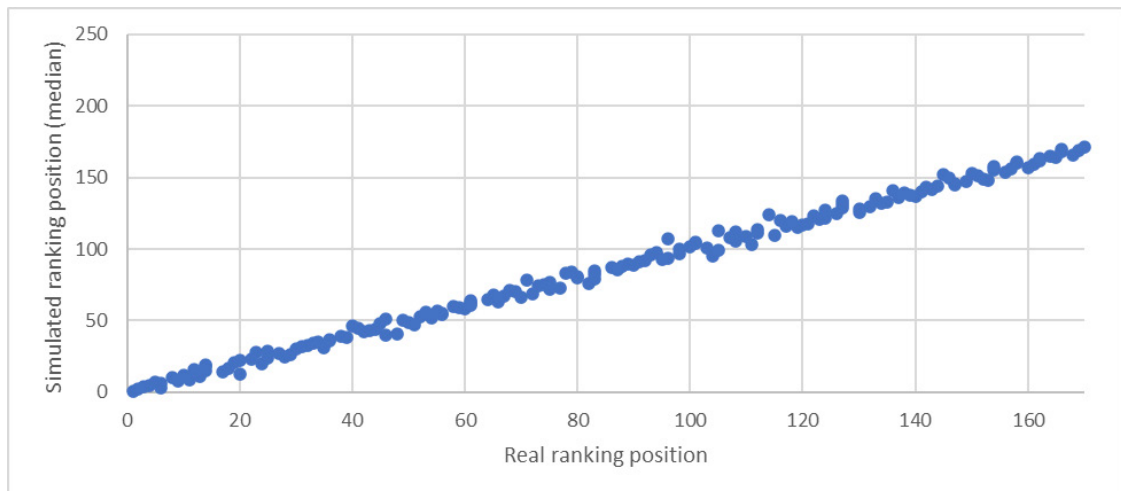
Figure 8: Median and 90 per cent confidence interval for scores from 2 000 simulations



Source: ITU

The robustness is even more clear when analysing the original ranking position in comparison with the ranks from the simulated median values (Figure 9). Only 11 per cent of the sample changes more than four positions in the rank when the simulation is carried out.

Figure 9: Comparison of rank position from the baseline procedure and median rank from 2 000 simulations



Source: ITU

This analysis confirms the robustness of the benchmark, as it is not influenced by the assumptions on importance of the pillars and by the aggregation procedure.

4.3.6 Statistical robustness assessment

The statistical robustness assessment underscores the fact that the conceptual structure of the benchmark is supported by the results of the analysis. The grouping of indicators into pillars is statistically coherent, and the overall score appears to be a good and balanced summary measure of its four underlying pillars. Moreover, the robustness of the benchmark with respect

to changes in the modelling assumptions is supported also by the results of the uncertainty and sensitivity analysis.

Box 3: Collaboration between the public and private sectors

The pace of development of the digital economy is dependent upon the collaboration between the public and private sectors. This collaboration is based on a joint formulation of goals, the sharing of planning responsibility, and the potential for co-regulation, among other areas. Fulfilling such actions becomes critical for the enrolment of the private sector in digital economy development strategies. A conventional approach of collaborating with the private sector is fulfilled through public consultations, the existence of which is captured in the current version of the benchmark. However, in some countries private sector involvement is more intense (for example, by ensuring that the private sector occupies some positions at digital economy planning committees). It is expected that this dimension will be captured in greater detail in the analysis based on the benchmark and the broader narrative around it.

5. Benchmark results and interpretation

5.1 A worldwide perspective

The calculation of the benchmark identifies countries by threshold level (see Table 11). While a sizable group of countries have reached a significant G5 Benchmark score (67 countries or 34 per cent of the sample), most countries still need to fulfil the conditions reflected in the leading or advanced threshold scores.

Table 11: Number of countries by G5 Benchmark threshold (by region)

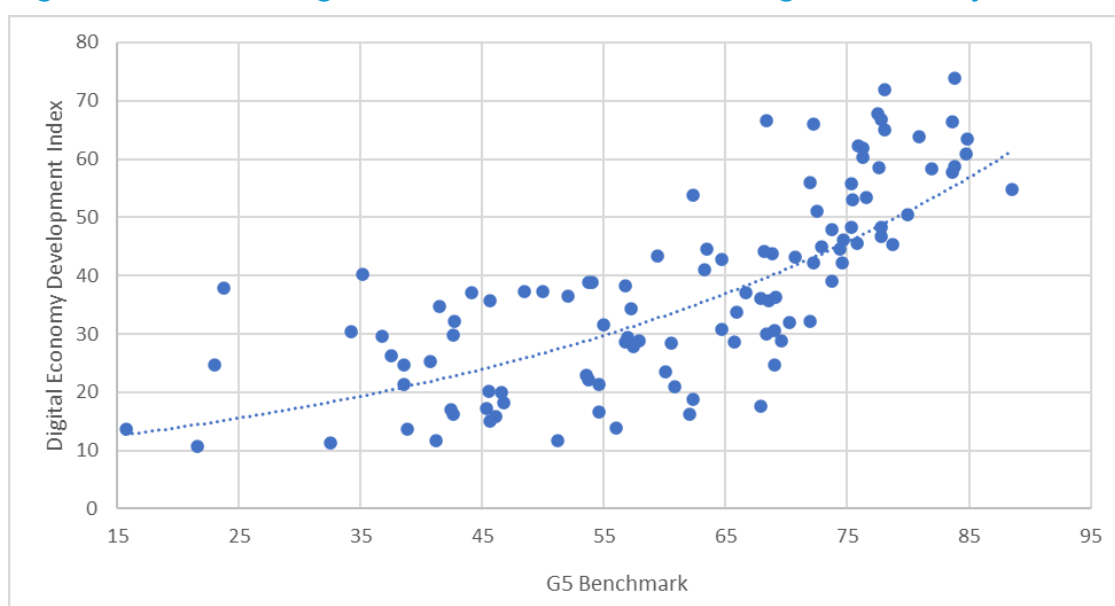
Region	Leading	Advanced	Transitional	Limited	Total
Africa	0	5	27	12	44
Americas region (North America) ¹	1	1	0	0	2
Americas region (Latin America and the Caribbean) ¹	0	9	16	8	33
Arab States	0	3	11	8	22
Asia-Pacific	3	10	13	12	38
CIS	0	0	6	3	9
Europe	5	30	9	1	45
Total	9	58	82	44	193

Source: ITU

A key question regarding the need to progress along this development path is the assessment of its potential benefit. In other words, what is the payback of migrating to an advanced or leading level of G5 collaborative regulation in terms of the development of the digital economy? At an aggregate level, and as expected, it appears that the high G5 Benchmark score is associated with advanced digital economy development¹⁴ (see Figure 10).

¹⁴ The Digital Economy Index (DEI) is a Strategy&-PwC composite index, based on 86 indicators structured around five pillars: (i) Digital Foundations, which consists of investments in Information and Communications infrastructure, increased connectivity relating to digital coverage, broadband service quality and affordability, and enabling digital regulations; (ii) Digital Talent measures human capital development initiatives; (iii) Digital Innovation relates to the scale of research and development (R&D), and the prevalence of successful start-ups and incubation ecosystems, including adequate availability of funding sources, mentoring, and service providers; (iv) Digital Adoption measures the adoption of services, devices and online platforms by individuals, enterprises and governments; (v) Digital Localization refers to the level of domestically generated digital products and services, as well as digital content and apps. This is measured through the importance of locally developed Internet platforms and content as well as the export of digital goods and services.

Figure 10: Correlating the G5 Benchmark and the Digital Economy Index¹⁵



Source: ITU

The correlation analysis presented in Figure 10 might indicate that, in addition to the direct relation between the G5 Benchmark and the Digital Economy Index, once countries exceed the 55-score threshold in the benchmark, the digital economy begins to grow at a faster pace. While this analysis would suggest a causal relationship between regulation and policy framework and digital economy development, more research is required to understand this link.

Can any regional trends be seen in terms of areas depicting higher G5 scores? Europe is the region with more countries depicting a leading and advanced regulatory and policy framework (14 out of top twenty world countries), indicating that the region appears to be at the highest level of regulatory and policy framework shaping the digital economy. However, six countries out of the top twenty belong to regions outside Europe (the Asia-Pacific region has four, and the Americas region has two) (see Table 12).

Table 12: G5 Benchmark: Top-twenty countries

Country	Region	G5 Benchmark (max: 100)	Pillar I: National collaborative governance (max: 29.63)	Pillar II: Policy design principles (max: 18.52)	Pillar III: Digital development toolbox (max: 29.63)	Pillar IV: Digital economy policy agenda (max: 22.22)
Germany	Europe	88.58	27.78	17.59	24.38	18.83
United Kingdom	Europe	84.88	28.70	16.67	22.22	17.28
Canada	Americas	84.72	24.07	17.59	26.08	16.98

¹⁵ El-Darwiche, et al., 2021

Table 12: G5 Benchmark: Top-twenty countries (continued)

Country	Region	G5 Benchmark (max: 100)	Pillar I: National collaborative governance (max: 29.63)	Pillar II: Policy design principles (max: 18.52)	Pillar III: Digital development toolbox (max: 29.63)	Pillar IV: Digital economy policy agenda (max: 22.22)
Korea (Rep. of)	Asia-Pacific	83.80	25.93	15.74	24.54	17.59
Singapore	Asia-Pacific	83.80	25.93	14.81	22.38	20.68
Estonia	Europe	83.64	23.15	17.59	24.07	18.83
Finland	Europe	83.64	25.00	13.89	25.62	19.14
Australia	Asia-Pacific	81.94	28.70	15.74	21.14	16.36
Netherlands	Europe	80.86	25.93	14.81	22.22	17.90
Lithuania	Europe	79.94	27.78	16.67	18.52	16.98
Italy	Europe	78.70	24.07	16.67	20.37	17.59
United States	Americas	78.09	19.44	16.67	23.77	18.21
Denmark	Europe	78.08	19.44	16.67	21.91	20.06
Portugal	Europe	77.78	24.07	15.74	22.53	15.43
Spain	Europe	77.78	21.30	15.74	23.15	17.59
Switzerland	Europe	77.78	24.07	14.81	22.22	16.67
New Zealand	Asia-Pacific	77.62	17.59	16.67	25.15	18.21
Sweden	Europe	77.47	24.07	14.81	22.22	16.36
Austria	Europe	76.54	23.15	16.67	17.90	18.83
Ireland	Europe	76.23	23.15	12.96	21.30	18.83

Source: ITU

A region-by-region review provides a better perspective of the geographic clustering of the G5 Benchmark.

5.2 A view from the regions

From an aggregate regional perspective, Europe region countries and North America (Canada and the United States) are the only regions with a G5 Benchmark average in leading or advanced benchmark threshold score performance, indicating the existence of national formal collaboration mechanisms and institutions, the implementation of highly developed

policy design principles, the implementation of digital economy enabling frameworks and a digitization development agenda. That being said, some regions exhibit scores at the pillar level that are not that far from Europe and North America. In particular, Latin America and the Caribbean depicts high scores in National Regulatory Governance (indicating the existence of strong formal collaboration). On the other hand, all emerging nations exhibit a lagging score in the digital economy policy agenda pillar, highlighting the urgent need to improve the performance in this pillar (see Table 13).

Table 13: G5 Benchmark (2021) averages (by region)

Region	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Africa region	39.96	14.94	8.00	9.83	7.19
Americas region (North America) ¹	81.41	21.76	17.13	24.92	17.59
Americas region (Latin America and the Caribbean) ¹	45.74	15.54	10.30	11.29	8.60
Arab States region	38.40	12.21	7.37	10.77	8.05
Asia-Pacific region	44.36	14.40	9.33	11.67	8.95
CIS region	39.64	10.29	9.36	10.77	9.22
Europe region	67.60	20.37	13.97	18.74	14.52

Source: ITU

The low scores in Pillars III and IV – digital development toolbox and digital economy policy agenda - for Africa, Latin America and the Caribbean, Asia-Pacific, and Arab States regions underscore future challenges for developing regions. These two pillars are fundamental to the development of a digital economy, a critical lever of post-COVID 19 recovery.

5.2.1 Africa region

The G5 Benchmark was calculated for 44 sub-Saharan African countries, yielding an average score of 39.96 (of a maximum of 100), underlining the Africa region transitional position with regards to the G5 benchmark. The average score for Pillar I (national collaborative governance), which is primarily focused on measuring the extent of collaboration across multiple regulatory and policy making stakeholders, is 14.94 (of a maximum possible of 29.63). The average score for Pillar II (policy design principles), measuring policy development and transparency is 8.00 (of a total possible of 18.52). The average score of Pillar III (digital development toolbox), which assesses the existence of strategies to develop the digital economy and the alignment of such policies with the SDGs is 9.83 (of a maximum possible score of 29.63). Finally, the average score of Pillar IV (digital economy policy agenda), measuring the frameworks for digital innovation development, digital transformation, as well as taxation disincentives, is 7.19 (of a maximum possible of 22.22).

The regional average scores for Africa mask wide differences among countries. While most countries are placed in the transitional benchmark threshold, five countries are in the advanced benchmark threshold (Ghana, Kenya, Nigeria, Rwanda, and South Africa). At the other end, eight countries received a score that positions them in the limited benchmark threshold (Burundi, Central African Republic, Republic of the Congo, Equatorial Guinea, Guinea, Guinea-Bissau, Namibia, and São Tome and Príncipe).

Table 14: Africa region: G5 Benchmark (2021)

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Angola	41.20	15.74	6.48	9.10	9.88
Benin	56.02	20.37	13.89	12.81	8.95
Botswana	53.55	24.07	8.33	10.96	10.19
Burkina Faso	38.89	11.11	10.19	10.49	7.10
Burundi	21.60	9.26	1.85	5.56	4.94
Cabo Verde	43.98	16.67	8.33	11.57	7.41
Cameroon	42.59	21.30	4.63	8.95	7.72
Central African Rep.	15.74	6.48	3.70	2.78	2.78
Chad	37.04	16.67	4.63	10.49	5.25
Congo (Rep. of the)	26.85	7.41	5.56	10.19	3.70
Côte d'Ivoire	46.76	25.00	6.48	8.80	6.48
Dem. Rep. of the Congo	46.60	18.52	11.11	8.33	8.64
Equatorial Guinea	29.94	15.74	3.70	6.48	4.01
Eritrea	8.33	5.56	0.00	0.00	2.78
Eswatini	47.99	22.22	7.41	12.81	5.56
Ethiopia	47.84	15.74	9.26	12.35	10.49
Gabon	39.51	14.81	7.41	10.19	7.10
Gambia	37.50	22.22	0.93	6.94	7.41
Ghana	62.35	24.07	9.26	16.67	12.35
Guinea	30.86	13.89	3.70	6.48	6.79
Guinea-Bissau	24.69	12.04	6.48	1.85	4.32
Kenya	60.80	10.19	14.81	22.22	13.58
Lesotho	42.75	18.52	5.56	10.19	8.49
Liberia	36.27	13.89	8.33	8.80	5.25

Table 14: Africa region: G5 Benchmark (2021) (continued)

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Madagascar	32.56	11.11	7.41	9.10	4.94
Malawi	51.23	24.07	9.26	11.11	6.79
Mali	46.76	18.52	8.33	11.57	8.33
Mauritius	56.33	20.37	9.26	14.35	12.35
Mozambique	15.74	1.85	10.19	0.93	2.78
Namibia	27.47	12.96	7.41	4.63	2.47
Niger	41.05	14.81	9.26	10.80	6.17
Nigeria	62.04	24.07	9.26	15.74	12.96
Rwanda	67.90	21.30	14.81	21.60	10.19
Sao Tome and Principe	20.06	6.48	6.48	5.56	1.54
Senegal	54.63	12.96	8.33	16.67	16.67
Seychelles	12.96	3.70	2.78	3.70	2.78
Sierra Leone	20.22	8.33	6.48	3.24	2.16
South Africa	68.98	16.67	16.67	19.29	16.36
South Sudan	16.98	4.63	7.41	2.78	2.16
Tanzania	45.68	16.67	13.89	10.19	4.94
Togo	35.49	7.41	12.96	9.26	5.86
Uganda	54.63	20.37	8.33	12.96	12.96
Zambia	45.37	14.81	12.04	12.35	6.17
Zimbabwe	42.44	14.81	9.26	11.57	6.79
AVERAGE	39.96	14.94	8.00	9.83	7.19

Source: ITU

Of note, while most countries in the region exhibit low scores in the digital development toolbox and the digital economy policy agenda pillars, some depict a higher performance in both domains. For example, within the digital development toolbox pillar, Ghana, Kenya, Mauritius, Nigeria, Rwanda, Senegal, and South Africa, exhibit higher performance than their regional peers. Similarly, with regard to the digital economy policy agenda, Ghana, Kenya, Mauritius, Nigeria, South Africa, Senegal, and Uganda, are positioned ahead of the rest of countries in the region.

5.2.2 Americas region

The Americas region is a composite of four clearly defined groups of countries as measured with regards to the G5 Benchmark. The United States of America and Canada exhibit advanced or leading benchmark threshold scores and score well in all pillars (see Table 15).

Table 15: Canada and the United States of America: G5 Benchmark (2021) averages

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Canada	84.72	24.07	17.59	26.08	16.98
United States	78.09	19.44	16.67	23.77	18.21
AVERAGE	81.41	21.76	17.13	24.92	17.59

Source: ITU

Note: For the purposes of analysis, the Americas region has been divided into North America (Table 15), and Latin America and the Caribbean (Table 16) in order to better reflect national averages and trends within the region.

As indicated in Table 15, the G5 Benchmark average for Canada and the United States of America is 81.41 (of a maximum possible of 100), the Pillar I score average is 21.76 (of a maximum possible of 29.63). The score average for Pillar II is 17.13 (very close to the maximum possible of 18.52). The score average of Pillar III is 24.92 (of a maximum possible score of 29.63), while the score average of Pillar IV is 17.56 (of a maximum possible of 22.22).

The Latin America and the Caribbean region is split into three categories of countries: those with an advanced G5 Benchmark score (Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Mexico, Peru, Panama and Uruguay), the nations with a transitioning benchmark threshold score (Argentina, Bahamas, Barbados, Bolivia, Cuba, Dominica, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Paraguay, and Trinidad and Tobago), with the remaining group of countries scoring at the limited benchmark threshold. It should be noted that the group of countries with a transitional score exhibit, in turn, a wide variance.

Table 16: Latin America and the Caribbean: G5 Benchmark (2021) averages

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Antigua and Barbuda	28.70	11.11	6.48	5.56	5.56
Argentina	56.79	17.59	10.19	16.67	12.35
Bahamas	43.98	13.89	12.96	9.10	8.02
Barbados	35.19	12.04	8.33	7.41	7.41
Belize	29.32	9.26	8.33	3.70	8.02
Bolivia	53.70	25.00	15.74	2.78	10.19
Brazil	73.77	23.15	16.67	18.21	15.74
Chile	75.77	22.22	12.96	23.61	16.98

Table 16: Latin America and the Caribbean: G5 Benchmark (2021) averages (continued)

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Colombia	71.91	17.59	18.52	23.15	12.65
Costa Rica	68.52	22.22	11.11	23.46	11.73
Cuba	30.71	17.59	0.00	6.48	6.64
Dominica	34.57	11.11	6.48	8.33	8.64
Dominican Rep.	69.60	27.78	12.04	19.91	9.88
Ecuador	57.41	25.93	10.19	11.11	10.19
El Salvador	45.52	15.74	8.33	12.50	8.95
Grenada	32.10	10.19	5.56	8.64	7.72
Guatemala	46.60	16.67	9.26	11.11	9.57
Guyana	44.14	21.30	12.04	4.63	6.17
Haiti	37.04	19.44	7.41	6.48	3.70
Honduras	46.14	16.67	11.11	12.96	5.40
Jamaica	56.94	20.37	14.81	11.11	10.65
Mexico	65.90	21.30	15.74	19.29	9.57
Nicaragua	27.47	7.41	9.26	4.94	5.86
Panama	60.49	21.30	13.89	15.12	10.19
Paraguay	38.58	10.19	11.11	11.73	5.56
Peru	68.36	22.22	14.81	18.98	12.35
Saint Kitts and Nevis	10.19	0.00	4.63	1.85	3.70
Saint Lucia	19.14	0.93	4.63	10.19	3.40
Saint Vincent and the Grenadines	24.69	4.63	13.89	3.70	2.47
Suriname	13.89	3.70	5.56	0.93	3.70
Trinidad and Tobago	50.00	17.59	10.19	10.80	11.42
Uruguay	69.14	19.44	10.19	25.00	14.51
Venezuela	22.99	7.41	7.41	3.24	4.94
AVERAGE	45.74	15.54	10.30	11.29	8.60

Source: ITU

Considering the importance of digitalization for the future economic growth of the region, it is important to note that only a few countries exhibit a relatively high score in the digital

development toolbox pillar (Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Mexico, and Uruguay) and only Brazil, Chile, Colombia, Costa Rica, Peru, Trinidad and Tobago, and Uruguay present a score higher than 50 per cent of the total maximum value in the digital economy policy agenda pillar.

5.2.3 Arab States region

The G5 Benchmark for the Arab States region denotes two levels of development: Qatar, Saudi Arabia, and the United Arab Emirates present an advanced benchmark threshold score, while the rest of countries depict a score that places them within the transitional or limited threshold levels.

Table 17: Arab States region: G5 Benchmark (2021) averages

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Algeria	37.50	15.74	4.63	8.80	8.33
Bahrain	53.70	16.67	10.19	15.74	11.11
Comoros	25.93	11.11	6.48	4.63	3.70
Djibouti	22.69	10.19	2.78	3.24	6.48
Egypt	56.79	12.96	8.33	21.60	13.89
Iraq	30.25	8.33	9.26	5.86	6.79
Jordan	42.59	9.26	10.19	13.27	9.88
Kuwait	45.68	12.04	11.11	14.51	8.02
Lebanon	36.73	19.44	5.56	4.63	7.10
Libya	2.78	1.85	0.00	0.00	0.93
Mauritania	38.58	13.89	5.56	13.89	5.25
Morocco	57.87	21.30	8.33	15.28	12.96
Oman	52.01	19.44	4.63	16.20	11.73
Palestine*	26.85	10.19	5.56	9.26	1.85
Qatar	63.27	17.59	9.26	21.30	15.12
Saudi Arabia	74.38	19.44	13.89	22.53	18.52
Somalia	17.59	4.63	7.41	2.47	3.09
Sudan	28.09	8.33	4.63	9.57	5.56
Syrian Arab Republic	14.51	7.41	3.70	0.93	2.47
Tunisia	34.26	5.56	13.89	9.26	5.56

Table 17: Arab States region: G5 Benchmark (2021) averages (continued)

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
United Arab Emirates	75.31	23.15	12.96	22.22	16.98
Yemen	7.41	0.00	3.70	1.85	1.85
AVERAGE	38.40	12.21	7.37	10.77	8.05

Source: ITU

Note: The status of the State of Palestine in ITU is governed by Resolution 99 (Rev. Dubai, 2018) of the ITU Plenipotentiary Conference.

Countries in the Arab States region with an advanced benchmark threshold score also exhibit a relatively high score in pillars that have an impact on the development of the digital economy. The scores of Qatar, Saudi Arabia, and the United Arab Emirates in these pillars are significantly close to the level of advanced economies of North America and Europe.

5.2.4 Asia-Pacific region

As in the case of other regions, the G5 Benchmark scores within the Asia-Pacific region are dichotomic. Several countries are placed in the leader benchmark threshold score (Australia, Korea (Rep. of), and Singapore) or the advanced benchmark threshold score (China, India, Indonesia, Japan, Malaysia, New Zealand, Pakistan, Philippines, Sri Lanka, and Thailand). The remaining countries in this region have transitional or limited benchmark threshold scores.

Table 18: Asia-Pacific region: G5 Benchmark (2021)¹⁶ averages

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Afghanistan	41.82	17.59	9.26	8.18	6.79
Australia	81.94	28.70	15.74	21.14	16.36
Bangladesh	38.58	9.26	8.33	14.20	6.79
Bhutan	44.14	16.67	11.11	7.41	8.95
Brunei Darussalam	48.92	23.15	7.41	8.80	9.57
Cambodia	39.81	19.44	4.63	7.72	8.02
China	63.43	22.22	7.41	18.98	14.81
Fiji	39.51	17.59	6.48	11.11	4.32

¹⁶ The Democratic People's Republic of Korea was excluded due to insufficient observations.

Table 18: Asia-Pacific region: G5 Benchmark (2021) averages (continued)

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Hong Kong, China	59.88	21.30	12.96	11.42	14.20
India	65.74	11.11	12.04	25.93	16.67
Indonesia	64.66	19.44	14.81	17.75	12.65
Iran (Islamic Republic of)	48.46	11.11	13.89	13.27	10.19
Japan	75.46	24.07	15.74	20.22	15.43
Kiribati	30.25	16.67	2.78	7.41	3.40
Korea (Rep. of)	83.80	25.93	15.74	24.54	17.59
Lao P.D.R.	41.98	19.44	6.48	7.41	8.64
Malaysia	64.66	20.37	12.96	14.66	16.67
Maldives	25.15	12.04	2.78	6.94	3.40
Marshall Islands	19.44	8.33	3.70	5.56	1.85
Micronesia	33.64	16.67	9.26	5.86	1.85
Mongolia	49.23	12.04	9.26	17.75	10.19
Myanmar	6.48	0.93	0.93	0.00	4.63
Nauru	9.88	0.93	2.78	5.56	0.62
Nepal (Republic of)	8.02	0.00	4.63	0.93	2.47
New Zealand	77.62	17.59	16.67	25.15	18.21
Pakistan	62.35	13.89	12.96	19.75	15.74
Papua New Guinea	22.99	5.56	10.19	3.24	4.01
Philippines	68.98	24.07	12.04	17.13	15.74
Samoa	29.94	12.04	8.33	6.48	3.09
Singapore	83.80	25.93	14.81	22.38	20.68
Solomon Islands	17.59	7.41	6.48	2.78	0.93
Sri Lanka	60.03	12.96	11.11	22.69	13.27
Thailand	70.22	19.44	13.89	18.06	18.83
Timor-Leste	21.91	8.33	9.26	2.78	1.54
Tonga	13.89	2.78	6.48	2.78	1.85
Tuvalu	0.46	0.00	0.00	0.46	0.00

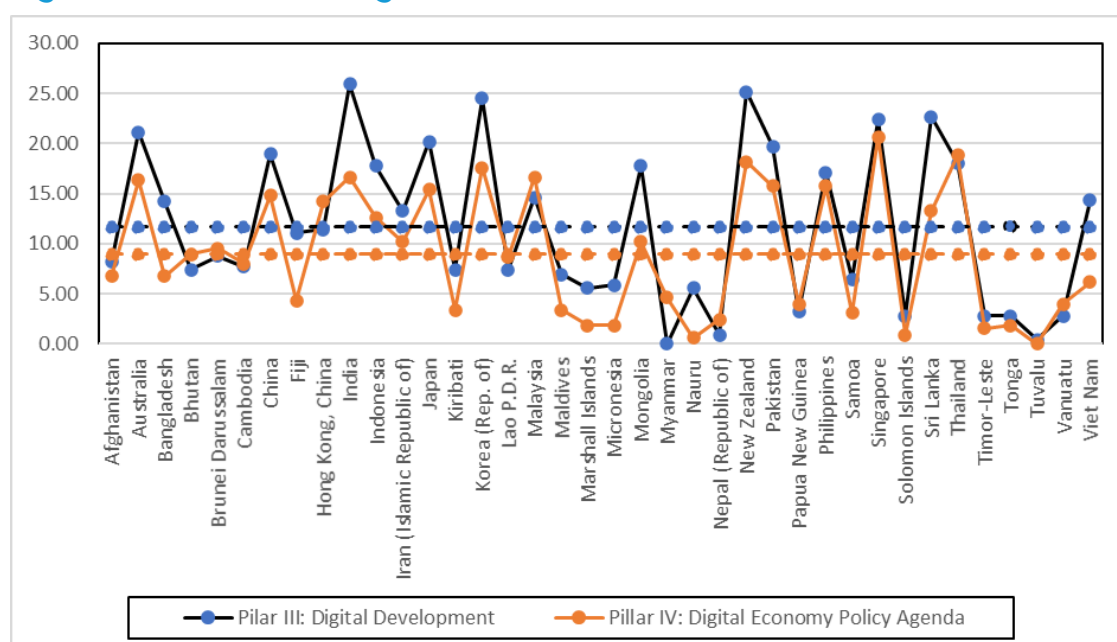
Table 18: Asia-Pacific region: G5 Benchmark (2021) averages (continued)

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Vanuatu	28.09	11.11	10.19	2.78	4.01
Viet Nam	42.75	11.11	11.11	14.35	6.17
AVERAGE	44.36	14.40	9.33	11.67	8.95

Source: ITU

The scores of pillars III and IV confirm the existence of countries in the region that are leaders in the development of their digital economies (see Figure 11).

Figure 11: Asia-Pacific region: Pillars III and IV scores



Source: ITU

Australia, China, India, Indonesia, Japan, Korea (Rep. of), New Zealand, Mongolia, Pakistan, Philippines, Singapore, Sri Lanka, and Thailand depict a digital development toolbox pillar score higher than 17 (out of a maximum possible of 29.63), while Australia, India, Japan, Korea (Rep. of), Malaysia, New Zealand, Pakistan, Philippines, Singapore, and Thailand (and China on the cusp) exhibit a digital economy policy agenda pillar score higher than 15 (out of a maximum possible of 22.22).

5.2.5 Commonwealth of Independent States region

The Commonwealth of Independent States (CIS) region has no countries with an advanced benchmark threshold score, although the Russian Federation is close to a minimum score in this threshold. This performance is not consistent with the pillar scores: Armenia has the highest score in Pillar I that measures collaborative regulation and Pillar II, a metric for policy design

principles, while the Russian Federation is highest in pillars III and IV, underlining its focus on digital economy development efforts.

Table 19: CIS region: G5 Benchmark (2021) averages

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Armenia	57.25	22.22	14.81	12.81	7.41
Azerbaijan	54.94	20.37	8.33	15.12	11.11
Belarus	23.77	3.70	7.41	5.56	7.10
Kazakhstan	44.14	7.41	12.04	13.89	10.80
Kyrgyzstan	45.37	12.04	12.04	8.64	12.65
Russian Federation	59.41	10.19	12.96	20.83	15.43
Tajikistan	31.17	9.26	9.26	6.17	6.48
Turkmenistan	21.30	5.56	0.93	5.56	9.26
Uzbekistan	19.44	1.85	6.48	8.33	2.78
AVERAGE	39.64	10.29	9.36	10.77	9.22

Source: ITU

5.2.6 Europe region

The Europe region has the highest concentration of countries with a leading or advanced benchmark threshold score, with 35 of 45 countries measured. As a result, the regional average for the G5 Benchmark score is 67.60, while pillar averages are consistently at the highest level of the sampled countries.

Table 20: Europe region: G5 Benchmark (2021)¹⁷ averages

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Albania	66.98	25.93	11.11	18.21	11.73
Andorra	30.25	7.41	2.78	11.11	8.95
Austria	76.54	23.15	16.67	17.90	18.83
Belgium	71.91	16.67	15.74	23.15	16.36
Bosnia and Herzegovina	40.74	13.89	11.11	11.11	4.63

¹⁷ The Vatican was excluded due to insufficient observations.

Table 20: Europe region: G5 Benchmark (2021) averages (continued)

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Bulgaria	54.01	11.11	14.81	12.96	15.12
Croatia	74.54	20.37	14.81	22.53	16.82
Cyprus	62.35	17.59	13.89	16.67	14.20
Czech Republic	73.77	21.30	15.74	20.37	16.36
Denmark	78.08	19.44	16.67	21.91	20.06
Estonia	83.64	23.15	17.59	24.07	18.83
Finland	83.64	25.00	13.89	25.62	19.14
France	75.31	16.67	15.74	25.62	17.28
Georgia	45.37	15.74	12.96	7.41	9.26
Germany	88.58	27.78	17.59	24.38	18.83
Greece	70.68	20.37	14.81	17.59	17.90
Hungary	72.84	23.15	13.89	21.30	14.51
Iceland	68.36	19.44	13.89	20.22	14.81
Ireland	76.23	23.15	12.96	21.30	18.83
Israel	76.23	19.44	15.74	22.84	18.21
Italy	78.70	24.07	16.67	20.37	17.59
Latvia	68.21	21.30	14.81	18.52	13.58
Liechtenstein	53.09	18.52	8.33	18.21	8.02
Lithuania	79.94	27.78	16.67	18.52	16.98
Luxembourg	72.22	22.22	15.74	15.43	18.83
North Macedonia	53.70	22.22	12.96	10.19	8.33
Malta	72.53	25.00	14.81	18.52	14.20
Moldova	59.57	18.52	14.81	15.74	10.49
Monaco	35.34	14.81	7.41	6.94	6.17
Montenegro	63.89	22.22	12.96	19.75	8.95
Netherlands	80.86	25.93	14.81	22.22	17.90
Norway	75.93	25.93	15.74	18.52	15.74
Poland	72.22	23.15	13.89	20.68	14.51
Portugal	77.78	24.07	15.74	22.53	15.43
Romania	67.90	20.37	15.74	16.67	15.12
San Marino	23.15	0.00	7.41	10.19	5.56

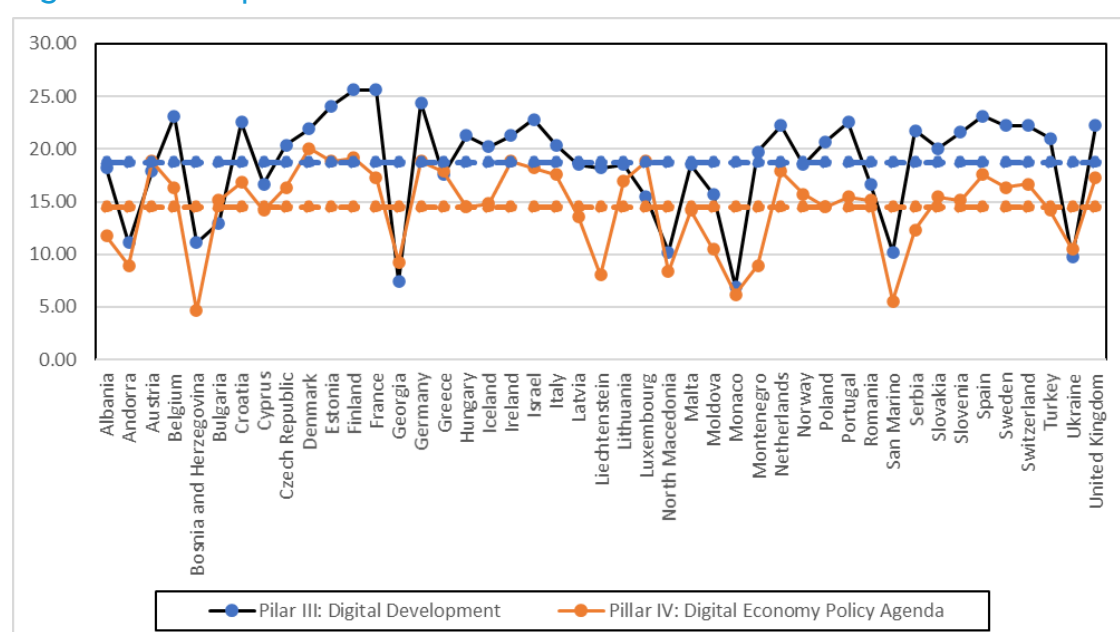
Table 20: Europe region: G5 Benchmark (2021) averages (continued)

Country	G5 Benchmark	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Serbia	67.44	19.44	13.89	21.76	12.35
Slovakia	68.83	19.44	13.89	20.06	15.43
Slovenia	74.69	24.07	13.89	21.60	15.12
Spain	77.78	21.30	15.74	23.15	17.59
Sweden	77.47	24.07	14.81	22.22	16.36
Switzerland	77.78	24.07	14.81	22.22	16.67
Turkey	66.67	19.44	12.04	20.99	14.20
Ukraine	41.51	9.26	12.04	9.72	10.49
United Kingdom	84.88	28.70	16.67	22.22	17.28
AVERAGE	67.60	20.37	13.97	18.74	14.52

Source: ITU

The scores of pillars III and IV confirm the number of Europe region countries leading in digital economy development: 33 countries (out of 45) exhibit a Digital Development Toolbox score more than 17 (from a maximum possible score of 29.63); similarly, twenty-six countries depict a digital economy policy agenda pillar score higher than 15 (out of a maximum possible of 22.22) (see Figure 12).

Figure 12: Europe: Pillars III and IV scores



Source: ITU

5.2.7 Regional conclusions

The region-by-region analysis of the G5 Benchmark provides a nuanced view of country progress. The G5 Benchmark is not an exclusive feature of developed economies. Three regions include nations with a Leading benchmark threshold score (Europe, Asia-Pacific, and North America), and with the exception of the CIS region, all regions join the United States and 30 European countries with an Advanced benchmark threshold score (Ghana, Nigeria, Rwanda, South Africa and Kenya in the Africa region; Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Mexico, Peru, Panama and Uruguay in Latin America and the Caribbean; Qatar, Saudi Arabia, and the United Arab Emirates in the Arab States region; China, India, Indonesia, Japan, Malaysia, New Zealand, Pakistan, Philippines, Sri Lanka, and Thailand in the Asia-Pacific region).

This situation is good news for many developing countries in terms of their capability for future growth. While the G5 Benchmark threshold score averages for developing countries are low in Pillars III and IV (digital development toolbox and digital economy policy agenda pillars), many countries in each region exhibit higher scores, an indication that they might be increasingly ready from a policy standpoint to tackle the development of a digital economy, a critical lever for post-COVID 19 recovery.

6. Analysis of the correlation between the G5 Benchmark and established international indices

In order to understand how the G5 Benchmark fits with existing metrics in the digital space, a selection of ten global indices that address a wide range of metrics have been considered, all of them with different focus and scope, but most are linked to the development of digital economy frameworks and are appropriate for such a descriptive and econometric analysis .

- The Network Readiness Index 2020 measures the degree of digital transformation of the economy. The 2020 version of this index, developed by Portulans Institute, is based on four fundamental dimensions: technology, people, governance, and impact.
- The E-Government Development Index was developed by the United Nations Department of Economic and Social Affairs (UNDESA) and designed to present a country-level state of e-government by assessing the website development patterns in each economy as well as infrastructure and educational levels.
- The E-Participation Index, also developed by UNDESA, focuses on the use of online services to facilitate provision of information by governments to citizens, interaction with stakeholders, and engagement in decision-making processes.
- The Global Cybersecurity Index, developed by ITU, measures the commitment of countries to cybersecurity.
- The Doing Business report, an index of business activity developed by the World Bank, provides a measure of business regulations for local firms in 190 countries. Even if the Doing Business is not focused on the digital economy, it is clear that the more digitized the environment becomes, the easier the business procedures with administrative bodies, largely because of the development of e-government.
- The Global Innovation Index (from the World Intellectual Property Organization) sheds light on the state of innovation financing. Again, this index is focused on innovation, but the digitized environment is positively linked to innovation.
- The B2C Ecommerce Index, developed by UNCTAD to assess a country's developments in that area, is also used.
- The Digital Maturity Index, developed by Telecom Advisory Services, is based on five pillars: Digital Foundations, Digital Talent, Digital Innovation, Adoption and Localization.
- The Global Competitiveness Index (by the World Economic Forum) identifies relevant policies and practices. The 5G Readiness Index (by Incities) looks at readiness to deploy and adopt 5G networks.

Table 21: Selected global Indices

Indicator	Geographical scope	Year of last edition	Source
Network Readiness Index	World	2020	Portulans Institute
E-Government Development Index	World	2020	United Nations
E-Participation Index	World	2020	United Nations
Global Cybersecurity Index	World	2020	ITU
Doing Business	World	2020	World Bank
Global Innovation Index	World	2020	WIPO
B2C Ecommerce Index	World	2020	UNCTAD
Digital Maturity Index	World	2020	Telecom Advisory Services
Global Competitiveness Index 4.0	37 countries	2020	World Economic Forum
5G Readiness Index	Europe	2019	Incities

Source: ITU

6.1 Descriptive analysis

As shown in Table 22, pairwise correlation coefficients between the G5 Benchmark and the selected indexes are very high and, in all cases, significant at a 1 per cent level. Table 22 shows that the G5 Benchmark correlates most with the Network Readiness Index (+0.7966), while the Global Competitiveness Index (+0.6235) is the index with the least correlation.

Table 22: Correlation between G5 Benchmark and selected indexes

Index	Correlation with G5 Benchmark
Network Readiness Index	0.7966***
5G Readiness Index	0.7755***
Global Innovation Index	0.7553***
Digital Maturity Index	0.7369***
Doing Business	0.7304***
E-Government Development Index	0.7303***
B2C Ecommerce Index	0.7253***
Global Cybersecurity Index	0.7020***
E-Participation Index	0.6966***
Global Competitiveness Index 4.0	0.6235***

Source: ITU

Note: *** $p < 1\%$

When analyzing the correlation of the selected indices with each of the G5 Benchmark pillars (Table 23), although results are similar overall, it is worth noting that the first pillar is reflects a lesser degree of correlation to the other indices.

Table 23: Correlation between G5 Benchmark pillars and the selected indexes

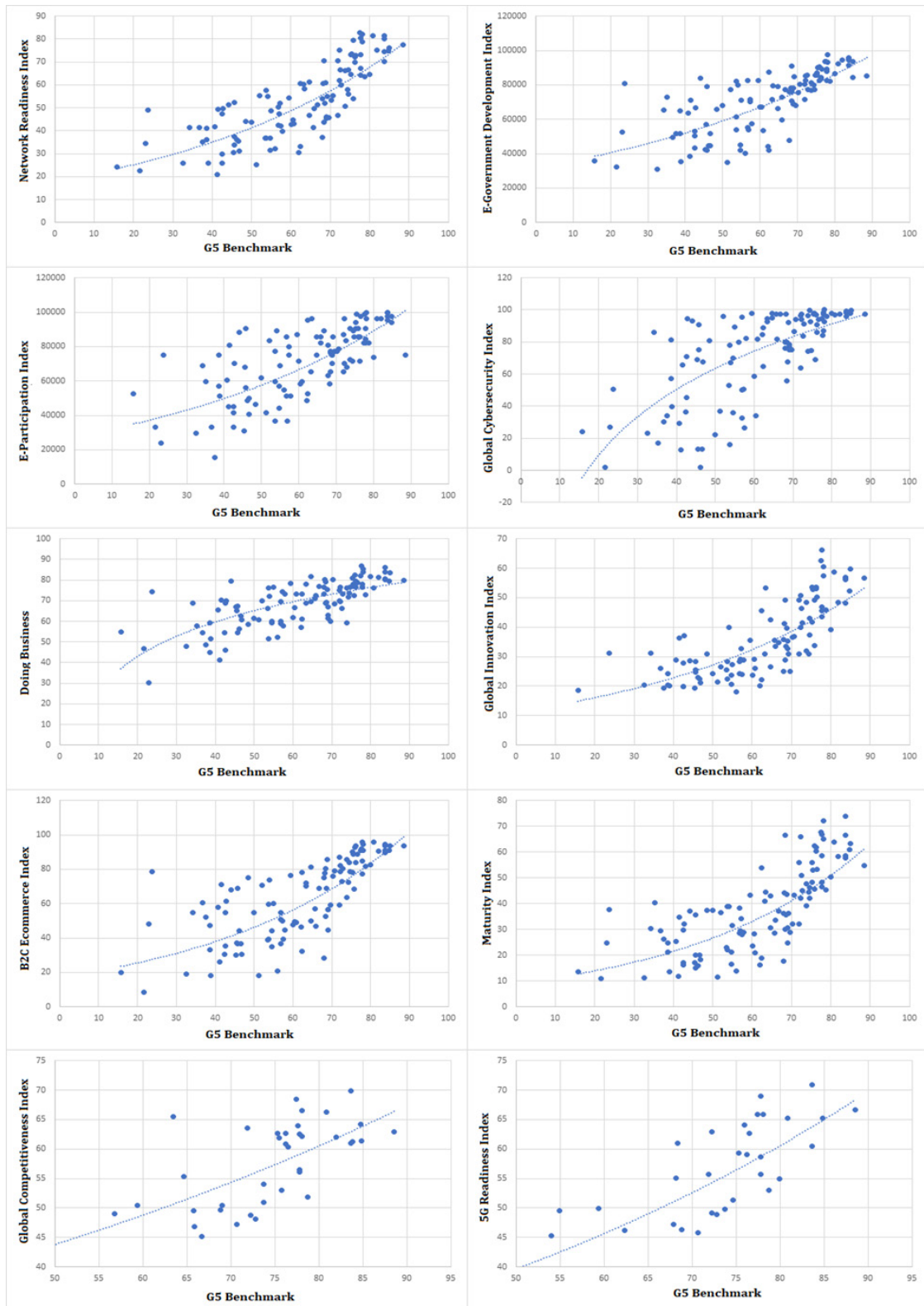
Index	Pillar I	Pillar II	Pillar III	Pillar IV
Network Readiness Index	0.5007***	0.6592***	0.7065***	0.7868***
E-Government Development Index	0.4348***	0.6246***	0.6612***	0.7289***
E-Participation Index	0.3756***	0.6252***	0.6716***	0.6694***
Global Cybersecurity Index	0.3553***	0.5712***	0.7281***	0.6838***
Doing Business	0.4019***	0.6441***	0.6950***	0.7032***
Global Innovation Index	0.4544***	0.6316***	0.6456***	0.7466***
B2C Ecommerce Index	0.4037***	0.6200***	0.6489***	0.7619***
Digital Maturity Index	0.4515***	0.6111***	0.6456***	0.7620***
Global Competitiveness Index 4.0	0.3760**	0.2444	0.4956***	0.5852***
5G Readiness Index	0.6247***	0.5026***	0.6403***	0.7317***

Source: ITU

Note: *** p<1%, ** p<5%

The results are clear when analyzing the respective scatter plots linking each selected metric with the G5 Benchmark (Figure 13), although there are some minor differences that are worth observing.

Figure 13: Correlations between selected indices and the G5 Benchmark



Source: Telecom Advisory Services

For instance, while in some cases the link is best expressed through a straight line (such as the Global Competitiveness Index, or the 5G Readiness Index), in other cases, the better fit comes from a logarithmic (Global Cybersecurity Index or Doing Business) or an exponential tendency

(Network Readiness Index, E-Government Development Index, E-participation Index, Global Innovation Index, B2C Ecommerce Index or Maturity Index).

The logarithmic correlation could indicate that once the G5 Benchmark reaches a certain threshold (40-50 for the Cybersecurity Index correlation, 50 for the Doing Business correlation), the increase would undergo a gradual saturation (or diminishing returns).

On the other hand, for the correlations that indicate an exponential tendency, when the G5 score reaches a certain threshold, the corresponding index might indicate a return to scale (this threshold is approximately 50 for the Network Readiness, the E-Government Development, the E-Participation and the B2C Ecommerce indices while it seems to be close to 60 in the case of the Global Innovation and the Maturity Index).

Beyond specific indices, the correlation between the G5 Benchmark (and its pillars) and macroeconomic outcomes was also tested (measured through GDP per capita¹⁸). There is a rationale for this relation: a stronger environment for collaborative digital regulation (as measured by the G5 Benchmark) is expected to be associated with better outcomes in the digital sector, and as a result, this should translate into spillover gains for the overall economy. As shown in Table 24, the respective correlation coefficients are in all cases positive and highly significant.

Table 24: Correlation between G5 Benchmark and pillars with GDP per capita

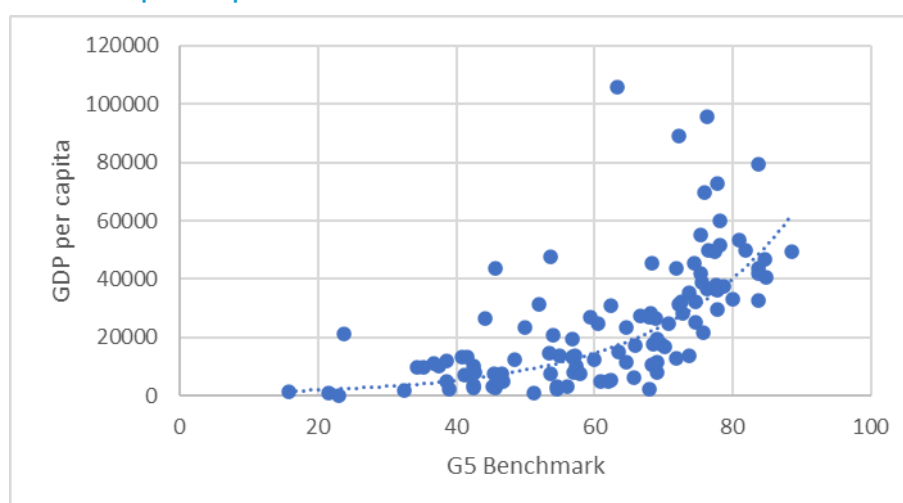
Index	G5 Benchmark	Pillar I	Pillar II	Pillar III	Pillar IV
GDP per capita	0.6155***	0.4092***	0.4398***	0.5357***	0.6546***

Source: ITU

Note: *** p<1%

GDP per capita was also plotted against the G5 Benchmark in Figure 14, exhibiting a positive and exponential functional link.

Figure 14: GDP per capita and G5 Benchmark



Source: ITU

¹⁸ Source: International Monetary Fund (IMF)

The exponential nature of the relationship might indicate a potential return to scale: in other words, once countries reach a G5 Benchmark score of approximately 60, economic growth triggered by the development of the digital economy begins to increase at a faster pace. While the correlations shown in this descriptive analysis seem to be strong, it is still necessary to find out if they are robust enough to considering further control variables.

6.2 Econometric analysis

Due to the lack of extended data series, the econometric analysis presents some limitations. As the G5 Benchmark, under the revised specification, has only been developed for 2021, it is not possible to estimate a panel-data model, having instead to rely on a cross-section specification for a single year. This is an important limitation, as in the absence of a panel, it is not possible to control for unobservable country-level effects affecting the variance in the scores of the different indices.

That being said, the empirical specification for the econometric analysis is represented by the following equation:

$$\log(\text{Index}) = \alpha + \beta \log(\text{G5}) + \gamma \log(\text{FBB}) + \delta \log(\text{MBB}) + \lambda \log(\text{GDPpc}) + \theta_r + \varepsilon$$

As a result, each index will be introduced respectively as a dependent variable, and on the right-hand side the G5 Benchmark will be added as an explanatory regressor, plus other controls (fixed and mobile broadband penetration, GDP per capita, and regional dummies ()) to capture region-level unobservable factors). Results are reported in Table 25, with all estimates performed through the Ordinary Least Squares (OLS) approach with robust standard errors.

Table 25: Regression analysis: Ordinary Least Squares (OLS) approach

Dep. var:	Log(NRI)	Log(E-gov)	Log(E-part)	Log(Cyber)	Log(DB)	Log(GII)	Log(E-com)	Log(DMI)
Log(G5)	0.243*** [0.037]	0.122*** [0.040]	0.163* [0.046]	1.264*** [0.316]	0.196*** [0.035]	0.224*** [0.061]	0.241** [0.107]	0.153** [0.070]
Log(FBB)	0.026 [0.011]	0.025** [0.013]	-0.001 [0.029]	0.028 [0.071]	-0.008 [0.017]	0.021 [0.016]	0.033 [0.057]	0.047*** [0.017]
Log(MBB)	0.277*** [0.081]	0.318*** [0.066]	-0.012 [0.161]	0.597* [0.338]	0.027 [0.090]	0.348*** [0.104]	0.632*** [0.140]	0.521*** [0.115]
Log(GDPpc)	0.065* [0.037]	0.061** [0.024]	0.163*** [0.046]	-0.117 [0.097]	0.072** [0.025]	0.062* [0.037]	0.029 [0.048]	0.098* [0.053]
Region dummies	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.91	0.92	0.62	0.58	0.71	0.86	0.88	0.91
Obs.	108	109	109	109	109	105	108	109

Source: ITU

Note: ***p<1%, **p<5%, *p10%. Models estimated with constant term. Robust standard errors in brackets.

In general, these results confirm those represented in the descriptive analysis. The coefficient associated with the G5 Benchmark regressor is in all cases positive and statistically significant, which suggest that a stronger collaborative digital regulation and digital prone environment (as measured by the G5 Benchmark) is associated with positive frameworks for competitiveness, innovation, cybersecurity, and the like. Beyond that, there are some differences among the equations that are worth observing. In the first place, the magnitude of the coefficient varies, taking its maximum value in the case of the Global Cybersecurity Index regression. Particularly, an increase of 1 per cent in the G5 Benchmark score seems to be associated to an increase of 1.26 per cent in the Cybersecurity Index, a strong relation among both variables. On the other hand, the lowest coefficient is found in the case of the E-Government Development Index estimation, where a 1 per cent increase in the G5 Benchmark score is associated with a 0.12 per cent increase in that index (strongly significant at 1 per cent). In general, there are some differences in the statistical significance of the coefficients, reaching in most cases the highest level (1 per cent), except for B2C Ecommerce Index and the Maturity Index (significance at 5 per cent) and E-Participation Index (10 per cent). All in all, the strongest link appears to be with the Cybersecurity Index, while the weakest seems to be with the E-Participation Index, because of a low coefficient and only significant at 10 per cent.

Beyond the link between the G5 Benchmark and other indices, the link with national economic output (measured by the GDP) was analysed through another econometric regression. The empirical specification is defined from a Cobb-Douglas production function after log-linearization:

$$\log(GDP) = \alpha + \beta \log(G5) + \gamma \log(K) + \delta \log(L) + \theta_r + \varepsilon$$

As can be seen, GDP es expected to depend on the G5 Benchmark score, and as further controls, measures for physical capital stock (K) and Labor (L) are added, as well as regional dummies (). Results are presented in Table 16, with the estimate performed through the OLS approach with robust standard errors.

Table 26: Regression analysis: OLS approach with robust standard errors

Dep. var:	Log(GDP)
Log(G5 score)	0.471*** [0.129]
Log(Capital)	0.626*** [0.047]
Log(Labour)	0.344*** [0.054]
Region dummies	YES
R-squared	0.98
Observations	104

Source: ITU

Note: ***p<1%. Models estimated with constant term. Robust standard errors in brackets.

Again, the results point at a positive link between G5 Benchmark scores and national economies. Particularly, an increase in 10 per cent in the score seems to be associated with an increase in 4.7 per cent in GDP.

6.3 Case study: Singapore

The final test of the strength of causation between G5 Benchmark scores and economy development was conducted through a case study. To select a case study country, the average position of all countries was calculated in each of the rankings associated with the indices described in Table 21. The country that tops this average-ranking was found to be Singapore. This country exhibits an outstanding performance in all selected indicators (Table 27), reaching the 5th position in the G5 Benchmark score, topping the ranking in the case of the Digital Maturity Index, and lying-in top-ten positions in every index, except for the E-Government Development Index (11th). Singapore also exhibits a high GDP per capita, of USD 58 902, being in 8th position worldwide in 2020 according to the IMF.

Table 27: Singapore position in the respective indices

Indices	Position
G5 Benchmark	5 th
Network Readiness Index	3 rd
E-Government Development Index	11 th
E-Participation Index	6 th
Global Cybersecurity Index	4 th
Doing Business	2 nd
Global Innovation Index	8 th
B2C Ecommerce Index	4 th
Digital Maturity Index	1 st
Average Ranking Position	4.9

Source: ITU

Table 18 presents Singapore's performance in each of the G5 Benchmark pillars and in the overall score. Singapore scores well (6th) in Pillar I (collaborative governance), less well in Pillar II and Pillar III (design principles and digital development, 28th and 21st), and in Pillar IV (economy policy agenda), it tops the ranking.

Table 28: Singapore pillar position and overall rank

	Overall score	Pillar I: National collaborative governance	Pillar II: Policy design principles	Pillar III: Digital development toolbox	Pillar IV: Digital economy policy agenda
Maximum score	100.00	29.63	18.52	29.63	22.22
Singapore score	83.80	25.93	14.81	22.38	20.68
Singapore ranking position	5 th	6 th	28 th	21 st	1 st

Source: ITU

- Pillar I: National collaborative governance.** Singapore obtains a 25.93 score, 87.5 per cent of the maximum possible. The country exhibits high levels of collaborative links between the ICT regulator and related bodies. Spectrum and broadcasting issues are conducted by the ICT regulator, ensuring coordination in those areas. As for cybersecurity and CERT issues, formal collaboration mechanisms were put in place. In addition, strong collaborative mechanisms have been established between economic sectors, such as the financial, transport, energy, postal, health and education authorities. On the other hand, collaboration with the Competition Authority and with the Ministry of Environment was found to be mainly informal, so these are areas to improve in the future.
- Pillar III: Policy design principles.** Singapore obtained 80 per cent of the score (28th) and implements sound policy design principles, requiring Regulatory Impact Assessment (RIA) procedures before taking regulatory decisions, allowing affected parties to request reconsideration or appeals, and promoting technological-neutral policy and regulatory frameworks. In addition, the regulatory framework has proven to be suitable for regulatory experimentation, as sandboxes for financial inclusion are included in addition to transparency best practice. Areas to improve within this pillar include the design of public consultations (as timelines are not clearly defined in the regulation) and regular rolling policy reviews.
- Pillar III: Digital development toolbox.** Singapore scores well in this pillar (75.5 per cent) despite not yet acceding to the Budapest Convention on Cybercrime, nor to the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations, no publicly available official infrastructure mapping, nor any official broadband strategy for women and young people. However, Singapore scores well in the indicators linked to SDGs and those related to digital strategy for development.
- Pillar IV: Digital economy policy agenda.** Singapore performs well in this pillar (93 per cent) scoring well for indicators linked to international collaboration, innovation framework and digital transformation, including policy design for specific economic sectors and Industry 4.0, but less so with indicators related to the scope of the USF and the scope of fiscal incentives for the digital economy.

Singapore appears to be a paradigmatic case of suitable environment for the development of digitization, as well as innovation and economic progress.

6.4 Validation of the results of the G5 Benchmark

The selected indicators applied to the Singapore case study and its performance in the pillars of the G5 Benchmark show that it constitutes a propitious reference for the development of digitization.

This approach to ICT regulation suggests that the coherent and robust benchmark from a conceptual and statistical perspective provides strong evidence of a correlation between the G5

Benchmark and internationally recognised indices that captures the development of regulatory and policy frameworks applied to the digital sector.

This relation has proved to be robust when adding further control variables through a specified econometric model: in all cases the associated coefficient for the G5 Benchmark introduced as regressor to explain the respective indices as dependent variables was found to be positive and statistically significant (albeit at different levels). Moreover, the G5 Benchmark is positively linked to national economic output (GDP), when introducing it as regressor in a Cobb-Douglas production function framework. Thus, the G5 Benchmark seems to behave as expected.

It is important to reiterate that the econometric analysis conducted had an important limitation related to data availability. Due to having a value for the G5 Benchmark for a single year (2021), it was not possible to perform panel estimates, which allow to control for unobservable factors. In addition, due to the absence of data prior to 2021, it was not possible to test the lagged effects of the G5 scores on the other variables. Therefore, any causality conclusion should be addressed with caution, and further research will be necessary when more complete datasets become available.

7. Implications and a way forward

The development of a national digital economy is, to a large degree, dependent on implementing a collaborative regulatory and policy framework. The lack of cross-institutional coordination represents a critical barrier to the development of policy coherence and regulatory consistency. The G5 Benchmark not only provides a tool to assess where a country stands in terms of the development of this critical capability, it also emphasises what areas need to be changed. In light of the challenges posed by COVID-19, the need for cross-institutional coordination and collaboration highlights the need to build a single policy and regulatory focus in the digital economy domain.¹⁹

As the benchmark indicates, there is not a single path to fulfil the collaboration and cross-institutional coordination objective. However, governments need to recognize that if the development of the digital economy is a policy objective, they should explore approaches to fulfil this objective. It will allow the definition of strategic priorities, while aligning all government agencies behind them.

The G5 Benchmark has been conceived as a tool to track the evolution of regulatory frameworks and help countries establish roadmaps towards the new paradigm of inter-institutional collaboration. In the refined version of the benchmark, an effort was made to address the feedback provided after the release of the pilot version in 2020 along with the insights and recommendations of the review board members. That said, future upgrades may be introduced insofar that the concept and framework of collaborative regulation undergoes further conceptual refinement. As the development of digital economy policy making and regulation proceeds, it will be worthwhile to review the benchmark structure and scoring system.

The issue areas to be considered in the future release of the Benchmark, include:

- (i) a more detailed approach to digital economy taxation policy,
- (ii) collaboration in the field of technology ethics,
- (iii) digital infrastructure funding policies, such as earmarking a portion of the general budget for network deployment or initiatives to address demand-side barriers,
- (iv) the role of central governments and the executive branch in marshalling policy coherence and coordination,
- (v) coordination between the public and private sectors, and
- (vi) policy coordination between the central and regional/municipal governments.

In the meantime, additional dimensions will be captured in building the broader narrative around the G5 Benchmark and collaborative digital regulation.

In addition to refining the benchmark, an effort will be made to produce practical guidelines and outlining ways to interrogate the data to promote improvements in policy making and regulatory frameworks and practices. It is expected that specific data and tools for extracting and analysing impact of changes will be shared with the global regulatory community.

¹⁹ See an assessment of the importance of digital infrastructure in mitigating the economic disruption of the pandemic in Katz, Jung, and Callorda (2020) and Katz and Jung (2021).

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Annex A: List of members of the review board

Name	Position	Represented Entity
Mr. Bocar Ba	Chief Executive Officer	Samena Telecommunications Council
Dr. Pau Castells	Head of Economic Analysis	GSMA
Prof. Martin Cave	Professor	London School of Economics
Ms. Belinda Exelby	Head of International Relations	GSMA
Ms. Lise Fuhr	Director General	European Telecommunications Network Operators (ETNO)
Dr. Tim Kelly	Lead Digital Development Specialist	World Bank Group
Ms. Natasa Kuzmanovic	Expert Advisor in Telecommunications at Communications Regulatory Agency of Bosnia Herzegovina (RAK)	European Mediterranean Regulators Group (EMERG)
Dr. Lourdes Montenegro	Lead Digital Sector Transformation	World Benchmarking Alliance
Ms. Inga Popovici	Expert, Strategy Analysis and Innovation Unit at ANCOM, Romania and Head, Independent Regulators and Broadband Expert Working Group (IRB EWG)	Eastern Partnership Regulators Network (EaPeReg)
Prof. Andrea Renda	Senior Research Fellow and Head of the CEPS Unit on Global Governance, Regulation, Innovation, and the Digital Economy (GRID)	Centre for European Policy Studies (CEPS)
Prof. Ahmad Reza Sharafat	Chairman, Management Committee	Asia Pacific Telecommunity Policy and Regulatory Forum
Mr. Ahmad Said	Chief, International Department, National Telecom Regulatory Authority (NTRA), Egypt	Arab Regulators Network of Telecommunications and Information Technologies (AREGNET)

Annex B: Detailed methodology of the G5 Benchmark

Pillar I: National collaborative governance			
Component: Regulatory collaboration in digital core areas			
Indicators	Option	Score	Source
Collaboration with (Independent) Spectrum Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	
Collaboration with (Independent) Broadcasting (content) Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	
Collaboration with Cybersecurity agency	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	
Collaboration with CERT	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	

(continued)

Pillar I: National collaborative governance			
Component: Regulatory collaboration in digital core areas			
Indicators	Option	Score	Source
Collaboration with (Independent) Data Protection Authority	Yes, formal collaboration (MOU or joint program or committee)	2	
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	1	
	Activities carried out under the same ministry	1	
Collaboration between ICT ministry OR ICT regulator AND Digital (Transformation) Agency/ National Agency in charge of (coordination of) the implementation of digital policies/strategies	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	

Pillar I: National collaborative governance			
Component: Cross-sector institutional cooperation			
Indicators	Option	Score	Source
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and (Independent) Finance Regulator	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	0	
	Activities carried out under the same ministry	0	
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and Energy regulatory Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	

(continued)

Pillar I: National collaborative governance			
Component: Cross-sector institutional cooperation			
Indicators	Option	Score	Source
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and Transport regulatory Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and (Independent) Competition Authorities	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	1	
	Activities carried out under the same ministry	1	
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and Postal regulation Authority	Yes, formal collaboration (MoU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and (Independent) Consumer Protection Authority, Data Protection Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	1	
	Activities carried out under the same ministry	1	

(continued)

Pillar I: National collaborative governance			
Component: Cross-sector institutional cooperation			
Indicators	Option	Score	Source
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and Ministry responsible for Health (e-health)	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	1	
	Activities carried out under the same ministry	1	
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and Ministry responsible for Education (e-education)	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and Ministry responsible for the Environment (e-waste)	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	
Collaboration between ICT policy body (e.g., telecom/ICT/communication Ministry) and Ministry responsible for Economic development OR similar focusing on a single or a subset of economic sector/s, e.g., Industry, Agriculture, Fishery)	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 and desk-top research 2021
	Yes, informal or semi-formal collaboration	1	
	No collaboration, no entity in charge, or no data	0	
	ICT regulator has the mandate / same authority	2	
	Activities carried out under the same ministry	1	

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Pillar II: Policy design principles				
Component: Regulatory design procedures				
Indicators	Option	Score	Source	
Are public consultations designed as a tool to gather feedback from national stakeholders and guide regulatory decision-making (e.g., clear deadlines, process are defined, requirement to respond to stakeholder comments is in place)?	Yes	2	TREG20 and desk-top research 2021	
	Yes, but there is no requirement/it is unclear what the timeline and process is and whether the regulator incorporates results in their decision-making/ there is no obligation to consider/respond to all comments	1		
	Not undertaken or required by law/No data	0		
Is there a formal requirement for Regulatory Impact Assessment (RIA) before regulatory decisions are made?	Yes	2	World Bank	
	Yes, but not consistently applied to all decisions	1		
	No	0		
Are the decisions of the regulatory authority (entity in charge of regulation) subject to a general administrative procedures law?	Yes	2	TREG20 and desk-top research 2021	
	No	0		
Can affected parties request reconsideration or appeal adopted regulations to the relevant administrative agency (all sectors)?	Yes, administrative review by an independent body / the judiciary	2	World Bank	
	Yes, administrative review by the regulatory body	1		
	No	0		
Are national policy and regulatory frameworks technology and service-neutral?	Yes, for both authorization/operating licences and spectrum	2	TREG20	
	Yes, for authorization/operating licences or spectrum, but not for both / There are exceptions to which bands of the spectrum are technology neutral	1		
	No	0		
Regulatory experimentation	Are there mechanisms for experimentation in ICT/digital regulation?	Yes	2	TREG20 and desk-top research 2021
		No	0	
	Are there regulatory sandboxes for digital financial services?	Yes	2	CGAP
		No	0	
Policy reviews	Do ministries/regulatory agencies conduct ex-post policy reviews?	Yes	2	World Bank
		No	0	

(continued)

Pillar II: Policy design principles				
Component: Regulatory design procedures				
Indicators		Option	Score	Source
	Do ministries/regulatory agencies conduct policy rolling reviews and commission monitoring reports?	Yes	2	World Bank
		No	0	
Are the laws (all sectors) that are currently in effect available on a single website managed by the government?		Yes	2	World Bank
		No	0	
Is public access to information ensured and fundamental freedoms protected, in accordance with national legislation and international agreements?		Yes	2	United Nations
		No	0	
Are there ethics rules in place that apply to the regulator's staff, including Head/Chairperson and Members/Commissioners of NRA (e.g., improper acceptance of gifts, personal and financial conflicts of interest, post-employment obligations)?		Yes	2	TREG20
		No	0	

Pillar III: Digital Development Toolbox				
Component: Digital strategy for development				
Indicators		Option	Score	Source
Strategy design and implementation	Is there an overarching digital strategy in place?	Yes	2	TREG20 and desk-top research 2021
		Expired, or being planned, is part of a broader development strategy, only covers specific plans or not clearly implemented	1	
		No	0	
	The digital strategy has mechanisms for implementation/operational objectives?	Yes	2	TREG20 and desk-top research 2021
		Yes, partially, or the strategy has expired	1	
		No/ No strategy	0	
Is broadband considered as part of universal access/service definition?		Yes	2	TREG20 and desk-top research 2021
		No	0	

(continued)

Pilar III: Digital Development Toolbox					
Component: Digital strategy for development					
Indicators	Option	Score	Source		
Is there a digital identity framework in place?	Yes	2	TREG20 and desk-top research 2021		
	No	0			
Is there an e-gov/ Digital first government/ National e-government strategy or equivalent?	Very high development	2	United Nations		
	High development	1			
	Medium development	0			
	Low development	0			
Has your country adopted e-waste regulations or e-waste management standards?	Yes	2	Global E-waste Statistics Partnership (GESP)		
	No	0			
Does a regulatory framework exist for ICT accessibility for persons with disabilities?	Yes	2	TREG20		
	No clear framework/enforcement or partial	1			
	No	0			
Is there a legislation/regulation for child online protection?	Yes	2	TREG20		
	No	0			
Public services	Has your country adopted any policy/legislation/regulation related to Smart Cities?	Yes	2	TREG20 and desk-top research 2021	
		No			0
	Has your country adopted any policy/legislation/regulation related to e-Health or Smart Health?	Yes	2	TREG20 and desk-top research 2021	
		No			0
	Has your country adopted any policy/legislation/regulation related to e-applications and/ or m-applications on Education and Learning?	Yes	2	TREG20 and desk-top research 2021	
		No			0
Cybersecurity	Is there cybersecurity legislation or regulation?	Yes	2	TREG20, GCI, UNCTAD and desktop research 2021	
		Partial coverage			1
		No			0

(continued)

Pillar III: Digital Development Toolbox				
Component: Digital strategy for development				
Indicators		Option	Score	Source
	Has your country signed or ratified the Budapest convention on cybersecurity?		2	Council of Europe
			0	
Data protection	Are there formal data protection rules (e.g., law, regulations)?	There is a law and a data protection agency has been established	2	TREG20, UNCTAD and desktop research 2021
		There is a law but either: i) a data protection agency has not yet been established, ii) the law is not yet implemented, or iii) the law covers only a limited number of activities	1	
		No	0	
	Has your country signed on international agreements determining jurisdiction and/or managing cross border flows on data privacy?	Yes, determining jurisdiction and managing cross border flows	2	Desktop research 2021
		Yes, either determining jurisdiction or managing cross border flows	1	
		No	0	
Emergency telecommunications	Has your country signed or ratified the Tampere convention for communications in emergency situations?	Yes	2	UNTC
		No	0	
	Does a National Emergency (Telecommunications) Plan exist?	Yes	2	TREG20 and desktop research 2021
		No	0	
Infrastructure sharing	Does an official register or a mapping exist in your country of all telecommunication/ICT infrastructure?	Yes	2	TREG20 and desktop research 2021
		Yes, but only for some infrastructure or evidence is unclear	1	
		No	0	
	Is there any cross-sector (ICT, energy, rail or other) infrastructure sharing or fibre co-deployment regulations/agreements/promotion initiatives in your country?	Yes	2	Desktop research 2021
		No	0	

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Pilar III: Digital Development Toolbox			
Component: SDGs			
Indicators	Option	Score	Source
Is the digital strategy explicitly SDG-oriented OR has mention of specific SDGs or other international development goals (e.g., MDGs, WSIS goals, EU Strategic objectives)?	Yes	2	UNSTAT
	No	0	
Are there policy instruments aimed at supporting the shift to sustainable consumption and production, or coordination mechanism for sustainable consumption and production?	Yes	2	UNSTAT
	No	0	
Is there a developed and operationalized global strategy for youth employment and to implement the Global Jobs Pact of the ILO?	Yes	2	Desktop research 2021
	Developed, not yet operationalized	1	
	No	0	
Strategies for targeted groups	Broadband plan/ initiative includes promotion of the provision of broadband services to women and girls	Yes	TREG20 and desktop research 2021
		No	
	Broadband plan/ initiative includes promotion of the provision of broadband services to persons with disabilities	Yes	TREG20 and desktop research 2021
		No	
	Broadband plan/ initiative includes promotion of the provision of broadband services to young people	Yes	TREG20 and desktop research 2021
		No	
Component: International collaboration and harmonization			
Indicators	Option	Score	Source
Does your country belong to regional integration initiatives with ICT chapters?	Yes	2	Desktop research 2021
	Yes, partial	1	
	No	0	
Has your country have made commitment to facilitate trade in telecommunication services?	Yes	2	WTO
	No	0	

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Component: Framework for innovation				
Indicators	Option	Score	Source	
Is there a holistic innovation policy or one tailored to the ICT/digital sector?	Yes	2	Desktop research 2021	
	Planned or not clearly implemented	1		
	No	0		
Is there a forward-looking competition policy, law or regulation applied to digital markets?	Yes	2	TREG20 and desktop research 2021	
	Planned, or only a general competition law exists	1		
	No	0		
Pillar IV: Digital economy policy agenda				
Component: Framework for digital transformation				
Indicators	Option	Score	Source	
Has your country adopted a forward-looking or innovative national strategy, policy or initiative focusing on spectrum (e.g., IMT-2000, 5G, FWA)	Yes	2	TREG20 and desktop research 2021	
	No	0		
Are there policies and regulations for e-commerce/e-transactions?	Yes	2	TREG20, UNCTAD, and desktop research 2021	
	Rules at regional level exist (e.g., EU) but has not yet formulated national rules to match or no monitoring and enforcement of rules or has limited provisions	1		
	No	0		
Digital Skills	Does universal service/ access definition includes connectivity for telecentres or schools (primary, secondary, post-secondary)?	Yes	2	TREG20
		No	0	
	Has the Universal Service Fund financed projects for connecting schools (primary, secondary, post-secondary, universities, specialized training institutions, etc.) or multi-purpose telecentres?	Yes	2	TREG20
		No	0	
	Does the digital strategy include the educational sector?	Yes	2	TREG20
		No	0	

(continued)

Pillar IV: Digital economy policy agenda				
Component: Framework for digital transformation				
Indicators		Option	Score	Source
Policies for specific sectors	Does the digital strategy include specific mentions of multiple sectors of the economy?	Yes	2	Desktop research 2021
		Partly/ Not clearly expounded	1	
		No	0	
	Has your country adopted any policy/legislation/regulation related to cloud or edge computing?	Yes, for Agriculture/Science/Financial Services	2	TREG20 and desktop research 2021
		Yes, for two of Agriculture/Science/Financial Services	1.3	
		Yes, for only one of Agriculture/Science/Financial Services	0.7	
		No	0	
Industry 4.0	Does it include a strategy, policy or initiative focusing on the Internet of Things (IoT)? Or have any measure/s been applied regarding spectrum management and availability for IoT?	Yes	2	TREG20 and Desktop research 2021
		No	0	
	Has your country adopted a generic policy/legislation/regulation related to cloud computing?	Yes	2	TREG20 and desktop research 2021
		No	0	
	Has your country adopted a national strategy, policy or initiative related to Artificial Intelligence?	Yes	2	TREG20 and desktop research 2021
		No	0	
Component: Taxation framework				
Indicators		Option	Score	Source
Are there specific taxes on the telecom/digital sector (supply side) OR on Internet services/devices/SIM cards/airtime recharge (demand side)?		Yes	0	ITU Tariff Policies 20 and desktop research 2021
		No	2	
Are there regulatory incentives targeted at network operators or other digital market players?		Yes, for all	2	TREG20 and desktop research 2021
		Yes, but only for some	1	
		No	0	

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Component: Codes of conduct			
Indicators	Option	Score	Source
Do codes of conduct exist (voluntary or enforceable/ required by regulator)?	Yes	2	Desktop research 2021
	No	0	

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