Global STI Capacity Index: Comparison and Achievement Gap Analysis of National STI Capacities†

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Abstract

Science, technology and innovation (STI) is crucially important to eradicating poverty, and making advances in various areas such as agriculture, health, environment, transport, industry, and telecommunications. Therefore, it is vital to the overall socioeconomic development of nations. The indispensable role of STI in the competitive globalized economy led to several attempts to measure national STI capacities. The present study outlines STI capacity around three sets of capabilities: technological capabilities, social capabilities, and common capabilities. The Global Science, Technology and Innovation Capacity (GSTIC) index was developed to provide current evidence on the national STI capacities of the countries, and to improve the composite indicators used for such purposes. The GSTIC ranks a large number of countries (167) on the basis of their STI capacities and categories them into four groups: i.e. leaders, dynamic adopters, slow adopters, and laggards. For more meaningful assessment of the STI capacities of nations, it captures the achievement gaps of individual countries with the highest achiever. The study also provides ranking and achievement gaps of nations in the nine GSTIC pillars: technology creation, R&D capacity, R&D performance, technology absorption, diffusion of old technologies, diffusion of recent innovations, exposure to foreign technology, human capital, and enabling factors. A more detailed analysis of the strengths and weaknesses in different pillars of STI capacity of ten selected countries is also provided. The results show that there are significant disparities among nations in STI capacity and its various aspects, and developing countries have much to catch-up with the developed nations. However, different countries may adopt different strategies according to their strengths and weaknesses. Useful insight into the strengths and weaknesses of the national STI capacities of different countries are provided in the study.

Keywords
STI capacity, STI policy, technology achievement gap, STI index, technology development index

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1. INTRODUCTION

1.1. STI and Development

It is now universally recognized that science, technology and innovation (STI) are critical components of any successful national development strategy. Inclusive and sustainable socioeconomic development cannot be achieved without technological development and innovation. STI has become an indispensable factor for economic success, growth, and development in the competitive global economy. The pivotal importance of STI, knowledge sharing, and capacity building for eradicating poverty and achieving sustainable development was also confirmed at the Rio+20 Conference and the 2013 ECOSOC Annual Ministerial Review (UNDESA, 2013).

Research and development can lead to development that improves social wellbeing and economic equity, and also ensures environmental sustainability and promotes gender equity (Parikh, 2003). STI contributes towards addressing poverty, disease, and environmental degradation that hamper development in many countries. STIcan be a powerful tool in the creation of employment opportunities, the growth of indigenous firms, and the improvement of agricultural productivity as well as facilitating the achievement of the Millennium Development Goals (MDGs). It is well-understood that the process of socioeconomic development is not only based on the natural resources that a country possesses but also on its scientific and technological capability (Naim & Atta-ur-Rahman, 2005). The scientific and technological preparedness of a country in the knowledge-based economy leads to enhancing its innovation and technological capabilities essential for socioeconomic development (Nasir, Ali, Shahdin, & Rahman, 2011).The industrial revolution and emergence of the service sector were possible only because of technological developments (Khan, 2004). In fact, STI is today a tool used to gain economic development and progress. Success in the developed economies is largely based on sustained investmentin building their education and STI. The scientific and technological developments in the fields of agriculture, health, environment, telecommunication, and applied engineering have made significant contributions in the improvement of the living standards of people in the developed world. The developing nations, however, still are limited in their capacity for utilizing STI to tackle their problems (POST, 2004). As a result, over 1.2 billion people in the world still lack access to electricity, 2.6 billion people are without clean cooking facilities (IEA, 2013), 783 million people do not have access to clean water, and almost 2.5 billion do not have access to adequate sanitation (UN Water, 2013). According to an International Telecommunication Union report, 60% and 68% of the world population is without Internet and mobile-broadband subscriptions, respectively (ICT-ITU, 2014). This is a notable statistic as these technologies are crucial to human wellbeing in today's world.

The declaration of the 13th Session of the United Nations Conference on Trade and Development ("The Doha Manar") states that the development of a strong STI capacity, together with effective information and communication technologies (ICT), are important capabilities for mobilizing gains from the globalized and knowledge-based economy of the twenty-first century (UNCTAD, 2012). This document also states that the development of a strong STI capacity is a key to addressing

many of the persistent and emerging trade and development challenges that developing countries face. With clear evidence provided by researchers in the last few decades on strong linkage between the STI base of a country and its socioeconomic development, STI capacity building has become crucial for countries for poverty reduction and achieving other social and economic targets.

1.2. Defining STI Capacity

In today's world, STI has become "the game changer" for sustainable development (Bokova, 2012), necessitating the need for benchmarking and measuring change in STI capacities at the national level. Although the measuring of capacity and change in STI has a long history (Litan, Wyckoff, & Fealing, 2012), there is no universal agreement on the definition of STI capacity or on the indicators that best represent it. However, the indicators generally used involve input, output, outcome, or impact of STI activities. There is also a general consensus that STI capacity does not simply relate to R&D or sophisticated scientists and engineers; it also concerns the commercialization of lab results and the training of technical and vocational workers. In the context of the knowledge-based economy, success in economic development is not only determined by the ability of a nation to create knowledge, develop technology, or innovate, but also its ability to understand, interpret, select, adapt, use, transmit, diffuse, produce, and commercialize scientific and technological knowledge in ways appropriate to its culture, aspirations, and level of development (World Bank, 2014). Therefore, the present study takes a more holistic approach in defining and capturing STI capacity. It defines STI capacity as the combination of "technological capabilities" required for knowledge generation, technology development and technological innovation, the "social capabilities" required for knowledge and technology acquisition, diffusion, exploitation and utilization for socioeconomic benefits, and the common capabilities that affect both technological and social capabilities.

1.3. Measuring STI Capacity

The United Nations recommends that governments in developing countries should consider formulating and implementing STI policies as a central feature of their development strategies (UNCTAD, 2012). However, for countries to formulate appropriate STI policies, they must assess their existing STI capacities. In turn, the absence of relevant indicators is often a major obstacle in assessing existing STI capacities, limiting the design and implementation of STI policies (Lugones & Suarez, 2010). Systematic statistical data on national technological capabilities has multiple uses (Arundel & Garrelfs, 1997). It not only serves as a source of information for public policies, but also can broaden our knowledge of technological change and test innovation theories, as well as being an important input for firms towards formulating their strategies (Archibugi, Denni, & Filippetti, 2009). The three main stakeholders of statistical data on national STI capacity are "researchers," "policy makers" and "industry managers." Researchers use this data as measurement tools for testing various hypotheses about technological changes as engines of development, and innovation as the determinant of economic growth, productivity, competitiveness, and employment. Policy makers use this data to locate their country's position in the world, to identify their national strengths and weaknesses, to secure technological opportunities, and to assess the effectiveness of

the policies they have adopted (Furman, Porter, & Stern, 2002; Pianta & Sirilli, 1997). Therefore, this data serves as a fundamental source of information for formulating and implementing effective STI policies. For industry managers, data on the national technological capabilities of countries play an important role in their decisions about location of their innovation as well as production activities.

Different studies have been carried out to measure the scientific, technological, and innovation capabilities of nations in terms of composite indicators. Some well-known composite indicators are: the Global Competitiveness Index (GCI, 2014), the Global Innovation Index (GII, 2015), the Index of Science and Technology Capacity (Wagner, Brahmakulam, Jackson, Wong, & Yoda, 2001), the Technology Achievement Index (Desai, Fukuda-Parr, Johansson, & Sagasti, 2002), the National Innovative Capacity Index (Porter & Stern, 2003), the UNIDO Industrial Scoreboard (Lall & Albaladejo, 2003; UNIDO, 2004), the New Indicator of Technological Capabilities (Archibugi & Coco, 2004), the UNIDO Industrial-cum-Technological Advance Index (UNIDO, 2005), the Georgia High Technology Indicators (Porter, Roessner, Newman, Jin, & Johnson, 2006), and the Technological Capability Monitoring Index (Tabatabaeean, Naghizadeh, Khaledia, & Naghizadeha, 2010). Due to the scope of the present study, not all of the indicators mentioned above are discussed in detail.

The Technology Achievement Index (TAI: Desai et al, 2002) was developed as a measure of a country's participation in creating and using technology. This index was originally developed for the UNDP Human Development Report 2001. The index is based on four dimensions: the creation of technology, diffusion of recent innovations, diffusion of old innovations, and human skills. Each dimension is represented by two indicators. The study includes the data of seventy-two countries that are divided into four groups—leaders, potential leaders, dynamic adopters, and marginalized countries—on the basis of scores they had achieved in the Index. Nasir et al (2011) extended the list of countries included in the TAI index to ninety-one in their study. They also presented a comparison of the progress of technology achievement and relative positions of the fifty-six countries in the two indices common in the 2002 and 2011 TAI studies.

The Index of Science and Technology Capacity, developed by Wagner et al (2001) for the RAND Corporation, aims to measure the extent to which a country can absorb and use scientific and technological knowledge. This index was also based on eight indicators but was divided into three dimensions of S&T capacity: enabling factors, resources, and embedded knowledge. Compared to Desai et al (2002), who awarded equal weight to all dimensions, Wagner et al (2001) awarded different weights to different dimensions. Utilizing this methodology, they evaluated 150 countries for science and technology capacity and categorized them into four groups: "scientifically advanced countries," "scientifically proficient countries," "scientifically developing countries," and "scientifically lagging countries."

The new indicator of technological capabilities (Archibugi & Coco, 2004) is also comprised of three dimensions: creation of technology, technological infrastructures, and development of human

skills. These dimensions are represented by eight indicators. This index was developed by Archibugi and Coco (2004), whose main purpose was to provide a measurement of technological capabilities that accounts for both developed and developing countries. They evaluated 162 countries on the basis of their index. They also tried to assess technological capability by including an indicator of technology exports (based on FDI, technology licensing payments, and capital goods imports) as introduced by Lall and Albaladejo (2003).

The Technological Capability Monitoring Index, developed by Tabatabaeean et al (2010), is composed of seventeen indicators but did not have any sub-indices or dimensions. In the Index, 127 countries are ranked in three groups: large economy, medium economy, and small economy, based on the size of their GDP.

In summary, "technology" is a common factor that can explain differences between countries in productivity, growth rate, competitiveness, job creation, and human wellbeing (Juma, Fang, Honca, Huete-Perez, Konde, Lee, Arenas, Ivinson, Robinson, & Sing, 2001). However, as the STI system is continuously and rapidly evolving (Freeman & Soete, 2007), and drivers and patterns of economic growth and development are changing in the context of knowledge-based economies, methods of measuring STI capacity also need to be developed accordingly. True transformation into a knowledge-based economy does not mean merely the production of knowledge-intensive goods and services, but rather that knowledge must be internalized and disseminated throughout the economy (ADB, 2013). The STI capacity-related indices developed previously do not make clear distinctions between the "technological capabilities" and "social capabilities" required for this transformation. The present study is an attempt to explain different elements of STI capacity more explicitly. The concept of the GSTIC index is discussed in more detail in the next section.

It is worth mentioning here that while composite indicators are an important tool for assessing overall capabilities of a country (particularly in comparison to others), they do not present a comprehensive picture. They do not identify which nations are the leaders in particular technologies. They also cannot capture the existence of local pockets of brilliance among national mediocrities. However, these limitations do not undermine the importance of the composite indicators, as currently there is no more trusted tool to assess national technological capabilities or technology development potential, or to identify where a nation stands among others in its overall technological capabilities or how prepared a nation is for participating in the global network of the knowledge and innovation economy. However, it must be recognized that the composite indicators must be considered as the "starting point" of the investigative process in the analysis of ailment of nations, and not as the "end point."

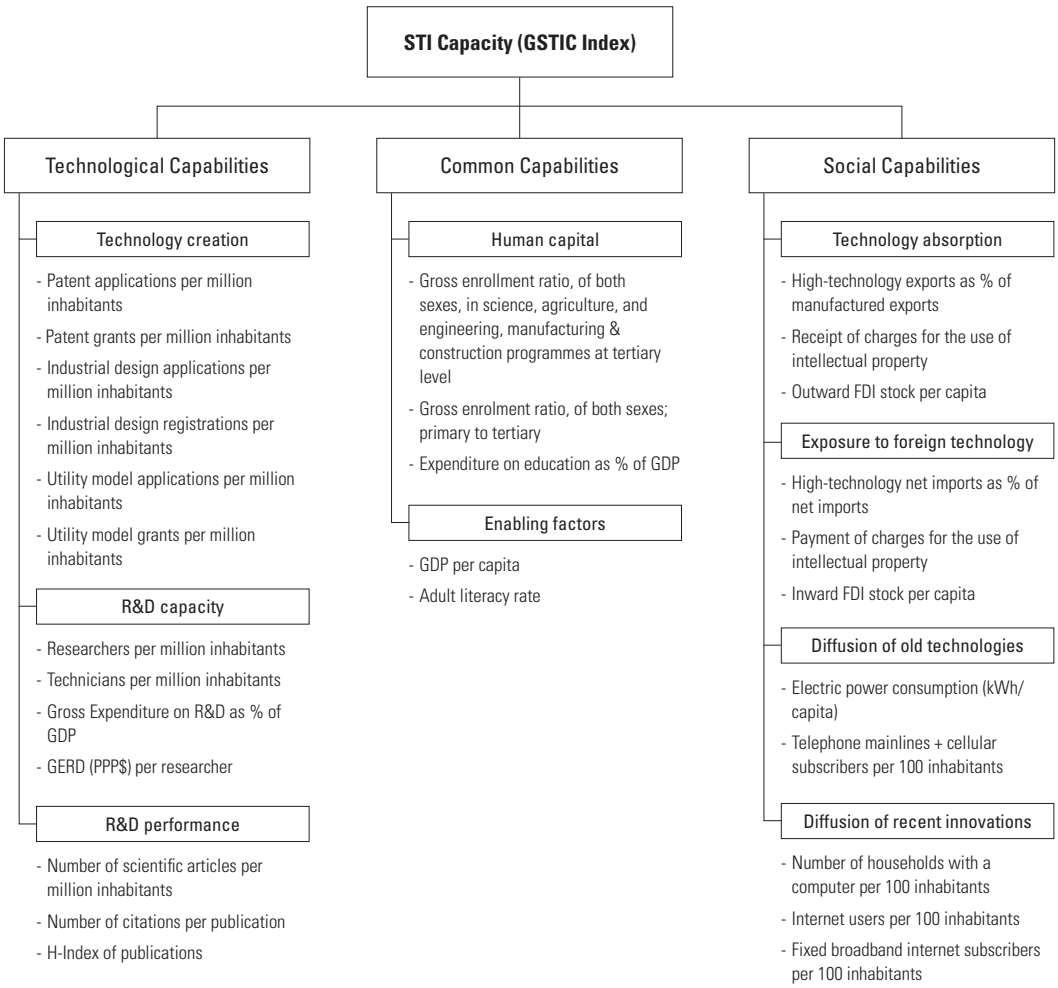
2. GLOBAL SCIENCE, TECHNOLOGY AND INNOVATION CAPACITY INDEX

2.1. GSTIC Index Conceptual Framework

The Global Science, Technology and Innovation Capacity Index (GSTIC) relies on the assumption

that the national STI capacity can be explained by three sets of national capabilities, here termed as the technological capabilities, social capabilities, and common capabilities (Figure 1). Technological capabilities are required for knowledge generation, technology development (creation and adaptation) and technological innovations. Social capabilities are required for knowledge/technology acquisition, diffusion, exploitation, and utilization for socioeconomic benefits at the wider societal level. Common capabilities are those capabilities of a nation that affect, positively or negatively, both of its technological and social capabilities. These capabilities are multifaceted, and it is very difficult—if not impossible—to capture them entirely. However, the present paper attempts to capture different elements of these capabilities through nine (9) pillars that can be taken as distinct but interconnected facets of the STI capacity of a nation. Each pillar is composed of more than one individual indicator. GSTIC pillars and their composition are discussed in more detail in the next section.

FIGURE 1. GSTIC Index Conceptual Framework



2.2. GSTIC Pillars, Individual Indicators, and Data Sources

GSTIC Pillar 1: Technology Creation

Technology creation capabilities are critical because leaders in knowledge creation and technological innovations reap maximum rewards in the competitive global knowledge-based economy. Data regarding intellectual property rights (especially patents) have been used by almost all previous studies investigating innovation and the technological capacities of nations as an indicator of innovation and technology creation capabilities.

Indicators:

i. Patent applications per million inhabitants (average 2009–2013)
ii. Patent grants per million inhabitants (average 2009–2013)
iii. Industrial design applications per million inhabitants (average 2009–2013)
iv. Industrial design registrations per million inhabitants (average 2009–2013)
v. Utility model applications per million inhabitants (average 2009–2013)
vi. Utility model grants per million inhabitants (average 2009–2013)

Data sources: World Intellectual Property Organization (WIPO). Data for Taiwan was not available at the WIPO website; it was retrieved from the European Patent Office (EPO) website.

GSTIC Pillar 2: Research and Development Capacity

Research and Development (R&D) is a crucial component of the innovation process and a key factor in developing new competitive advantages. Some companies rely on R&D for growth through new product introduction while others use R&D to stimulate incremental improvements. R&D capabilities of a country indicate how successful it will be in future in developing new products, processes, and services. It also indicates the extent of benefits it can derive from foreign technologies through adaptation. It also shows the ability of a country in using present and related knowledge for solving local problems.

Indicators:

i. Researchers (full time equivalent) per million inhabitants (2008–2012)
ii. Technicians (full time equivalent) per million inhabitants (2008–2012)
iii. Gross Expenditure on R&D (GERD) expenditure as % of GDP (2008–2012)
iv. GERD (PPP$) per researcher (2008–2012)

Data sources: UNESCO Institute of Statistics; Index Mundi website (for missing data)

GSTIC Pillar 3: Research and Development Performance

Measuring the performance of R&D activities is not simple. However, the number of scientific articles published is one of the most widely used indicators for measuring performance of R&D activities. Scientific articles are an important source of codified knowledge generated in R&D organizations and universities. In the present study, the indictors related to the number of publications, quality, and impact of publications have been used for assessing R&D performance.

Indicators:

i. Number of scientific articles per million inhabitants (average 2009–2013)
ii. Number of citations per publication (average 2009–2013)
iii. H-Index of publications (2013)

Data sources: Scimago Journal & Country Rank website

GSTIC Pillar 4: Technology Absorption

Technology absorption capacity means the ability to assimilate, utilize, and exploit acquired or developed technology for social and economic gains. It is very important for developing countries to have the ability to use technologies developed by the advanced countries for their economic benefits.

Indicators:

i. High-technology exports as % of manufactured exports (average 2008–2012)
ii. Receipt of charges for the use of intellectual property (USD per person;average 2009–2013)
iii. Outward FDI stock per capita (USD; 2013)

Data sources: World Development Indicators 2015; World Investment Report 2014

GSTIC Pillar 5: Diffusion of Old Technologies

Widespread diffusion of (basic) old technologies, such as electricity and telephones, is important because without these it is not possible to get the full benefits of the newer or advanced technologies.

Indicators:

i. Electric power consumption (kWh/capita; 2010–2011)
ii. Telephone mainlines and cellular subscribers per 100 inhabitants (2013)

Data sources: World Development Indicators 2015; CIA World Fact Book website;International Telecommunication Union

GSTIC Pillar 6: Diffusion of Recent Innovations

Recent innovations in the form of information communication technologies (ICTs) have become a prerequisite for participation in global economic activities. They are not only the foremost tools for accessing global information at a relatively low cost, but also for providing solutions in other fields such as health, the environment, and agriculture.

Indicators:

i. Number of households with a computer per 100 inhabitants (2013)
ii. Internet users per 100 inhabitants (2013)
iii. Fixed broadband internet subscribers per 100 inhabitants (2013)

Data sources: International Telecommunication Union (2014)

GSTIC Pillar 7: Exposure to Foreign Technology

Import and use of technologically advanced products help developing countries to enhance their own technological capabilities through raising production efficiency and product quality. Exposure to foreign technology provides powerful inducements to nations towards adopting more advanced technology in both exporting and import-competing. However, the extent to which they benefit from the exposure to foreign technologies, inter alia, depends on the absorptive capacity of individual countries. Reverse spillover impacts of outward FDI, even for companies in the developed countries, are also well known.

Indicators:

i. High-technology net imports as % of net imports (2012)
ii. Payment of charges for the use of intellectual property (USD per person; average 2009–2013)
iii. Inward FDI stock per capita (USD; 2013)

Data sources: World Development Indicators 2015; World Investment Report 2014

GSTIC Pillar 8: Human Capital

The level of education and cognitive skills of populations play an important role in the success of national innovation and technology development of the countries by increasing the technological capabilities. Higher education is a key factor in today's knowledge-based economy for learning, using and exploiting modern technologies. National effort into the development of human capital indicates the extent of necessary "soft infrastructure" for national STI capacities.

Indicators:

i. Gross enrollment ratio, of both sexes, in science, agriculture, and engineering, manufacturing and construction programs at the tertiary level (2008–2012)
ii. Gross enrollment ratio of both sexes: primary to tertiary (2008–2012)
iii. Expenditure on education as % of GDP (2008–2012)

Data sources: UNESCO Institute of Statistics; CIA World Fact Book website; Data for Taiwan was retrieved from the Ministry of Education, Taiwan website

GSTIC Pillar 9: Enabling Factors

GDP per capita indicates the presence and level of necessary infrastructure for the supporting economy and STI activities. It is often used as an indicator on the rationale that all citizens would benefit from their country's increased economic production. For developing countries, the general literacy rate may determine the ability to accept new ideas and technologies as well as changing views towards work and society. Hence, it can have great impact on the technology development in developing countries.

Indicators:

i. GDP per capita (PPP$) (2013)
ii. Adult literacy rate (2008–2012)

Data sources: UNESCO Institute of Statistics; World Development Indicators 2015; CIA World Fact Book website

2.3. Methodology for Calculation of the GSTIC Index

2.3.1. Calculation of GSTIC Index

Overall, the methodology used in the synthesis of the GSTIC index is similar to that of Desai et al. (2002):

a. Calculation of index values for all the individual indicators.
b. Calculation of sub-indices for different pillars by taking simple average of individual indicators representing a pillar.
c. Calculation of GSTIC index by taking a simple average of all the sub-indices.

However, some modifications were made in the calculation formula:

i. For calculation of indices of individual indicators, Desai et al. (2002) used the following formula:

$$\text{Indicator Index} = \frac{\text{Actual Value of Indicator - Observed Minimum Value}}{\text{Observed Maximum Value - Observed Minimum Value}}$$

It was observed during the study that the use of this formula unnecessarily exaggerates differences between countries. A country with the minimum value, even if it is very close to the maximum value, will have a "zero" score in the index. For example, if country A has 100 Internet users per 100 inhabitants (maximum observed value) and country B has 90 Internet users per 100 inhabitants (minimum observed value), use of this formula will show that country A's score is one (1) and country B's score is zero (0) in the index. In other words, country A's performance is 100 percent and country B's performance compared to country A is zero, which is misleading. This deficiency of the formula was removed by making it simpler:

$$\text{Indicator Index} = \frac{\text{Actual Value of Indicator}}{\text{Observed Maximum Value}}$$

Using this modified formula, country B's performance, in the above example, will be shown as 90 percent, which is more accurate indication of its performance. Values thus obtained were multiplied by 100 to make very small values visible. The final formula is as follows:

$$\text{Indicator Index} = \frac{\text{Actual Value of Indicator}}{\text{Observed Maximum Value}} \times 100$$

2.3.2. Calculation of Achievement Gap

Performance of the highest achiever (country with the maximum value) in GSTIC index/sub-indices was assumed to be as 100 percent and performances of rest of the countries were calculated as "percent achievement gap" with the highest achiever.

2.3.3. Estimation of Missing Values

Missing values of the individual indicators were estimated based on the similar-condition countries, i.e. countries belonging to the same GSTIC category, income group and geographical region. This

involved following step:

i. Different GSTIC pillars (preliminary) were calculated considering missing values of individual indicators as "zero."
ii. The GSTIC index (preliminary) was developed by awarding equal weight to all nine pillars.
iii. Achievement gaps of countries, with the highest achiever, were calculated as in section 2.3.2.
iv. Based on the preliminary GSTIC scores and achievement gaps, countries were divided into four categories: leaders, dynamic adopter, slow adopters, and laggards.
v. Missing values of the individual indicators in the original data were replaced with the lowest values of countries with similar conditions, i.e. countries belonging to the same GSTIC category, income group, and geographical region.
vi. GSTIC index and sub-indices were recalculated as in section 2.3.1.

2.4. GSTIC Index Ranking and Comparison of National STI Capacities

The results show significant disparities in national STI capacities among 167 countries that were included in the study (Table 1). The GSTIC index score ranged from 57.94 for Luxembourg to 7.19 for Niger. The achievement gap of Switzerland with the highest achiever (Luxembourg) was just 3.53% while it was as substantial as 87.59% for the bottom-ranked Niger. On the basis of the GSTIC index score and achievement gap analysis, countries included in the index were divided into four groups: leaders, dynamic adopters, slow adopters, and laggards.

2.4.1. Leaders (GSTIC>40.50; Achievement Gap < 30.00%)

The top twenty countries in the index were included in this group. All the countries in the group were "high income" countries, with the European countries Luxembourg, Switzerland, Iceland, Sweden and Denmark, occupying the top five positions (Table 1). Most (14) of the countries in the group belonged to Europe, but four East & Southeast Asian countries—Singapore, South Korea, Hong Kong China, and Japan—were also included in the group along with the United States from North America and Israel from Middle East & North Africa region. In general, countries in the "leaders" group were much stronger than other groups in the GSTIC pillars "technology creation," "technology absorption," "R&D capacity" and "R&D performance." On average, countries in the "leaders" group have 2–4 times higher GSTIC scores in these pillars than countries in the next group ("dynamic adopters").

2.4.2. Dynamic Adopters (GSTIC>23.00<40.50; Achievement Gap <60.00%>30.00%)

The "dynamic adopters" group, topped by Australia, included forty-eight countries. Most (34) of the countries in this group belonged to the "high income" group and about a quarter (13) of the countries belonged to the "upper middle income" group (Table 1). However, one "lower middle income" country, Ukraine, was included in this group. Like the "leaders" group, most (20) of the countries included in the "dynamic adopters" group also belonged to Europe. However, the group also included countries from regions such as Latin America and the Caribbean (9), the Middle East

and North Africa (7), and East and Southeast Asia (5). One country (Seychelles) was included from Sub-Saharan Africa. Countries in the "dynamic adopters" group, in general, were much stronger in "technology creation" and "R&D capacity" than countries in the "slow adopters" group. The average GSTIC index score of "dynamic adopters" in these pillars was about four and eleven times higher than the "slow adopters." Slow Adopters (GSTIC>14.50<23.00; Achievement Gap <75.00%>60.00%)

2.4.3. Slow Adopters (GSTIC>14.50<23.00; Achievement Gap <75.00%>60.00%)

The largest number (62) of countries was included in the group of "slow adopters." A large number (23) of Latin American and Caribbean countries was part of this group, which was also topped by a country (Mexico) from the same region, followed by Sub-Saharan African (10), Middle East and North African (8) and Central and Western Asian (6) countries (Table 1). Five European countries—Montenegro, Moldova, Macedonia, Bosnia and Herzegovina, and Albania—were also included in the group. Most of the countries included in the "slow adopters" group were "upper middle income" countries (31) followed by "lower middle income" countries (25). Interestingly, three "high income" (Trinidad and Tobago, the Bahamas, and Antigua and Barbuda) and two "low income" countries (Kenya and Uganda) were also present in the group. Countries in the "slow adopters" group have average GSTIC index score greater by about 2–9 times in the pillars "technology creation," "technology absorption," and "diffusion of recent innovations" than "laggards."

2.4.4. Laggards (GSTIC<14.50; Achievement Gap >75.00%)

Mostly "low income" (22) and "lower middle income" (13) countries were present in the "laggards" group. However, two "upper middle income" countries (Iraq and Angola) were also present in this group (Table 1). The "laggards" group is predominantly comprised of countries from Sub-Saharan Africa (26). Five countries from South Asia and three countries from Middle East & North Africa were also included in this group. Understandably, this group has lagged behind compared than others in almost all pillars but their least differences with the "slow adopter" was in the pillar of "R&D performance."

TABLE 1. Global Science, Technology and Innovation Capacity (GSTIC) Index

Country	GSTIC Index			Income Group			Region		
	Score (0-100)	Rank	Ach.Gap (%)	Income Group	Rank	Ach.Gap (%)	Region	Rank	Ach.Gap (%)
Leaders (GSTIC>40.50; Achievement Gap < 30.00%)									
Luxembourg	57.94	1	0.00	HI	1	0.00	EUR	1	0.00
Switzerland	55.90	2	3.53	HI	2	3.53	EUR	2	3.53
Iceland	50.82	3	12.30	HI	3	12.30	EUR	3	12.30
Sweden	50.19	4	13.38	HI	4	13.38	EUR	4	13.38
Denmark	49.59	5	14.41	HI	5	14.41	EUR	5	14.41
Finland	48.95	6	15.53	HI	6	15.53	EUR	6	15.53
Singapore	48.40	7	16.46	HI	7	16.46	ESEA	1	0.00
Netherlands	47.22	8	18.51	HI	8	18.51	EUR	7	18.51

Country	GSTIC Index			Income Group			Region		
	Score (0-100)	Rank	Ach.Gap (%)	Income Group	Rank	Ach.Gap (%)	Region	Rank	Ach.Gap (%)
Ireland	46.94	9	18.99	HI	9	18.99	EUR	8	18.99
Korea (South)	45.84	10	20.88	HI	10	20.88	ESEA	2	5.29
United States	45.18	11	22.02	HI	11	22.02	NA	1	0.00
Germany	44.46	12	23.27	HI	12	23.27	EUR	9	23.27
Hong Kong	43.95	13	24.16	HI	13	24.16	ESEA	3	9.21
Norway	43.59	14	24.77	HI	14	24.77	EUR	10	24.77
Austria	43.31	15	25.26	HI	15	25.26	EUR	11	25.26
Belgium	42.61	16	26.47	HI	16	26.47	EUR	12	26.47
France	41.73	17	27.97	HI	17	27.97	EUR	13	27.97
United Kingdom	41.73	18	27.99	HI	18	27.99	EUR	14	27.99
Japan	41.05	19	29.16	HI	19	29.16	ESEA	4	15.19
Israel	40.95	20	29.32	HI	20	29.32	MENA	1	0.00
Dynamic Adopters (GSTIC>23.00<40.50; Achievement Gap <60.00%>30.00%)									
Australia	40.05	21	30.88	HI	21	30.88	OCE	1	0.00
Canada	40.03	22	30.92	HI	22	30.92	NA	2	11.41
Bermuda	39.29	23	32.19	HI	23	32.19	NA	3	13.05
Slovenia	37.20	24	35.79	HI	24	35.79	EUR	15	35.79
New Zealand	36.83	25	36.43	HI	25	36.43	OCE	2	8.03
Estonia	36.12	26	37.66	HI	26	37.66	EUR	16	37.66
Taiwan	35.36	27	38.97	HI	27	38.97	ESEA	5	26.94
Spain	34.65	28	40.20	HI	28	40.20	EUR	17	40.20
Czech Republic	34.53	29	40.40	HI	29	40.40	EUR	18	40.40
Malta	33.96	30	41.38	HI	30	41.38	MENA	2	17.06
Italy	33.88	31	41.52	HI	31	41.52	EUR	19	41.52
Macao	32.48	32	43.94	HI	32	43.94	ESEA	6	32.89
Hungary	32.30	33	44.26	UMI	1	0.00	EUR	20	44.26
Greece	31.97	34	44.83	HI	33	44.83	EUR	21	44.83
Portugal	31.45	35	45.72	HI	34	45.72	EUR	22	45.72
Andorra	30.13	36	48.00	HI	35	48.00	EUR	23	48.00
Barbados	30.07	37	48.10	HI	36	48.10	LAC	1	0.00
Qatar	29.83	38	48.52	HI	37	48.52	MENA	3	27.16
Cyprus	29.18	39	49.63	HI	38	49.63	CWA	1	0.00
Poland	29.02	40	49.91	HI	39	49.91	EUR	24	49.91
Malaysia	28.74	41	50.39	UMI	2	11.01	ESEA	7	40.61
Lithuania	28.53	42	50.76	HI	40	50.76	EUR	25	50.76
Slovak Republic	28.52	43	50.78	HI	41	50.78	EUR	26	50.78
Russian Federation	28.10	44	51.50	HI	42	51.50	EUR	27	51.50
Croatia	27.76	45	52.09	HI	43	52.09	EUR	28	52.09
Latvia	27.50	46	52.53	HI	44	52.53	EUR	29	52.53
Chile	27.40	47	52.71	HI	45	52.71	LAC	2	8.89

Country	GSTIC Index			Income Group			Region		
	Score (0-100)	Rank	Ach.Gap (%)	Income Group	Rank	Ach.Gap (%)	Region	Rank	Ach.Gap (%)
China	27.29	48	52.90	UMI	3	15.50	ESEA	8	43.61
Belarus	27.24	49	52.99	UMI	4	15.66	EUR	30	52.99
Argentina	26.77	50	53.81	UMI	5	17.13	LAC	3	11.00
Costa Rica	26.69	51	53.94	UMI	6	17.38	LAC	4	11.26
Kuwait	26.46	52	54.33	HI	46	54.33	MENA	4	35.38
Uruguay	26.21	53	54.76	HI	47	54.76	LAC	5	12.84
Brunei Darussalam	26.10	54	54.96	HI	48	54.96	ESEA	9	46.08
Saudi Arabia	26.04	55	55.06	HI	49	55.06	MENA	5	36.42
Bulgaria	25.73	56	55.59	UMI	7	20.34	EUR	31	55.59
Bahrain	25.55	57	55.90	HI	50	55.90	MENA	6	37.60
Seychelles	25.36	58	56.23	UMI	8	21.47	SSA	1	0.00
Panama	25.00	59	56.86	UMI	9	22.61	LAC	6	16.88
United Arab Emirates	24.71	60	57.36	HI	51	57.36	MENA	7	39.67
Oman	24.37	61	57.94	HI	52	57.94	MENA	8	40.49
Brazil	24.37	62	57.94	UMI	10	24.54	LAC	7	18.96
Serbia	24.32	63	58.03	UMI	11	24.70	EUR	32	58.03
Kazakhstan	24.24	64	58.17	UMI	12	24.95	CWA	2	16.94
Ukraine	24.21	65	58.22	LMI	1	0.00	EUR	33	58.22
Romania	23.52	66	59.40	UMI	13	27.17	EUR	34	59.40
Aruba	23.48	67	59.47	HI	53	59.47	LAC	8	21.91
Saint Kitts and Nevis	23.23	68	59.91	HI	54	59.91	LAC	9	22.77
Slow Adopters (GSTIC>14.50<23.00; Achievement Gap <75.00%>60.00%)									
Mexico	22.78	69	60.69	UMI	14	29.48	LAC	10	24.27
Turkey	22.73	70	60.77	UMI	15	29.62	CWA	3	22.11
Thailand	22.62	71	60.96	UMI	16	29.96	ESEA	10	53.26
South Africa	22.57	72	61.05	UMI	17	30.13	SSA	2	11.02
Montenegro	22.29	73	61.54	UMI	18	31.00	EUR	35	61.54
Venezuela	22.09	74	61.88	UMI	19	31.62	LAC	11	26.56
Trinidad and Tobago	21.91	75	62.18	HI	55	62.18	LAC	12	27.14
Lebanon	21.83	76	62.33	UMI	20	32.42	MENA	9	46.70
Jordan	21.77	77	62.42	UMI	21	32.59	MENA	10	46.83
Moldova	21.62	78	62.69	LMI	2	10.70	EUR	36	62.69
Grenada	21.31	79	63.22	UMI	22	34.02	LAC	13	29.14
Macedonia	21.26	80	63.31	UMI	23	34.19	EUR	37	63.31
Colombia	21.06	81	63.65	UMI	24	34.79	LAC	14	29.97
Iran	20.98	82	63.79	UMI	25	35.04	MENA	11	48.77
Philippines	20.84	83	64.03	LMI	3	13.90	ESEA	11	56.94
Mauritius	20.62	84	64.41	UMI	26	36.15	SSA	3	18.70
Armenia	20.49	85	64.63	LMI	4	15.35	CWA	4	29.78
Azerbaijan	20.42	86	64.76	UMI	27	36.78	CWA	5	30.04

Country	GSTIC Index			Income Group			Region		
	Score (0-100)	Rank	Ach.Gap (%)	Income Group	Rank	Ach.Gap (%)	Region	Rank	Ach.Gap (%)
Ecuador	20.32	87	64.93	UMI	28	37.09	LAC	15	32.44
Georgia	20.28	88	65.00	LMI	5	16.22	CWA	6	30.51
Tunisia	20.09	89	65.32	UMI	29	37.79	MENA	12	50.93
Saint Vincent and The Grenadines	19.86	90	65.73	UMI	30	38.53	LAC	16	33.98
Dominica	19.79	91	65.84	UMI	31	38.72	LAC	17	34.19
Vietnam	19.78	92	65.86	LMI	6	18.29	ESEA	12	59.13
Bahamas	19.61	93	66.16	HI	56	66.16	LAC	18	34.81
Mongolia	19.55	94	66.25	LMI	7	19.23	ESEA	13	59.60
Antigua and Barbuda	19.52	95	66.32	HI	57	66.32	LAC	19	35.11
Botswana	19.26	96	66.76	UMI	32	40.37	SSA	4	24.07
Cuba	19.20	97	66.86	UMI	33	40.55	LAC	20	36.15
Gabon	19.18	98	66.89	UMI	34	40.61	SSA	5	24.37
Bolivia	19.05	99	67.12	LMI	8	21.29	LAC	21	36.65
Saint Lucia	18.98	100	67.25	UMI	35	41.25	LAC	22	36.91
Peru	18.95	101	67.29	UMI	36	41.32	LAC	23	36.98
Paraguay	18.88	102	67.41	LMI	9	22.00	LAC	24	37.22
Bosnia and Herzegovina	18.81	103	67.54	UMI	37	41.76	EUR	38	67.54
Fiji	18.23	104	68.54	UMI	38	43.56	OCE	3	54.49
Solomon Islands	18.05	105	68.86	LMI	10	25.45	OCE	4	54.94
Morocco	18.02	106	68.91	LMI	11	25.57	MENA	13	56.01
Kyrgyzstan	17.98	107	68.98	LMI	12	25.74	CWA	7	38.41
Albania	17.93	108	69.06	UMI	39	44.50	EUR	39	69.06
Egypt	17.90	109	69.10	LMI	13	26.03	MENA	14	56.28
Kenya	17.63	110	69.58	LI	1	0.00	SSA	6	30.51
Jamaica	17.59	111	69.64	UMI	40	45.54	LAC	25	41.51
Cape Verde	17.41	112	69.95	LMI	14	28.08	SSA	7	31.36
Namibia	17.22	113	70.29	UMI	41	46.69	SSA	8	32.12
El Salvador	16.93	114	70.78	LMI	15	30.05	LAC	26	43.70
Indonesia	16.88	115	70.87	LMI	16	30.28	ESEA	14	65.13
Dominican Republic	16.69	116	71.19	UMI	42	48.32	LAC	27	44.50
Uzbekistan	16.64	117	71.28	LMI	17	31.25	CWA	8	42.98
Ghana	16.50	118	71.52	LMI	18	31.84	SSA	9	34.95
Samoa	16.38	119	71.73	LMI	19	32.34	OCE	5	59.10
Swaziland	16.04	120	72.32	LMI	20	33.76	SSA	10	36.78
Guatemala	15.86	121	72.62	LMI	21	34.47	LAC	28	47.26
Belize	15.52	122	73.22	UMI	43	51.96	LAC	29	48.40
India	15.07	123	73.99	LMI	22	37.74	SA	1	0.00
Syria	14.99	124	74.13	LMI	23	38.07	MENA	15	63.40
Guyana	14.84	125	74.39	LMI	24	38.70	LAC	30	50.66
Nicaragua	14.84	126	74.40	LMI	25	38.71	LAC	31	50.67

Country	GSTIC Index			Income Group			Region		
	Score (0-100)	Rank	Ach.Gap (%)	Income Group	Rank	Ach.Gap (%)	Region	Rank	Ach.Gap (%)
Sri Lanka	14.83	127	74.40	LMI	26	38.72	SA	2	1.57
Uganda	14.77	128	74.51	LI	2	16.21	SSA	11	41.77
Honduras	14.69	129	74.64	LMI	27	39.31	LAC	32	51.15
Algeria	14.52	130	74.94	UMI	44	55.05	MENA	16	64.55
Laggards (GSTIC<14.50; Achievement Gap >75.00%)									
Lesotho	14.31	131	75.30	LMI	28	40.87	SSA	12	43.57
Vanuatu	13.89	132	76.02	LMI	29	42.61	OCE	6	65.31
Gambia	13.89	133	76.03	LI	3	21.22	SSA	13	45.25
Tanzania	13.87	134	76.06	LI	4	21.31	SSA	14	45.32
Tajikistan	13.81	135	76.17	LI	5	21.66	CWA	9	52.68
Cambodia	13.71	136	76.33	LI	6	22.19	ESEA	15	71.67
Zambia	13.69	137	76.37	LMI	30	43.44	SSA	15	46.02
Zimbabwe	13.64	138	76.46	LI	7	22.63	SSA	16	46.23
Mali	13.21	139	77.21	LI	8	25.07	SSA	17	47.93
Mozambique	13.16	140	77.29	LI	9	25.33	SSA	18	48.11
Malawi	12.69	141	78.09	LI	10	27.98	SSA	19	49.95
Bhutan	12.59	142	78.27	LMI	31	47.98	SA	3	16.44
Iraq	12.44	143	78.52	UMI	45	61.47	MENA	17	69.62
Rwanda	12.34	144	78.71	LI	11	30.01	SSA	20	51.36
Congo, Rep.	12.32	145	78.74	LMI	32	49.12	SSA	21	51.44
Nepal	12.19	146	78.96	LI	12	30.84	SA	4	19.12
Senegal	11.98	147	79.32	LMI	33	50.51	SSA	22	52.77
Angola	11.92	148	79.43	UMI	46	63.11	SSA	23	53.02
Sudan	11.85	149	79.55	LMI	34	51.06	SSA	24	53.29
Burundi	11.52	150	80.12	LI	13	34.65	SSA	25	54.59
Cameroon	11.31	151	80.49	LMI	35	53.29	SSA	26	55.42
Yemen	11.04	152	80.95	LMI	36	54.41	MENA	18	73.05
Djibouti	10.98	153	81.05	LMI	37	54.63	MENA	19	73.18
Bangladesh	10.59	154	81.73	LI	14	39.95	SA	5	29.77
Pakistan	10.54	155	81.82	LMI	38	56.48	SA	6	30.10
Togo	10.45	156	81.96	LI	15	40.70	SSA	27	58.79
Nigeria	10.36	157	82.12	LMI	39	57.20	SSA	28	59.15
Madagascar	10.09	158	82.59	LI	16	42.76	SSA	29	60.22
Congo, Dem. Rep.	10.09	159	82.59	LI	17	42.78	SSA	30	60.24
Cote d'Ivoire	9.62	160	83.40	LMI	40	60.26	SSA	31	62.08
Benin	9.33	161	83.90	LI	18	47.07	SSA	32	63.22
Afghanistan	8.77	162	84.86	LI	19	50.25	SA	7	41.81
Burkina Faso	8.70	163	84.98	LI	20	50.62	SSA	33	65.69
Liberia	8.58	164	85.20	LI	21	51.34	SSA	34	66.19
Ethiopia	8.34	165	85.60	LI	22	52.68	SSA	35	67.11

Country	GSTIC Index			Income Group			Region		
	Score (0-100)	Rank	Ach.Gap (%)	Income Group	Rank	Ach.Gap (%)	Region	Rank	Ach.Gap (%)
Guinea	7.37	166	87.29	LI	23	58.21	SSA	36	70.96
Niger	7.19	167	87.59	LI	24	59.19	SSA	37	71.64

Note: Ach.Gap = Achievement Gap with the Highest Achiever
World Bank Income Group Classification (2013): HI=high income; UMI=upper-middle income; LMI=lower-middle income; and LI=low income.
CWA=Central & Western Asia; ESEA=East & South East Asia; EUR=Europe; LAC=Latin America & Caribbean; MENA=Middle East & North Africa; NA=North America; OCE=Oceania; SA=South Asia; SAA=Sub-Saharan Africa

2.5. Comparison of National Capacities in GSTIC Pillars

Study of the sub-indices revealed that there were inconsistencies in the capacities of different countries in different GSTIC pillars. In the pillar "technology creation," Switzerland was significantly ahead of a great majority of countries. Only four countries—Luxembourg (8.23%), Taiwan (24.50%), Korea, Rep. (35.23%) and Japan (46.07%)—had less than a 50% achievement gap with it. For a vast majority (130) of countries, their achievement gap with Switzerland was greater than 90% (Table 2). Switzerland was also at the top of the list in the pillars "R&D capacity" and "R&D performance." However, in the pillar "R&D capacity," Israel, Sweden, and Denmark were not far behind with a less than 10% achievement gap (Table 3). In total, there were twenty-three countries that had a less than 50% achievement gap with Switzerland in this pillar. In the pillar "R&D performance," only the United States had a less than 10% achievement gap with Switzerland while 22 countries have a less than 50% achievement gap with it (Table 4).

Luxembourg's performance was much better than all the other countries in the pillar "technology absorption." Its closest competitor in this pillar (Ireland) had a more than 25% gap with it, and only one other country Singapore (35.17%) had a less than 50% gap (Table 5). In the pillar "diffusion of old technologies," Iceland was at the top of the list followed by Macau and Hong Kong with 22.61% and 30.90% achievement gap, respectively. It was interesting to note that countries like Bermuda (23rd), Qatar (38th) and Kuwait (52nd), which were relatively at the lower positions in the GSTIC index, were among the top ten achievers in this pillar (Table 6). The Netherlands topped the rank in the pillar "diffusion of recent innovations," very closely followed by Denmark with just a 0.5% gap. Iceland (1.46%), Norway (2.60%), Switzerland (4.45%) and Luxembourg (4.55%) were also not far behind the top two countries in this pillar (Table 7). Hong Kong lead the table in the pillar "exposure to foreign technology" with Ireland and Singapore as its closest competitors with a 19.03% and 19.45% achievement gap, respectively. A huge majority (159) of countries had more than a 70% gap with Honk Kong in this pillar (Table 8). In the pillar "human capital," Greece was at the top of the list, followed by Finland, Korea, Rep. and Belarus with 2.78%, 6.68% and 8.42% achievement gaps, respectively (Table 9). Macau was at the top of the list in the pillar "enabling factors." Qatar was its closest competitor with a 3.34% achievement gap. A vast majority (105) of countries had a less than 50% gap with the highest achiever Macau in this pillar (Table 10).

Analysis of the GSTIC index and its sub-indices also revealed interesting fact that the top twenty

countries (leaders group) in the GSTIC index were not always among the top twenty countries in GSTIC pillars. In some cases their position in one or more pillars was actually very low; for example, Singapore was at the 30th position in "technology creation," Austria was at the 33rd position in "technology absorption," Ireland was at the 58th position in "diffusion of old technologies," Denmark was at the 42nd and Germany was at the 44th position in "exposure to foreign technology," and Luxembourg and Hong Kong were at the 111th and 73rd position in the pillar "human capital." Similarly, some countries in the "dynamic adopters" group (GSTIC index positions 21–68) were placed in far lower positions in GSTIC pillars. Serbia was at 114th position in "technology absorption," Kazakhstan was at the 163rd position in "R&D performance," and the United Arab Emirates was at 167th position in the "human capital" pillar.

Some countries in the "slow adopters" group (GSTIC index positions 69–130) showed exceptional achievement in one individual pillar. The Philippines was placed as high as 4th in the pillar "technology absorption." Paraguay and Cuba were placed 11th in "exposure to foreign technology" and "human capital," respectively. From "laggards" group (GSTIC index positions 131–167), Vanuatu, Gambia, Malawi, and Lesotho achieved higher positions in "technology absorption" (28th), R&D performance" (30th), and "exposure to foreign technology" (33rd) and human capital (32nd), respectively.

TABLE 2. Technology Creation Sub-index

Country	Score (0-100)	Rank	A.Gap(%)	Country	Score (0-100)	Rank	A.Gap(%)	Country	Score (0-100)	Rank	A.Gap(%)
Switzerland	65.84	1	0.00	Slovenia	12.12	22	81.60	Russian Fed.	4.70	43	92.86
Luxembourg	60.42	2	8.23	Norway	11.81	23	82.07	Slovak Rep.	4.43	44	93.28
Taiwan	49.71	3	24.50	United States	11.54	24	82.48	Bulgaria	4.12	45	93.74
Korea Rep.	42.64	4	35.23	Czech Rep.	11.36	25	82.75	Samoa	3.57	46	94.58
Japan	35.51	5	46.07	UK	11.24	26	82.93	Hungary	3.37	47	94.89
Sweden	31.76	6	51.77	Estonia	10.22	27	84.48	Croatia	2.67	48	95.95
Denmark	30.77	7	53.27	Ireland	10.03	28	84.76	Turkey	2.53	49	96.16
Bermuda	30.46	8	53.73	Malta	9.14	29	86.11	Moldova	2.15	50	96.73
Finland	30.27	9	54.02	Singapore	8.61	30	86.93	Swaziland	2.13	51	96.76
Germany	29.85	10	54.66	Spain	8.47	31	87.14	Lithuania	2.08	52	96.85
Netherlands	25.85	11	60.74	Ukraine	7.77	32	88.21	Greece	1.78	53	97.30
Austria	25.53	12	61.23	Poland	7.60	33	88.46	Antigua & Barb.	1.77	54	97.31
Barbados	19.06	13	71.05	Andorra	7.55	34	88.53	Brunei Darus.	1.50	55	97.73
China	16.27	14	75.30	Australia	7.24	35	89.00	Belize	1.49	56	97.74
Seychelles	15.94	15	75.79	New Zealand	7.08	36	89.24	Aruba	1.43	57	97.83
France	14.88	16	77.40	Cyprus	7.01	37	89.35	St. Kitts & Nev.	1.38	58	97.90
Belgium	14.61	17	77.82	Canada	6.50	38	90.13	SV Grenadines	1.31	59	98.00
Italy	12.94	18	80.35	Belarus	6.05	39	90.81	Romania	1.22	60	98.15
Hong Kong	12.82	19	80.52	Bahamas	5.44	40	91.74	Iran	1.18	61	98.20
Iceland	12.46	20	81.08	Portugal	5.23	41	92.06	Armenia	1.12	62	98.30
Israel	12.38	21	81.19	Latvia	5.19	42	92.12	Kazakhstan	0.99	63	98.49

Country	Score (0-100)	Rank	A.Gap(%)	Country	Score (0-100)	Rank	A.Gap(%)	Country	Score (0-100)	Rank	A.Gap(%)
Georgia	0.89	64	98.65	Bosnia & Herzg.	0.14	101	99.79	Togo	0.01	138	99.98
Serbia	0.88	65	98.66	Gabon	0.13	102	99.80	Cape Verde	0.01	139	99.98
Thailand	0.87	66	98.68	Madagascar	0.10	103	99.84	Burkina Faso	0.01	140	99.98
Macao	0.81	67	98.77	Peru	0.10	104	99.85	Gambia	0.01	141	99.98
Malaysia	0.74	68	98.88	India	0.10	105	99.85	Rwanda	0.01	142	99.99
Mongolia	0.73	69	98.89	Bahrain	0.10	106	99.85	Guyana	0.01	143	99.99
Mauritius	0.62	70	99.05	Trini. & Tobag.	0.08	107	99.87	Yemen	0.01	144	99.99
Brazil	0.59	71	99.11	Botswana	0.08	108	99.88	Zambia	0.01	145	99.99
South Africa	0.53	72	99.20	Albania	0.07	109	99.89	Niger	0.01	146	99.99
Montenegro	0.42	73	99.36	Vanuatu	0.07	110	99.90	Angola	0.01	147	99.99
UAE	0.38	74	99.42	Oman	0.07	111	99.90	Solomon Isl.	0.01	148	99.99
Tajikistan	0.38	75	99.42	Cameroon	0.06	112	99.91	Djibouti	0.01	149	99.99
Chile	0.38	76	99.43	Paraguay	0.06	113	99.92	Syria	0.01	150	99.99
Azerbaijan	0.37	77	99.44	Grenada	0.05	114	99.92	Fiji	0.01	151	99.99
Panama	0.37	78	99.44	Algeria	0.05	115	99.92	Lesotho	0.01	152	99.99
Uruguay	0.36	79	99.45	Bangladesh	0.05	116	99.93	Sudan	0.00	153	99.99
Kyrgyzstan	0.32	80	99.52	Indonesia	0.05	117	99.93	Bolivia	0.00	154	99.99
Saudi Arabia	0.31	81	99.52	Senegal	0.05	118	99.93	Nicaragua	0.00	155	99.99
Macedonia	0.31	82	99.53	Egypt	0.05	119	99.93	Nepal	0.00	156	100.00
Mexico	0.29	83	99.57	Kenya	0.04	120	99.94	Afghanistan	0.00	157	100.00
Jamaica	0.27	84	99.59	Saint Lucia	0.04	121	99.94	Burundi	0.00	158	100.00
Lebanon	0.22	85	99.66	Dominican Rep.	0.04	122	99.94	Ghana	0.00	159	100.00
Philippines	0.22	86	99.66	Congo Rep.	0.04	123	99.95	Cambodia	0.00	160	100.00
Tunisia	0.22	87	99.67	Benin	0.03	124	99.95	Iraq	0.00	161	100.00
Uzbekistan	0.21	88	99.68	Ecuador	0.03	125	99.95	Uganda	0.00	162	100.00
Argentina	0.20	89	99.69	Guatemala	0.03	126	99.96	Mozambique	0.00	163	100.00
Morocco	0.20	90	99.69	Honduras	0.02	127	99.96	Tanzania	0.00	164	100.00
Dominica	0.20	91	99.70	Venezuela	0.02	128	99.96	Congo D.R.	0.00	165	100.00
Kuwait	0.19	92	99.70	Nigeria	0.02	129	99.97	Malawi	0.00	166	100.00
Qatar	0.19	93	99.71	Namibia	0.02	130	99.97	Ethiopia	0.00	167	100.00
Sri Lanka	0.19	94	99.71	Pakistan	0.02	131	99.97				
Cote d'Ivoire	0.18	95	99.73	Liberia	0.02	132	99.97				
Colombia	0.17	96	99.74	El Salvador	0.02	133	99.97				
Vietnam	0.17	97	99.75	Mali	0.02	134	99.98				
Costa Rica	0.14	98	99.78	Zimbabwe	0.02	135	99.98				
Jordan	0.14	99	99.79	Guinea	0.02	136	99.98				
Cuba	0.14	100	99.79	Bhutan	0.01	137	99.98				

A.Gap. = Achievement Gap; SVGrenadines = St. Vincent and the Grenadines; Trini. & Tobag. = Trinidad and Tobago; Herzg. = Herzegovina; Darus. = Darussalam

TABLE 3. R&D Capacity Sub-index

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Switzerland	74.99	1	0.00	Poland	21.61	41	71.18	Macao	11.59	81	84.54
Israel	71.04	2	5.28	Greece	20.71	42	72.38	Brunei Darus.	11.59	82	84.54
Sweden	70.24	3	6.33	Kuwait	20.44	43	72.74	UAE	11.37	83	84.83
Denmark	67.71	4	9.71	Croatia	20.43	44	72.76	Montenegro	10.45	84	86.07
Luxembourg	67.21	5	10.38	Malaysia	19.49	45	74.01	Jordan	10.38	85	86.16
Austria	65.38	6	12.81	South Africa	19.42	46	74.10	Morocco	10.19	86	86.41
Korea Rep.	64.83	7	13.54	Mali	19.40	47	74.14	Mozambique	9.75	87	87.00
Finland	64.36	8	14.18	Turkey	19.27	48	74.30	Egypt	9.64	88	87.14
Germany	61.95	9	17.40	Gabon	18.31	49	75.59	Zambia	9.24	89	87.68
Iceland	61.94	10	17.40	Latvia	17.84	50	76.21	Cuba	9.09	90	87.89
Slovenia	60.41	11	19.45	India	17.53	51	76.63	Saudi Arabia	8.77	91	88.30
United States	58.46	12	22.05	Panama	17.42	52	76.77	Bahrain	8.77	92	88.30
Netherlands	56.18	13	25.08	Botswana	17.32	53	76.91	Qatar	8.77	93	88.30
Japan	55.92	14	25.43	Tunisia	16.53	54	77.96	Gambia	8.38	94	88.82
France	54.15	15	27.80	Bulgaria	16.43	55	78.09	Thailand	7.99	95	89.35
Belgium	51.16	16	31.78	Andorra	16.28	56	78.30	Colombia	7.81	96	89.59
Australia	50.66	17	32.45	Serbia	16.27	57	78.31	Venezuela	7.73	97	89.69
Singapore	49.80	18	33.59	Kenya	15.79	58	78.94	Peru	7.10	98	90.53
Norway	46.91	19	37.44	Mexico	15.67	59	79.10	Dominica	7.10	99	90.53
Canada	46.43	20	38.08	Namibia	15.58	60	79.22	Grenada	7.10	100	90.53
Czech Rep.	44.71	21	40.39	Mauritius	15.58	61	79.22	Jamaica	7.10	101	90.53
UK	42.07	22	43.90	Oman	15.58	62	79.23	Saint Lucia	7.10	102	90.53
Ireland	41.53	23	44.61	Cyprus	15.42	63	79.44	SV Grenadines	7.10	103	90.53
Estonia	40.02	24	46.63	Tanzania	15.34	64	79.54	Nigeria	6.97	104	90.70
Bermuda	37.34	25	50.21	Azerbaijan	15.25	65	79.66	Albania	6.80	105	90.93
Spain	35.73	26	52.36	Uganda	14.83	66	80.22	Macedonia	6.75	106	91.00
New Zealand	34.29	27	54.27	Iran	14.03	67	81.29	Moldova	6.62	107	91.17
Portugal	32.60	28	56.53	Romania	13.43	68	82.10	Sri Lanka	6.57	108	91.24
Italy	30.66	29	59.12	Uruguay	13.30	69	82.27	Pakistan	6.50	109	91.33
Hungary	28.56	30	61.92	Barbados	13.30	70	82.27	Senegal	6.45	110	91.40
China	27.19	31	63.74	Armenia	13.26	71	82.31	Nepal	6.40	111	91.47
Malta	27.13	32	63.82	Ukraine	13.22	72	82.37	Afghanistan	6.40	112	91.47
Brazil	26.58	33	64.56	Ecuador	12.96	73	82.72	Bangladesh	6.40	113	91.47
Russian Fed.	25.95	34	65.40	Argentina	12.83	74	82.89	Lebanon	6.38	114	91.49
Taiwan	25.58	35	65.90	Belarus	12.81	75	82.92	Guatemala	6.12	115	91.84
Chile	25.30	36	66.26	Uzbekistan	12.58	76	83.22	Mongolia	5.85	116	92.20
Hong Kong	23.89	37	68.15	Kyrgyzstan	12.58	77	83.22	Togo	5.85	117	92.20
Lithuania	22.81	38	69.59	Georgia	12.58	78	83.22	Kazakhstan	5.52	118	92.63
Seychelles	22.70	39	69.73	Ghana	12.19	79	83.75	Philippines	5.43	119	92.76
Slovak Rep.	21.80	40	70.93	Costa Rica	11.87	80	84.17	Ethiopia	5.15	120	93.13

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Vietnam	4.80	121	93.60	Sudan	3.10	137	95.87	Congo D.R.	2.06	153	97.25
Burkina Faso	4.72	122	93.71	El Salvador	2.93	138	96.10	Burundi	2.00	154	97.33
Indonesia	4.72	123	93.71	Guyana	2.93	139	96.10	Cambodia	1.97	155	97.37
Paraguay	4.71	124	93.72	Belize	2.50	140	96.66	Rwanda	1.96	156	97.39
Bhutan	4.67	125	93.77	Dominican Rep.	2.50	141	96.66	Nicaragua	1.95	157	97.39
Cape Verde	4.65	126	93.80	Lesotho	2.48	142	96.70	Honduras	1.95	158	97.39
Swaziland	4.61	127	93.85	Malawi	2.45	143	96.74	Cote d'Ivoire	1.95	159	97.39
Bolivia	4.29	128	94.28	Iraq	2.39	144	96.81	Niger	1.94	160	97.41
Trini. & Tobag.	3.38	129	95.49	Djibouti	2.29	145	96.95	Benin	1.94	161	97.41
Antigua & Barb.	3.38	130	95.49	Syria	2.29	146	96.95	Guinea	1.94	162	97.41
Aruba	3.38	131	95.49	Yemen	2.29	147	96.95	Liberia	1.94	163	97.41
Bahamas	3.38	132	95.49	Vanuatu	2.27	148	96.98	Congo Rep.	1.83	164	97.56
St. Kitts & Nev.	3.38	133	95.49	Zimbabwe	2.24	149	97.01	Cameroon	1.74	165	97.68
Samoa	3.32	134	95.57	Fiji	2.19	150	97.08	Bosnia & Herzg.	1.63	166	97.82
Solomon Isl.	3.32	135	95.57	Tajikistan	2.17	151	97.10	Angola	1.02	167	98.64
Algeria	3.13	136	95.82	Madagascar	2.15	152	97.14				

A.Gap. = Achievement Gap; SVGrenadines = St. Vincent and the Grenadines; Trini. & Tobag. = Trinidad and Tobago; Herzg. = Herzegovina; Darus. = Darussalam

TABLE 4. R&D Performance Sub-index

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Switzerland	73.83	1	0.00	Spain	41.46	21	43.84	Zambia	26.32	41	64.35
United States	67.97	2	7.94	Bermuda	39.79	22	46.11	Uganda	24.78	42	66.44
Iceland	62.09	3	15.91	Hong Kong	39.57	23	46.40	Poland	24.46	43	66.87
Denmark	61.06	4	17.30	Japan	36.44	24	50.64	Kenya	24.10	44	67.36
Netherlands	61.02	5	17.35	Slovenia	36.22	25	50.95	Croatia	24.07	45	67.40
UK	60.10	6	18.60	Estonia	35.04	26	52.55	South Africa	23.89	46	67.64
Sweden	59.55	7	19.35	Greece	35.03	27	52.55	Tanzania	23.06	47	68.76
Canada	54.63	8	26.01	Portugal	33.55	28	54.55	Chile	23.02	48	68.82
Australia	53.15	9	28.01	Luxembourg	33.06	29	55.23	Samoa	22.92	49	68.96
Belgium	52.24	10	29.24	Gambia	32.78	30	55.60	Andorra	22.83	50	69.08
Germany	51.50	11	30.24	Taiwan	32.37	31	56.15	Bolivia	22.82	51	69.09
Finland	51.32	12	30.49	Korea Rep.	31.42	32	57.45	Costa Rica	22.60	52	69.39
Norway	50.21	13	31.99	Czech Rep.	31.20	33	57.74	Philippines	22.60	53	69.39
Singapore	49.30	14	33.23	Mozambique	29.72	34	59.74	Peru	22.54	54	69.47
Austria	47.13	15	36.17	Cambodia	29.30	35	60.32	Argentina	22.28	55	69.82
France	47.10	16	36.20	Hungary	28.52	36	61.37	Mali	22.02	56	70.17
Israel	46.55	17	36.95	Cyprus	27.57	37	62.66	Gabon	22.01	57	70.19
Ireland	45.67	18	38.14	Panama	27.16	38	63.22	Zimbabwe	21.98	58	70.23
Italy	44.30	19	40.01	Barbados	26.90	39	63.57	Slovak Rep.	21.76	59	70.53
New Zealand	44.05	20	40.34	Malawi	26.45	40	64.18	Solomon Isl.	21.72	60	70.58

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Armenia	21.68	61	70.64	Romania	15.31	97	79.27	Mongolia	11.64	133	84.24
Georgia	21.59	62	70.76	Iran	15.29	98	79.29	Angola	11.56	134	84.34
Congo D.R.	21.56	63	70.80	Saudi Arabia	15.21	99	79.40	Saint Lucia	11.50	135	84.42
Seychelles	21.10	64	71.42	Qatar	15.19	100	79.42	Pakistan	11.46	136	84.48
Ecuador	20.32	65	72.48	Grenada	15.05	101	79.62	Ukraine	11.44	137	84.51
Swaziland	20.16	66	72.70	Malaysia	15.02	102	79.66	Macedonia	11.34	138	84.63
Uruguay	20.08	67	72.80	Colombia	14.88	103	79.84	Liberia	11.34	139	84.65
Lithuania	20.05	68	72.84	Latvia	14.84	104	79.90	Brunei Darus.	11.33	140	84.65
China	19.79	69	73.20	Dominican Rep.	14.63	105	80.18	Syria	11.25	141	84.76
Brazil	19.67	70	73.35	Macao	14.28	106	80.66	Bangladesh	11.22	142	84.81
Botswana	19.28	71	73.89	Lesotho	14.17	107	80.81	Afghanistan	11.22	143	84.81
Nicaragua	19.16	72	74.05	Cameroon	14.16	108	80.82	Mauritius	11.13	144	84.92
Bahamas	18.20	73	75.35	Belarus	14.12	109	80.88	Guyana	11.03	145	85.06
Bulgaria	18.06	74	75.54	Senegal	14.11	110	80.89	Morocco	10.87	146	85.28
Turkey	18.04	75	75.56	St. Kitts & Nev.	14.07	111	80.94	Sudan	10.75	147	85.44
Malta	18.00	76	75.63	Belize	13.88	112	81.21	Montenegro	10.35	148	85.98
El Salvador	17.99	77	75.63	Trini. & Tobag.	13.72	113	81.41	Cuba	10.17	149	86.22
Serbia	17.99	78	75.64	Guinea	13.66	114	81.49	Djibouti	9.79	150	86.74
Mexico	17.94	79	75.71	Aruba	13.62	115	81.56	Burundi	9.66	151	86.92
Namibia	17.93	80	75.71	Jordan	13.57	116	81.61	Kyrgyzstan	9.46	152	87.19
Congo Rep.	17.28	81	76.59	Tunisia	13.44	117	81.79	Azerbaijan	9.41	153	87.25
Russian Fed.	17.19	82	76.72	Kuwait	13.40	118	81.85	Bahrain	9.31	154	87.39
Vanuatu	17.18	83	76.73	Vietnam	13.40	119	81.85	Bhutan	9.19	155	87.56
Rwanda	17.09	84	76.85	Jamaica	13.25	120	82.05	Algeria	9.12	156	87.64
Fiji	17.04	85	76.92	Moldova	13.11	121	82.25	Nigeria	9.01	157	87.80
Guatemala	17.01	86	76.96	Egypt	13.10	122	82.25	Yemen	8.98	158	87.84
Burkina Faso	16.98	87	77.01	UAE	12.85	123	82.59	Albania	8.74	159	88.16
Thailand	16.86	88	77.16	Venezuela	12.69	124	82.81	Bosnia & Herzg.	8.31	160	88.75
India	16.82	89	77.22	Sri Lanka	12.67	125	82.84	Togo	8.22	161	88.87
Niger	16.77	90	77.29	Dominica	12.35	126	83.27	Uzbekistan	7.58	162	89.73
Paraguay	16.75	91	77.32	Cote d'Ivoire	12.32	127	83.32	Kazakhstan	5.77	163	92.18
Lebanon	16.62	92	77.49	Oman	12.30	128	83.34	Iraq	5.21	164	92.94
Honduras	16.60	93	77.51	Nepal	11.96	129	83.80	Tajikistan	5.09	165	93.11
Madagascar	16.24	94	78.00	Ethiopia	11.96	130	83.80	SV Grenadines	4.62	166	93.75
Cape Verde	16.19	95	78.07	Benin	11.96	131	83.81	Antigua & Barb.	4.23	167	94.27
Ghana	16.02	96	78.30	Indonesia	11.79	132	84.04				

A.Gap. = Achievement Gap; SVGrenadines = St. Vincent and the Grenadines; Trini. & Tobag. = Trinidad and Tobago; Herzg. = Herzegovina; Darus. = Darussalam

TABLE 5. Technology Absorption Sub-index

Country	Score (0-100)	Rank	A.Gap(%)	Country	Score (0-100)	Rank	A.Gap(%)	Country	Score (0-100)	Rank	A.Gap(%)
Luxembourg	71.45	1	0.00	New Zealand	7.77	41	89.13	Kuwait	3.51	81	95.09
Ireland	52.74	2	26.18	Brunei Darus.	7.59	42	89.38	Qatar	3.42	82	95.22
Singapore	46.32	3	35.17	Italy	7.26	43	89.83	Seychelles	3.41	83	95.23
Philippines	33.35	4	53.33	Brazil	6.87	44	90.38	Moldova	3.38	84	95.27
Sweden	32.78	5	54.13	Barbados	6.83	45	90.44	Bahrain	3.30	85	95.38
Switzerland	32.46	6	54.57	Greece	6.41	46	91.02	South Africa	3.22	86	95.50
Solomon Isl.	31.75	7	55.56	Lithuania	6.37	47	91.09	Lebanon	3.21	87	95.50
Denmark	30.67	8	57.07	Estonia	6.23	48	91.28	Oman	3.15	88	95.59
Malta	30.57	9	57.22	Gabon	6.08	49	91.50	Gambia	3.09	89	95.68
Hong Kong	29.25	10	59.06	Paraguay	5.95	50	91.67	El Salvador	3.06	90	95.71
Netherlands	29.19	11	59.15	Panama	5.91	51	91.73	Kenya	3.01	91	95.78
Iceland	28.29	12	60.41	Indonesia	5.82	52	91.85	Taiwan	2.95	92	95.87
Finland	27.18	13	61.95	Spain	5.76	53	91.94	Ukraine	2.93	93	95.90
Malaysia	26.37	14	63.09	Croatia	5.60	54	92.16	Tunisia	2.90	94	95.94
United States	26.22	15	63.30	Uganda	5.59	55	92.17	Colombia	2.90	95	95.94
Costa Rica	24.16	16	66.19	Bermuda	5.58	56	92.19	Guatemala	2.82	96	96.05
France	22.97	17	67.85	Romania	5.57	57	92.21	Tanzania	2.79	97	96.09
Belgium	22.80	18	68.09	Cote d'Ivoire	5.51	58	92.29	Nicaragua	2.74	98	96.16
UK	21.94	19	69.30	Russian Fed.	5.33	59	92.54	Peru	2.68	99	96.25
Hungary	20.43	20	71.40	Vietnam	5.04	60	92.94	Ecuador	2.65	100	96.30
Korea Rep.	19.15	21	73.19	Latvia	5.01	61	92.99	Iran	2.61	101	96.35
Japan	18.47	22	74.14	Argentina	4.97	62	93.04	Saudi Arabia	2.51	102	96.49
Cyprus	17.23	23	75.88	Bolivia	4.79	63	93.30	Zimbabwe	2.50	103	96.49
Kazakhstan	16.78	24	76.51	Slovenia	4.63	64	93.52	Venezuela	2.32	104	96.75
Norway	16.17	25	77.36	Bulgaria	4.58	65	93.59	Senegal	2.32	105	96.76
China	15.73	26	77.98	Sudan	4.48	66	93.73	Congo Rep.	2.31	106	96.76
Germany	14.87	27	79.19	Mongolia	4.42	67	93.82	Cameroon	2.25	107	96.86
Vanuatu	14.38	28	79.87	Zambia	4.41	68	93.83	Macedonia	2.22	108	96.90
Thailand	13.78	29	80.71	India	4.33	69	93.94	Burkina Faso	2.20	109	96.92
Cuba	13.62	30	80.94	Slovak Rep.	4.29	70	93.99	Macao	2.11	110	97.04
Canada	13.50	31	81.10	Niger	4.18	71	94.15	Fiji	1.97	111	97.24
Israel	13.47	32	81.14	UAE	4.01	72	94.38	Kyrgyzstan	1.97	112	97.24
Austria	12.83	33	82.04	Morocco	3.95	73	94.47	Bosnia & Herzg.	1.96	113	97.26
Andorra	12.77	34	82.12	Poland	3.87	74	94.58	Serbia	1.91	114	97.33
Australia	10.39	35	85.45	Uruguay	3.84	75	94.62	Dominica	1.88	115	97.37
Mexico	10.14	36	85.81	Chile	3.77	76	94.72	Ghana	1.86	116	97.39
Grenada	10.04	37	85.95	Aruba	3.74	77	94.77	Dominican Rep.	1.85	117	97.41
Czech Rep.	9.66	38	86.48	Portugal	3.70	78	94.83	Belarus	1.73	118	97.58
Saint Lucia	9.40	39	86.85	Rwanda	3.61	79	94.95	Guyana	1.68	119	97.65
Mozambique	7.77	40	89.13	Burundi	3.58	80	94.99	Ethiopia	1.52	120	97.87

Country	Score (0-100)	Rank	A.Gap(%)	Country	Score (0-100)	Rank	A.Gap(%)	Country	Score (0-100)	Rank	A.Gap(%)
Mauritius	1.52	121	97.88	Sri Lanka	0.69	140	99.03	Antigua & Barb.	0.15	159	99.79
Georgia	1.50	122	97.90	Trini. & Tobag.	0.63	141	99.12	SV Grenadines	0.13	160	99.82
Azerbaijan	1.47	123	97.95	Liberia	0.60	142	99.16	Congo D.R.	0.12	161	99.83
Madagascar	1.43	124	98.00	Egypt	0.55	143	99.22	Guinea	0.11	162	99.85
Malawi	1.35	125	98.11	Botswana	0.50	144	99.30	Togo	0.09	163	99.88
Belize	1.31	126	98.17	St. Kitts & Nev.	0.49	145	99.31	Bhutan	0.07	164	99.90
Armenia	1.28	127	98.21	Jamaica	0.41	146	99.43	Cambodia	0.07	165	99.90
Uzbekistan	1.27	128	98.22	Bangladesh	0.41	147	99.43	Iraq	0.06	166	99.92
Namibia	1.23	129	98.28	Benin	0.38	148	99.47	Djibouti	0.05	167	99.93
Jordan	1.22	130	98.29	Cape Verde	0.36	149	99.50				
Mali	1.20	131	98.32	Tajikistan	0.25	150	99.65				
Turkey	1.10	132	98.46	Algeria	0.25	151	99.65				
Honduras	1.06	133	98.52	Afghanistan	0.25	152	99.65				
Pakistan	1.03	134	98.56	Nepal	0.25	153	99.65				
Syria	0.93	135	98.70	Swaziland	0.25	154	99.66				
Bahamas	0.92	136	98.72	Angola	0.23	155	99.68				
Nigeria	0.84	137	98.82	Yemen	0.23	156	99.68				
Albania	0.81	138	98.87	Samoa	0.17	157	99.76				
Montenegro	0.80	139	98.88	Lesotho	0.17	158	99.77				

A.Gap. = Achievement Gap; SVGrenadines = St. Vincent and the Grenadines; Trini. & Tobag. = Trinidad and Tobago; Herzg. = Herzegovina; Darus. = Darussalam

TABLE 6. Diffusion of Old Technologies Sub-index

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Iceland	73.96	1	0.00	Switzerland	36.43	17	50.74	UK	31.82	33	56.97
Macao	57.23	2	22.61	Kazakhstan	35.87	18	51.50	Trini. & Tobag.	31.14	34	57.89
Hong Kong	51.11	3	30.90	Korea Rep.	35.69	19	51.75	New Zealand	31.08	35	57.97
Bermuda	47.70	4	35.51	Estonia	35.06	20	52.60	France	30.95	36	58.16
Kuwait	46.32	5	37.38	Canada	35.02	21	52.65	Oman	30.75	37	58.42
Luxembourg	44.81	6	39.42	Italy	34.36	22	53.55	Denmark	30.68	38	58.52
Norway	43.61	7	41.04	Aruba	33.89	23	54.18	Uruguay	30.60	39	58.63
Finland	42.97	8	41.90	Montenegro	33.67	24	54.48	Belgium	30.58	40	58.65
Qatar	40.89	9	44.71	Germany	33.55	25	54.64	Bulgaria	30.55	41	58.69
Taiwan	39.81	10	46.17	Russian Fed.	33.49	26	54.71	Argentina	30.29	42	59.04
Sweden	38.24	11	48.29	United States	33.39	27	54.85	Netherlands	30.24	43	59.11
UAE	38.20	12	48.34	Gabon	33.38	28	54.87	Greece	29.94	44	59.51
Bahrain	37.83	13	48.85	Australia	32.99	29	55.39	Lithuania	29.28	45	60.41
Austria	37.46	14	49.36	Japan	32.42	30	56.16	St. Kitts & Nev.	28.91	46	60.90
Singapore	36.94	15	50.06	Malta	32.13	31	56.55	Slovenia	28.85	47	60.99
Saudi Arabia	36.83	16	50.20	Israel	31.86	32	56.92	Czech Rep.	28.58	48	61.36

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Panama	28.57	49	61.37	Indonesia	21.37	90	71.10	Guyana	14.02	131	81.05
Belarus	28.54	50	61.41	Egypt	21.21	91	71.32	Uzbekistan	13.78	132	81.36
Seychelles	28.53	51	61.42	Mongolia	21.14	92	71.42	Lesotho	13.56	133	81.67
Poland	28.34	52	61.69	Kyrgyzstan	21.11	93	71.46	Bhutan	13.53	134	81.71
Ukraine	28.22	53	61.84	SV Grenadines	21.00	94	71.60	Syria	13.11	135	82.27
Serbia	28.19	54	61.88	Iran	20.99	95	71.62	Swaziland	12.12	136	83.61
Malaysia	28.14	55	61.95	Albania	20.98	96	71.64	India	11.66	137	84.24
Portugal	28.08	56	62.03	Cambodia	20.74	97	71.96	Pakistan	11.52	138	84.43
South Africa	27.98	57	62.17	Azerbaijan	20.64	98	72.09	Zambia	11.46	139	84.51
Ireland	27.54	58	62.77	Bosnia & Herzg.	20.27	99	72.59	Cameroon	11.38	140	84.61
Spain	27.51	59	62.81	Ecuador	20.21	100	72.67	Nepal	11.32	141	84.69
Barbados	27.45	60	62.88	Tunisia	20.05	101	72.90	Yemen	11.28	142	84.75
Latvia	27.21	61	63.22	Mali	19.58	102	73.53	Sudan	11.27	143	84.76
Brunei Darus.	27.06	62	63.41	China	19.41	103	73.76	Nigeria	11.21	144	84.84
Botswana	27.02	63	63.47	Turkey	19.31	104	73.89	Belize	10.87	145	85.30
Costa Rica	26.73	64	63.86	Namibia	19.27	105	73.94	Kenya	10.85	146	85.33
Croatia	26.50	65	64.17	Colombia	18.97	106	74.35	Afghanistan	10.67	147	85.58
Chile	26.36	66	64.35	Lebanon	18.19	107	75.41	Bangladesh	10.46	148	85.86
Andorra	26.26	67	64.49	Nicaragua	18.16	108	75.44	Burkina Faso	10.16	149	86.26
Brazil	26.06	68	64.77	Jamaica	17.95	109	75.74	Angola	9.70	150	86.88
Antigua & Barb.	25.82	69	65.09	Paraguay	17.68	110	76.10	Togo	9.65	151	86.95
Hungary	25.75	70	65.18	Peru	17.66	111	76.13	Guinea	9.61	152	87.01
Slovak Rep.	24.93	71	66.29	Algeria	17.60	112	76.20	Vanuatu	9.43	153	87.25
Mauritius	24.69	72	66.62	Cape Verde	17.58	113	76.23	Liberia	9.03	154	87.79
Grenada	24.58	73	66.76	Mexico	17.46	114	76.40	Solomon Isl.	9.00	155	87.83
Dominica	24.39	74	67.02	Fiji	17.39	115	76.49	Rwanda	8.64	156	88.32
Thailand	24.35	75	67.08	Samoa	17.09	116	76.90	Tanzania	8.53	157	88.47
Jordan	24.32	76	67.12	Philippines	16.84	117	77.24	Mozambique	7.70	158	89.59
El Salvador	23.55	77	68.15	Ghana	16.78	118	77.32	Uganda	6.78	159	90.84
Guatemala	23.47	78	68.27	Sri Lanka	16.76	119	77.33	Congo D.R.	6.68	160	90.97
Georgia	23.32	79	68.47	Iraq	16.60	120	77.55	Niger	6.05	161	91.82
Cyprus	23.02	80	68.88	Bolivia	16.54	121	77.64	Madagascar	5.65	162	92.36
Moldova	22.64	81	69.39	Honduras	16.27	122	78.00	Cuba	5.59	163	92.44
Macedonia	22.55	82	69.51	Tajikistan	16.24	123	78.04	Malawi	5.01	164	93.23
Venezuela	22.31	83	69.83	Congo Rep.	15.99	124	78.38	Djibouti	4.90	165	93.38
Vietnam	22.26	84	69.90	Dominican Rep.	15.86	125	78.55	Ethiopia	4.28	166	94.22
Saint Lucia	22.02	85	70.23	Gambia	15.69	126	78.79	Burundi	3.81	167	94.85
Romania	21.71	86	70.65	Zimbabwe	15.56	127	78.97				
Armenia	21.53	87	70.89	Cote d'Ivoire	14.78	128	80.02				
Morocco	21.48	88	70.96	Senegal	14.54	129	80.34				
Bahamas	21.42	89	71.04	Benin	14.36	130	80.59				

A.Gap. = Achievement Gap; SVGrenadines = St. Vincent and the Grenadines; Trini. & Tobag. = Trinidad and Tobago; Herzg. = Herzegovina; Darus. = Darussalam

TABLE 7. Diffusion of Recent Innovations Sub-index

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Netherlands	86.86	1	0.00	Lithuania	58.19	41	33.01	Morocco	36.83	81	57.60
Denmark	86.42	2	0.50	Cyprus	57.52	42	33.77	Kuwait	34.93	82	59.79
Iceland	85.59	3	1.46	Croatia	57.48	43	33.82	Grenada	34.35	83	60.45
Norway	84.60	4	2.60	Portugal	57.26	44	34.07	Georgia	34.02	84	60.83
Switzerland	82.99	5	4.45	Italy	56.68	45	34.75	Armenia	34.01	85	60.84
Luxembourg	82.91	6	4.55	Brunei Darus.	56.44	46	35.02	Egypt	33.66	86	61.24
Sweden	81.92	7	5.68	Poland	55.79	47	35.76	Mexico	33.33	87	61.62
UK	80.67	8	7.12	Greece	55.28	48	36.36	Ukraine	33.12	88	61.87
Andorra	79.41	9	8.57	Uruguay	54.72	49	37.00	Panama	32.47	89	62.61
Finland	78.79	10	9.28	Russian Fed.	54.13	50	37.68	Saint Lucia	32.36	90	62.74
Germany	78.25	11	9.90	Belarus	53.70	51	38.18	Albania	31.32	91	63.95
Korea Rep.	77.57	12	10.70	Macedonia	53.08	52	38.89	Bahamas	31.30	92	63.96
France	77.34	13	10.96	Oman	52.80	53	39.22	Ecuador	29.62	93	65.90
Canada	76.37	14	12.07	Trini. & Tobag.	52.22	54	39.87	Iran	29.19	94	66.40
Belgium	75.14	15	13.49	Malaysia	49.91	55	42.54	South Africa	27.39	95	68.46
Bermuda	73.95	16	14.86	Saudi Arabia	49.76	56	42.71	Peru	27.32	96	68.54
United States	72.01	17	17.10	Chile	49.16	57	43.40	Dominican Rep.	26.78	97	69.17
Japan	71.57	18	17.60	Argentina	48.51	58	44.15	Tunisia	26.42	98	69.58
New Zealand	70.95	19	18.31	SV Grenadines	48.04	59	44.68	Jamaica	26.10	99	69.96
Australia	70.88	20	18.40	Romania	47.58	60	45.22	Cape Verde	25.61	100	70.51
Hong Kong	70.41	21	18.94	Bulgaria	47.45	61	45.37	Syria	25.44	101	70.71
Bahrain	70.11	22	19.28	Azerbaijan	47.35	62	45.48	Bolivia	25.23	102	70.95
Austria	69.71	23	19.74	Serbia	46.85	63	46.06	Fiji	25.19	103	71.00
Estonia	69.47	24	20.02	Kazakhstan	46.55	64	46.41	Vietnam	24.72	104	71.53
Malta	69.12	25	20.42	Montenegro	45.00	65	48.19	Paraguay	24.51	105	71.79
Ireland	68.85	26	20.73	Seychelles	44.76	66	48.46	Thailand	23.83	106	72.57
Singapore	68.65	27	20.96	Bosnia & Herzg.	44.58	67	48.68	Guyana	21.75	107	74.96
Qatar	68.18	28	21.50	Antigua & Barb.	43.56	68	49.84	Philippines	20.61	108	76.27
Israel	67.53	29	22.24	Dominica	41.10	69	52.67	Mongolia	20.55	109	76.34
UAE	67.35	30	22.46	Moldova	41.10	70	52.68	Bhutan	18.35	110	78.87
Macao	65.36	31	24.75	Taiwan	40.87	71	52.94	El Salvador	18.04	111	79.22
Slovenia	64.85	32	25.33	Aruba	40.71	72	53.13	Belize	17.60	112	79.74
Latvia	63.97	33	26.35	Turkey	40.19	73	53.73	Kenya	17.24	113	80.15
Spain	63.77	34	26.58	Brazil	40.02	74	53.92	Uzbekistan	16.95	114	80.48
Hungary	63.25	35	27.18	Costa Rica	38.64	75	55.52	Ghana	16.94	115	80.49
Slovak Rep.	62.79	36	27.71	China	38.24	76	55.98	Algeria	16.39	116	81.13
Barbados	62.53	37	28.01	Colombia	37.36	77	56.98	Nigeria	16.00	117	81.57
St. Kitts & Nev.	61.39	38	29.32	Venezuela	36.99	78	57.42	Kyrgyzstan	15.46	118	82.20
Czech Rep.	60.18	39	30.71	Jordan	36.92	79	57.49	Guatemala	14.54	119	83.26
Lebanon	59.89	40	31.05	Mauritius	36.91	80	57.51	Sri Lanka	14.27	120	83.57

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Honduras	13.50	121	84.46	Gambia	7.38	137	91.50	Congo Rep.	3.86	153	95.55
Cuba	13.26	122	84.74	Zambia	7.38	138	91.50	Malawi	3.42	154	96.07
Sudan	13.15	123	84.86	Gabon	7.34	139	91.55	Benin	3.26	155	96.25
Swaziland	13.00	124	85.04	Uganda	7.33	140	91.56	Burkina Faso	2.93	156	96.62
Indonesia	11.52	125	86.74	Samoa	6.14	141	92.93	Afghanistan	2.90	157	96.66
Senegal	11.16	126	87.15	Tajikistan	6.01	142	93.08	Tanzania	2.74	158	96.84
Namibia	10.78	127	87.59	Cambodia	5.38	143	93.81	Togo	2.67	159	96.93
Botswana	10.39	128	88.04	Cameroon	5.30	144	93.89	Liberia	2.27	160	97.38
Nicaragua	10.27	129	88.18	Iraq	5.21	145	94.00	Madagascar	2.06	161	97.63
Djibouti	10.14	130	88.32	Solomon Isl.	4.83	146	94.44	Cote d'Ivoire	1.84	162	97.89
India	9.92	131	88.57	Bangladesh	4.58	147	94.73	Ethiopia	1.51	163	98.26
Angola	9.87	132	88.64	Vanuatu	4.44	148	94.89	Niger	1.33	164	98.47
Yemen	9.40	133	89.18	Mozambique	4.20	149	95.16	Congo D.R.	1.31	165	98.49
Zimbabwe	9.19	134	89.42	Rwanda	4.01	150	95.38	Guinea	1.28	166	98.53
Pakistan	8.92	135	89.73	Mali	3.99	151	95.40	Burundi	0.74	167	99.15
Nepal	7.67	136	91.16	Lesotho	3.98	152	95.42				

A.Gap. = Achievement Gap; SVGrenadines = St. Vincent and the Grenadines; Trini. & Tobag. = Trinidad and Tobago; Herzg. = Herzegovina; Darus. = Darussalam

TABLE 8. Exposure to Foreign Technology Sub-index

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Hong Kong	60.08	1	0.00	UK	12.45	21	79.28	Israel	9.43	41	84.30
Ireland	48.64	2	19.03	Kenya	12.37	22	79.41	Denmark	9.39	42	84.37
Singapore	48.40	3	19.45	Slovak Rep.	12.34	23	79.46	Finland	9.35	43	84.44
Luxembourg	45.07	4	24.99	France	12.15	24	79.78	Germany	9.35	44	84.44
Belgium	18.74	5	68.81	Thailand	12.11	25	79.85	Argentina	8.97	45	85.06
Switzerland	18.57	6	69.10	Australia	11.94	26	80.13	Barbados	8.92	46	85.16
Malaysia	18.43	7	69.33	Estonia	11.81	27	80.34	Aruba	8.85	47	85.27
Panama	18.10	8	69.88	Canada	11.42	28	80.99	St. Kitts & Nev.	8.57	48	85.73
Costa Rica	18.01	9	70.02	Japan	11.25	29	81.28	Cape Verde	8.38	49	86.05
Malta	16.02	10	73.33	New Zealand	10.94	30	81.79	South Africa	8.29	50	86.20
Paraguay	15.97	11	73.42	Korea Rep.	10.80	31	82.03	Poland	8.16	51	86.42
Netherlands	15.72	12	73.83	Colombia	10.74	32	82.12	Rwanda	8.14	52	86.45
Vietnam	15.20	13	74.71	Malawi	10.54	33	82.46	Romania	8.06	53	86.59
United States	15.11	14	74.85	Austria	10.07	34	83.24	Antigua & Barb.	7.82	54	86.99
Czech Rep.	14.89	15	75.22	Norway	10.00	35	83.35	Tunisia	7.82	55	86.99
China	14.73	16	75.49	Bahamas	9.89	36	83.54	Burundi	7.82	56	86.99
Mexico	13.92	17	76.83	Iceland	9.79	37	83.70	Bulgaria	7.78	57	87.04
Bermuda	13.80	18	77.04	Brazil	9.53	38	84.13	Brunei Darus.	7.70	58	87.19
Sweden	13.48	19	77.57	Chile	9.47	39	84.24	Indonesia	7.64	59	87.28
Hungary	13.39	20	77.71	Macao	9.45	40	84.27	Seychelles	7.53	60	87.46

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Ecuador	7.39	61	87.70	Qatar	5.64	97	90.62	Sri Lanka	4.05	133	93.27
Fiji	7.31	62	87.83	Ukraine	5.62	98	90.64	Andorra	3.96	134	93.41
El Salvador	7.29	63	87.87	Georgia	5.60	99	90.67	Niger	3.94	135	93.44
Guyana	7.29	64	87.87	Ghana	5.60	100	90.68	Togo	3.94	136	93.45
Uruguay	7.26	65	87.92	Namibia	5.59	101	90.69	Dominica	3.93	137	93.46
Italy	7.22	66	87.98	Belize	5.43	102	90.96	Burkina Faso	3.84	138	93.61
Tajikistan	7.12	67	88.14	Solomon Isl.	5.43	103	90.96	Cote d'Ivoire	3.80	139	93.67
Afghanistan	7.11	68	88.17	Samoa	5.39	104	91.03	Lebanon	3.76	140	93.74
Bangladesh	7.10	69	88.17	Morocco	5.38	105	91.04	Taiwan	3.69	141	93.86
Nepal	7.10	70	88.18	India	5.38	106	91.05	Belarus	3.62	142	93.98
Peru	7.03	71	88.29	Macedonia	5.33	107	91.13	Zambia	3.55	143	94.08
UAE	6.99	72	88.37	Egypt	5.33	108	91.13	Madagascar	3.47	144	94.23
Turkey	6.98	73	88.37	Tanzania	5.30	109	91.18	Azerbaijan	3.39	145	94.37
Spain	6.97	74	88.40	Honduras	5.28	110	91.21	Jamaica	3.38	146	94.37
Guatemala	6.96	75	88.41	Kazakhstan	5.22	111	91.30	Gambia	3.24	147	94.60
Portugal	6.94	76	88.45	Dominican Rep.	5.12	112	91.48	Senegal	3.06	148	94.91
Uganda	6.81	77	88.67	Jordan	4.84	113	91.94	Congo Rep.	3.06	149	94.91
Saudi Arabia	6.71	78	88.83	Bosnia & Herzg.	4.82	114	91.97	Albania	3.02	150	94.98
Russian Fed.	6.66	79	88.92	Bhutan	4.81	115	91.99	Venezuela	2.99	151	95.02
Croatia	6.62	80	88.98	SV Grenadines	4.75	116	92.10	Iran	2.94	152	95.10
Mali	6.57	81	89.07	Montenegro	4.74	117	92.12	Cuba	2.84	153	95.27
Serbia	6.36	82	89.42	Ethiopia	4.71	118	92.15	Liberia	2.58	154	95.71
Sudan	6.32	83	89.48	Mongolia	4.69	119	92.19	Mozambique	2.50	155	95.84
Pakistan	6.24	84	89.61	Kuwait	4.68	120	92.22	Lesotho	2.48	156	95.88
Bahrain	6.22	85	89.65	Algeria	4.64	121	92.28	Nigeria	2.46	157	95.91
Trini. &Tobag.	6.19	86	89.69	Grenada	4.64	122	92.28	Cameroon	2.43	158	95.96
Latvia	6.18	87	89.72	Gabon	4.63	123	92.30	Guinea	2.43	159	95.96
Cyprus	6.17	88	89.74	Mauritius	4.61	124	92.33	Benin	2.41	160	95.99
Slovenia	6.09	89	89.86	Iraq	4.60	125	92.34	Angola	2.41	161	95.99
Greece	5.92	90	90.15	Oman	4.57	126	92.40	Congo D.R.	2.40	162	96.00
Swaziland	5.77	91	90.40	Saint Lucia	4.50	127	92.51	Vanuatu	2.29	163	96.19
Armenia	5.74	92	90.44	Botswana	4.46	128	92.58	Djibouti	2.19	164	96.35
Nicaragua	5.74	93	90.45	Lithuania	4.37	129	92.72	Syria	2.06	165	96.57
Moldova	5.73	94	90.46	Kyrgyzstan	4.31	130	92.83	Yemen	2.01	166	96.65
Zimbabwe	5.69	95	90.53	Uzbekistan	4.27	131	92.90	Cambodia	1.92	167	96.81
Bolivia	5.64	96	90.61	Philippines	4.05	132	93.26				

A.Gap. = Achievement Gap; SVGrenadines = St. Vincent and the Grenadines; Trini. & Tobag. = Trinidad and Tobago; Herzg. = Herzegovina; Darus. = Darussalam

TABLE 9. Human Capital Sub-index

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Greece	74.93	1	0.00	Italy	50.01	41	33.26	South Africa	41.14	81	45.10
Finland	72.85	2	2.78	Tunisia	49.75	42	33.60	Panama	41.12	82	45.12
Korea Rep.	69.93	3	6.68	Hungary	49.70	43	33.67	Montenegro	40.90	83	45.42
Belarus	68.62	4	8.42	Uruguay	49.69	44	33.68	SV Grenadines	40.00	84	46.62
Denmark	65.11	5	13.10	Switzerland	49.64	45	33.75	Mauritius	39.87	85	46.79
New Zealand	63.62	6	15.09	Croatia	49.58	46	33.83	Ecuador	39.38	86	47.45
Ireland	62.74	7	16.27	Latvia	49.30	47	34.21	Indonesia	39.24	87	47.63
Ukraine	62.60	8	16.46	Cyprus	49.05	48	34.55	Brazil	39.08	88	47.84
Spain	62.00	9	17.26	Moldova	48.64	49	35.09	Andorra	39.08	89	47.85
Slovenia	61.88	10	17.42	Saudi Arabia	48.14	50	35.76	Cape Verde	38.99	90	47.96
Cuba	61.61	11	17.78	Bulgaria	47.82	51	36.18	Brunei Darus.	38.82	91	48.19
Taiwan	61.33	12	18.16	Russian Fed.	47.19	52	37.03	Algeria	38.51	92	48.61
Australia	59.91	13	20.04	Serbia	47.02	53	37.24	Kenya	38.34	93	48.83
Iceland	59.71	14	20.31	Malta	46.77	54	37.59	Samoa	37.61	94	49.81
Venezuela	59.58	15	20.49	Malaysia	45.87	55	38.78	Albania	37.51	95	49.94
Portugal	59.37	16	20.76	Kyrgyzstan	45.83	56	38.84	Bermuda	37.39	96	50.10
Sweden	58.96	17	21.32	Japan	45.60	57	39.15	Lebanon	37.36	97	50.15
Estonia	58.52	18	21.90	Colombia	45.59	58	39.16	Morocco	37.18	98	50.39
Argentina	57.35	19	23.46	Botswana	45.43	59	39.37	Kuwait	36.89	99	50.76
Austria	57.19	20	23.68	Slovak Rep.	45.40	60	39.41	Macedonia	36.82	100	50.86
Germany	56.09	21	25.15	Belize	45.17	61	39.72	Egypt	36.77	101	50.92
Norway	56.03	22	25.22	Aruba	44.71	62	40.34	Dominica	36.64	102	51.10
Israel	55.94	23	25.35	Costa Rica	44.46	63	40.67	India	36.61	103	51.14
Netherlands	55.15	24	26.39	Grenada	43.94	64	41.36	Tajikistan	36.26	104	51.61
Iran	54.99	25	26.62	Vietnam	43.82	65	41.52	Nepal	35.52	105	52.59
Lithuania	54.84	26	26.82	Solomon Isl.	43.58	66	41.85	Syria	35.50	106	52.63
Belgium	54.54	27	27.22	Kazakhstan	43.44	67	42.03	Bosnia &Herzg.	35.13	107	53.12
Mongolia	54.52	28	27.23	Mexico	43.36	68	42.14	Saint Lucia	35.10	108	53.16
United States	53.84	29	28.15	Fiji	43.32	69	42.19	Peru	35.08	109	53.18
France	53.63	30	28.43	Turkey	43.04	70	42.56	Nicaragua	34.88	110	53.45
Poland	53.34	31	28.82	Romania	43.01	71	42.61	Luxembourg	34.72	111	53.67
Lesotho	53.17	32	29.04	Jamaica	42.98	72	42.64	Benin	34.65	112	53.75
UK	53.04	33	29.21	Hong Kong	42.97	73	42.66	St. Kitts & Nev.	34.60	113	53.82
Chile	52.17	34	30.38	Namibia	42.90	74	42.75	Paraguay	34.56	114	53.87
Singapore	51.80	35	30.87	Bolivia	42.78	75	42.90	Angola	34.51	115	53.95
Canada	51.70	36	31.01	China	42.54	76	43.23	Philippines	34.49	116	53.97
Jordan	51.48	37	31.29	Swaziland	42.40	77	43.42	Rwanda	34.13	117	54.45
Czech Rep.	51.12	38	31.78	Ghana	41.96	78	44.00	Malawi	34.11	118	54.47
Thailand	50.56	39	32.52	Uzbekistan	41.57	79	44.52	El Salvador	34.03	119	54.58
Barbados	50.37	40	32.77	Oman	41.23	80	44.98	Dominican Rep.	33.89	120	54.77

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Macao	33.69	121	55.04	Yemen	30.55	137	59.23	Cambodia	26.04	153	65.25
Bhutan	33.62	122	55.14	Guatemala	30.12	138	59.80	Ethiopia	25.95	154	65.36
Djibouti	33.42	123	55.40	Guyana	30.05	139	59.90	CongoD.R.	25.76	155	65.62
Armenia	33.26	124	55.61	Bahamas	29.99	140	59.97	Bangladesh	24.77	156	66.95
Honduras	33.25	125	55.63	Azerbaijan	29.98	141	59.99	Congo Rep.	24.76	157	66.96
Iraq	33.09	126	55.84	Seychelles	29.89	142	60.11	Cote d'Ivoire	24.65	158	67.11
Togo	32.95	127	56.02	Trini. & Tobag.	29.74	143	60.31	Guinea	24.15	159	67.77
Gabon	32.88	128	56.13	Uganda	29.69	144	60.38	Afghanistan	23.82	160	68.22
Tanzania	32.54	129	56.57	Senegal	29.32	145	60.87	Zimbabwe	23.18	161	69.07
Burundi	32.31	130	56.89	Sri Lanka	29.31	146	60.88	Burkina Faso	22.57	162	69.88
Vanuatu	32.24	131	56.97	Zambia	29.04	147	61.25	Niger	22.48	163	69.99
Antigua & Barb.	32.08	132	57.19	Mali	28.74	148	61.65	Pakistan	20.12	164	73.15
Bahrain	31.71	133	57.68	Cameroon	27.84	149	62.85	Sudan	19.66	165	73.76
Qatar	31.64	134	57.77	Gambia	27.81	150	62.89	Nigeria	19.22	166	74.35
Mozambique	31.15	135	58.43	Liberia	27.65	151	63.10	UAE	15.85	167	78.84
Georgia	30.62	136	59.14	Madagascar	26.97	152	64.00				

A.Gap. = Achievement Gap; SVGrenadines = St. Vincent and the Grenadines; Trini. & Tobag. = Trinidad and Tobago; Herzg. = Herzegovina; Darus. = Darussalam

TABLE 10. Enabling Factors Sub-index

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Macao	97.82	1	0.00	Belgium	63.65	21	34.93	Slovak Rep.	58.96	41	39.73
Qatar	94.55	2	3.34	Iceland	63.53	22	35.06	Oman	58.92	42	39.77
Luxembourg	81.84	3	16.33	Finland	63.42	23	35.17	Lithuania	58.82	43	39.87
Kuwait	77.80	4	20.47	Australia	63.27	24	35.32	Estonia	58.72	44	39.98
Singapore	75.80	5	22.51	Andorra	63.05	25	35.55	Russian Fed.	58.30	45	40.40
Norway	72.96	6	25.42	Bahrain	62.65	26	35.96	Poland	58.04	46	40.67
Brunei Darus.	72.86	7	25.51	France	62.44	27	36.16	Latvia	58.02	47	40.68
Switzerland	68.32	8	30.15	Japan	62.24	28	36.38	Kazakhstan	58.00	48	40.70
United States	68.14	9	30.34	UK	62.19	29	36.42	Hungary	57.71	49	41.00
Bermuda	67.60	10	30.89	Taiwan	61.94	30	36.68	Greece	57.68	50	41.04
Saudi Arabia	66.07	11	32.45	New Zealand	61.71	31	36.91	Chile	56.96	51	41.77
Hong Kong	65.41	12	33.13	Italy	61.54	32	37.09	Croatia	56.89	52	41.84
UAE	65.36	13	33.19	Aruba	61.04	33	37.60	Antigua & Barb.	56.83	53	41.90
Sweden	64.77	14	33.79	Korea Rep.	60.57	34	38.08	Malta	56.80	54	41.94
Netherlands	64.72	15	33.84	Israel	60.37	35	38.28	Cuba	56.51	55	42.23
Germany	64.70	16	33.86	Spain	60.21	36	38.45	Portugal	56.32	56	42.42
Ireland	64.69	17	33.87	Trini. & Tobag.	60.08	37	38.58	St. Kitts & Nev.	56.24	57	42.51
Canada	64.67	18	33.89	Slovenia	59.78	38	38.89	Uruguay	56.07	58	42.68
Denmark	64.50	19	34.06	Cyprus	59.67	39	39.00	Belarus	55.99	59	42.77
Austria	64.48	20	34.08	Czech Rep.	59.09	40	39.59	Bahamas	55.90	60	42.85

Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)	Country	Score (0-100)	Rank	A.Gap (%)
Azerbaijan	55.90	61	42.86	Mauritius	50.66	97	48.21	Cambodia	38.02	133	61.14
Romania	55.84	62	42.92	Dominica	50.52	98	48.36	Angola	37.93	134	61.22
Argentina	55.48	63	43.28	Ecuador	50.32	99	48.56	Sudan	37.90	135	61.25
Barbados	55.31	64	43.46	Philippines	50.00	100	48.88	Ghana	37.14	136	62.03
Bulgaria	54.77	65	44.01	Indonesia	49.76	101	49.13	Uganda	37.10	137	62.07
Malaysia	54.73	66	44.05	Paraguay	49.76	102	49.13	Kenya	36.89	138	62.28
Seychelles	54.40	67	44.39	Fiji	49.64	103	49.26	Cameroon	36.60	139	62.59
Montenegro	54.24	68	44.55	Dominican Rep.	49.53	104	49.37	Morocco	36.07	140	63.13
Venezuela	54.14	69	44.66	Bolivia	49.38	105	49.52	Djibouti	36.05	141	63.15
Turkey	54.11	70	44.68	Sri Lanka	49.01	106	49.90	Yemen	34.58	142	64.65
Panama	53.86	71	44.94	Botswana	48.86	107	50.05	Tanzania	34.52	143	64.71
Costa Rica	53.57	72	45.24	Saint Lucia	48.75	108	50.16	Rwanda	33.44	144	65.82
Serbia	53.42	73	45.39	Vietnam	48.62	109	50.30	India	33.30	145	65.96
Thailand	53.26	74	45.55	Gabon	47.90	110	51.04	Madagascar	32.73	146	66.54
Jordan	53.08	75	45.74	Iran	47.61	111	51.33	Zambia	31.82	147	67.48
Ukraine	52.95	76	45.87	Jamaica	46.86	112	52.10	Malawi	30.93	148	68.38
Macedonia	52.91	77	45.91	El Salvador	45.47	113	53.52	Congo D.R.	30.86	149	68.45
Mexico	52.89	78	45.93	Cape Verde	44.91	114	54.09	Togo	30.69	150	68.62
Armenia	52.53	79	46.30	Iraq	44.83	115	54.17	Bangladesh	30.29	151	69.03
Bosnia &Herzg.	52.45	80	46.38	Guyana	44.79	116	54.21	Nepal	29.47	152	69.87
Mongolia	52.44	81	46.39	Syria	44.33	117	54.68	Bhutan	29.09	153	70.26
Georgia	52.38	82	46.45	Honduras	44.29	118	54.72	Pakistan	29.02	154	70.34
Albania	52.10	83	46.74	Swaziland	43.89	119	55.13	Nigeria	27.50	155	71.88
Grenada	52.03	84	46.81	Burundi	43.74	120	55.28	Senegal	26.82	156	72.58
SV Grenadines	51.74	85	47.11	Tunisia	43.72	121	55.31	Gambia	26.59	157	72.82
China	51.74	86	47.11	Solomon Isl.	42.78	122	56.27	Mozambique	25.66	158	73.77
Uzbekistan	51.55	87	47.30	Vanuatu	42.73	123	56.32	Liberia	21.76	159	77.76
South Africa	51.25	88	47.61	Zimbabwe	42.39	124	56.67	Cote d'Ivoire	21.55	160	77.97
Samoa	51.20	89	47.65	Congo Rep.	41.71	125	57.36	Ethiopia	19.97	161	79.58
Moldova	51.17	90	47.69	Guatemala	41.69	126	57.38	Mali	17.36	162	82.26
Colombia	51.13	91	47.73	Namibia	41.65	127	57.43	Afghanistan	16.57	163	83.06
Peru	51.05	92	47.81	Belize	41.41	128	57.67	Benin	14.98	164	84.69
Brazil	50.94	93	47.93	Algeria	40.97	129	58.12	Burkina Faso	14.92	165	84.74
Lebanon	50.82	94	48.05	Egypt	40.82	130	58.27	Guinea	13.09	166	86.61
Tajikistan	50.75	95	48.12	Nicaragua	40.60	131	58.49	Niger	8.05	167	91.77
Kyrgyzstan	50.75	96	48.12	Lesotho	38.81	132	60.33				

A.Gap. = Achievement Gap; SVGrenadines = St. Vincent and the Grenadines; Trini. & Tobag. = Trinidad and Tobago; Herzg. = Herzegovina; Darus. = Darussalam

2.6. Achievement Gap Analysis of Selected Countries in GSTIC Pillars

Ten countries were selected for more detailed analysis of their achievements and achievement gapsin the different GSTIC pillars. The countries were selected according to different sizes (population and area-wise), income groups, geographical regions, GSTIC categories, and developmental stages.

2.6.1. Luxembourg

Luxembourg is a very smallcountry with population of 0.56 million (World Bank, 2015) and area of only 2,586 sq.km (CIA, 2015). It is a high-income country in Western Europe. Historically, it has featured solid growth, low inflation and low unemployment. Its industrial sector, initially dominated by steel, has become increasingly diversified to include chemicals, rubber, and automobile components. The country enjoys an extraordinarily high standard of living; its GDP per capita ranks among the highest in the world (CIA, 2015). It was at the top in the GSTIC ranking. An analysis of the GSTIC pillars for Luxembourg shows that it has very strong capacity in "technology absorption," "technology creation," "R&D capacity" and "diffusion of recent innovations" where its positions were 1st, 2nd, 3rd and 6th among the countries included in the study. The results also reveal that even a country like Luxembourg, which is at the top of the GSTIC ranking, can improve in the pillars "human capital" (111th position) and "R&D performance" (29thposition) where it had 53.67% and 55.23% gaps with the highest achievers in the respective pillars (Figure 2; Table 2–10).

2.6.2. South Korea

South Korea (the Republic of Korea) has a population of 50.42 million (World Bank, 2015) and an area of 99,720 sq.km (CIA, 2015). It is a high-income country situated in East Asia. Korea has perhaps produced the greatest economic miracle of all the Asian tigers. One of the world's poorest economies only fifty years ago, South Korea has increased its GDP to an astonishing US$1.305 trillion within that timeframe (WDI, 2014). Korea is placed 10th in the current study in the overall STI capacity and is included in the category of "leaders." The present study shows that "human capital" and "technology creation" were the strongest area of Korea where it ranks 3rd and 4th, respectively, in the world. "R&D capacity" and "diffusion of recent innovations" were also its stronger areas where it ranks 7th and 12th, respectively. "Technology absorption" (21st position; 73.19% achievement gap) and "exposure to foreign technology" (31st position; 82.03% achievement gap) were its weaker areas (Figure 2; Table 2-10). This may be due to the fact that it has passed the "catching-up" phase where foreign technology was more critical for technology development. Currently, technology creation is a higher priority, and for that reason it has strengthened its R&D capacity focusing on technology creation. It can also be derived from Korea's much better performance in "technology creation" than in "R&D performance" that the focus of Korea's STI activity is "innovation" and not "research excellence."

2.6.3. Brazil

Brazil is a Latin American country included in the category of "upper middle income." It is the 5th largest country in the world both area-wise (8,514,877 square km; CIA, 2015) and population-wise (202.03 million; World Bank, 2015). Brazil has two world-class technology hubs in Sao Paolo and

Rio de Janerio. Yet, it ranked relatively lower at the 62nd place in the GSTIC index in the "dynamic adopters" category. The reason could be the slow diffusion of both old technologies and recent innovations, as is evident from its 64.77% achievement gap in the pillar "diffusion of old technologies" (68th position) and 53.92% gap in "diffusion of recent innovations" (74th position). The results reveal that "technology creation" (71st position) and "technology absorption" (44th position) are also its weakest areas in which it has enormous achievement gaps, of 99.11% and 90.38%, respectively, with the highest achievers in these pillars (Figure 2; Table 2–10).

2.6.4. Ukraine

Ukraine is an Eastern European country at the "lower middle income" level. It has a population of 45.36 million (World Bank, 2015) and is one of the largest countries in Europe with an area of 603,550 square km (CIA, 2015). It is one of the top exporters of grain in the world (WTE, 2015; FAQ, 2012). However, its GDP per capita is significantly below the European average. In GSTIC index, it was at the 65th position, placed towards the bottom of the "dynamic adopters" category. "Human capital" was its strongest pillar of STI capacity where it was at the 8th position with an only 16.46% achievement gap with the highest achiever. It was very weak in the areas of "technology absorption" (93rd position), "exposure to foreign technology" (98th position), and "R&D performance" (137th position) where it had 95.90%, 90.64% and 84.51% achievement gaps, respectively. Its achievement gaps were also quite large in the areas of "R&D capacity" (82.37%; 72nd position) and "technology creation" (88.21%; 32nd position; Figure 2; Table 2–10).

2.6.5. South Africa

Located in Sub-Saharan Africa, South Africa has a population of 54.00 million (World Bank, 20015) and a vast area of 1,219,090 square km (CIA, 2015). It was one of the few countries in its region that is included in the "upper middle income" category. South Africa is considered to be an emerging market with an abundant supply of natural resources, well-developed financial, legal, communications, energy, and transport sectors, and a stock exchange that is the 16th largest in the world (CIA, 2015). However, in the GSTIC index it placed at a relatively lower position (72nd) in the "slow adopters" category. This was due to its very weak capacity in "technology creation" (72nd position) and "technology absorption" (86th position), featuring 99.20% and 95.50% achievement gaps respectively. "Exposure to foreign technology" (50th position) is also its weak area with an 86.20% achievement gap. It had a relatively lower achievement gap in the GSTIC pillars "human capital" (46.45%) and "enabling factors" (47.61%), but here also its positions were quite low (81st and 88th; Figure 2; Table 2–10).

2.6.6. Egypt

Egypt is an Afro-Asiatic transcontinental country spanning the northeast corner of Africa and southwest corner of Asia. It has a population of 83.39 million (World Bank, 2015) with an area of 1,001,450 square km (CIA, 2015). It is one of the most developed and dynamic economies in Middle East and North Africa, but falls in the "lower middle income" group of countries. It is richly endowed with natural resources, and agriculture is the significant contributor to its GDP. It also benefits from a central location for international traffic (via the Suez Canal; OECD, 2015).

With an achievement gap of 69.10%, its position in the GSTIC index is quite low (109th) and has been placed in the "slow adopters" category. Analysis of the GSTIC pillars shows that "technology creation" (119th Position) and "technology absorption" (142nd Position) are its weakest areas with a 99.93% and 99.22% achievement gap, respectively. It also has a big gap with the highest achievers in the pillars "R&D capacity" (87.14%; 88th position) and "R&D performance" (82.25%; 122nd position). "Human capital" and "enabling factors" can be considered its relatively stronger areas with 50.92% and 58.27% gap respectively, but its positions in these pillars are as low as 101st and 130th (Figure 2; Table 2–10).

2.6.7. Kenya

Kenya is a "low income" country in the Sub-Saharan Africa with a population of 45.55 million (World Bank, 2015) and area of 580,367 square km (CIA, 2015). Its main dependence has been on several low-price primary goods. Tourism is also an important industry in Kenya. It is facing problems of low infrastructure development and unemployment (around 40%). Kenya was in the "slow adopters" category and at the 110th position in the GSTIC index with a 69.58% gap with the top-ranked Luxembourg. Its achievement gap in all the pillars of GSTIC, except "human capital," was more than 50%, attesting to its low capacity in almost all GSTIC pillars. "Human capital" was its stronger area relative to others with a 48.83% achievement gap and 93rd position. It needs urgent improvements in virtually all the GSTIC pillars but particularly in "technology creation" (120th position; 99.94% achievement gap), "technology absorption" (91st position; 95.78% achievement gap), "diffusion of old technologies" (146th position; 85.33% achievement gap) and "diffusion of recent innovations" (113th position; 80.15% achievement gap; Figure 2; Table 2–10).

2.6.8. India

India is the world's second most populous country with 1.27 billion people (World Bank, 2015) and its 7th largest in area (3,287,263 square km; CIA, 2015). It is a South Asian country placed in the "lower middle income" category. India has achieved significant growth in the ICT sector in the past two decades. The IT industry in India comprises of a software industry and information technology enabled services (ITES), which also includes its business process outsourcing (BPO) industry. Indian software and services exports including ITES-BPO exports were estimated at USD 49.7 billion while its IT services exports was estimated at USD 27.3 billion in 2009–10 (UNSTATS, 2014). In spite of this notable success in the ICT sector, India was placed among "slow adopters" at the 123rd place in the GSTIC index. The reason for this, as revealed by the analysis of the GSTIC pillars, is that these achievements of India are confined to a few pockets and are not widespread in society. It still had a huge gap with the highest achievers in the "diffusion of recent innovations" (88.57%; 131st position) as well as in the "diffusion of old technologies" (84.24%; 137th position; Figure 2; Table 2–10). Its performance in "technology creation" (105th position) and "technology absorption" (69th position) with 99.85% and 93.94% achievement gaps is also unsatisfactory.

2.6.9. Tajikistan

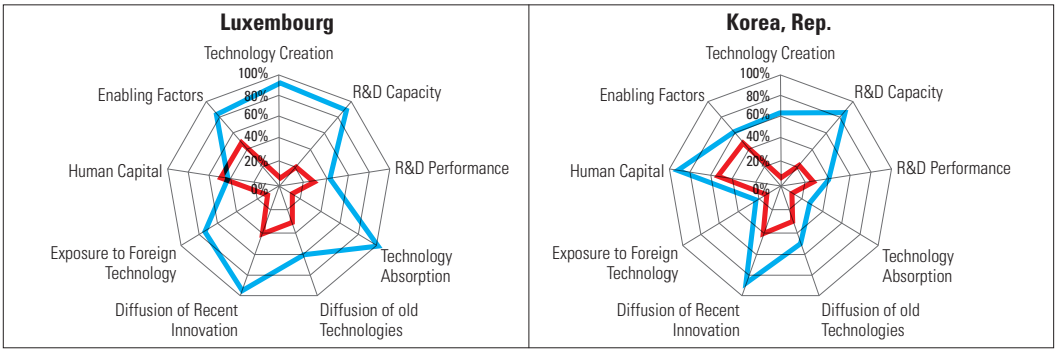
Tajikistan is a small country located in Central Asia. It has a population of 8.41 million (World Bank, 2015) and area of 143,100 square km (CIA, 2015). It is the world's 3rd largest producer of hy

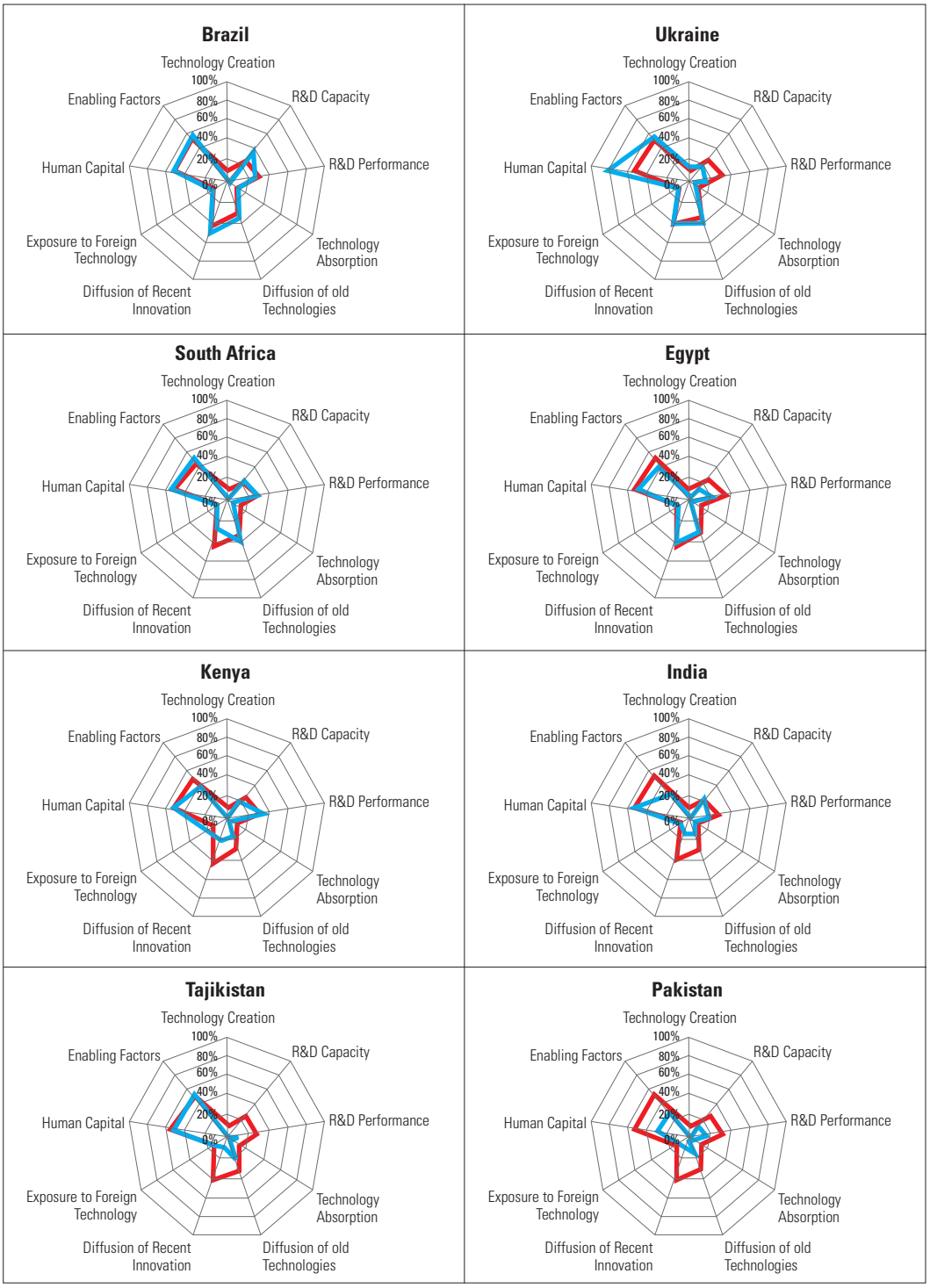
droelectric power which accounts for its 76% of total energy output (SCCI, 2015). It has one of the lowest per capita GDPs among the fifteen former Soviet republics. Its industry consists mainly of small and obsolete factories in the food processing and light industries, and a large aluminum plant currently operating below 25% of capacity (CIA, 2015). Tajikistan, placed at the 135th position in the GSTIC index, was included in the "laggards" category. Among the GSTIC pillars, its strongest area was "technology creation" where it is at the 75th position, but there also, it had a 99.42% achievement gap. Its position in "R&D performance" was two places above the bottom (165th) with an almost 93.11% achievement gap. It was also very weak in "R&D capacity" (151st position; 97.10% achievement gap), "technology absorption" (150th position; 99.65% achievement gap), and "exposure to foreign technology (68th position; 88.17% achievement gap; Figure 2; Table 2–10).

2.6.10. Pakistan

Pakistan is the 6th largest country in the world with a population of 185.13 million (World Bank, 2015) and has a reasonably large area of 796,095 square km (CIA, 2015). It is situated in South Asia and is placed in the "lower middle income" group. Textiles account for most of its export earnings as it has failed to expand a viable export base (CIA, 2015). Despite having the status of an "atomic power" and some bright spots in defense-related technologies, its overall STI capacity is very poor, indicated by its 155th position in the GSTIC index and an 81.82% achievement gap. As a result, it has been included in the "laggards" category. Its best performance was in the pillar "exposure to foreign technology" where it placed at the 84th position, but even there, its achievement gap was 89.61%. In the pillars "technology absorption" and "technology creation," it was placed at the 134th and 131st positions, respectively but with huge achievement gaps of 98.56% and 99.97%. Its worst performance was in the pillar "human capital" where with the 164th position (73.15% achievement gap) it ranked among the bottom-ranked countries (Figure 2; Table 2-10).

FIGURE 2. Achievement Gap Analysis of Some Select Countries in the GSTIC Pillars




Brazil
Ukraine
South Africa
Egypt
Kenya
India
Tajikistan
Pakistan
Technology Creation
R&D Capacity
R&D Performance
Technology Absorption
Diffusion of old Technologies
Diffusion of Recent Innovation
Exposure to Foreign Technology
Human Capital
Enabling Factors
100%
80%
60%
40%
20%
0%
World Average
Country

3. CONCLUSIONS

The preset paper is an attempt to contribute in the development of improved composite indicators for more accurate and meaningful assessment of national STI capacities. Capturing different elements of STI capacity within three sets of capabilities—technological capabilities, social capabilities, and common capabilities—is an important aspect of this study. Inclusion of the measure of "achievement gap," along with the ranking of countries, is an important feature of the index, as it not only informs what position a country is in, but also how far behind it is. This makes it a more meaningful tool for assessment of national achievements, as is evident from the following example. In the pillar "exposure to foreign technology," 4th placed Luxembourg has an "achievement gap" of about 25% but 5th placed Belgium has "achievement gap" of about 69%; the two countries have a difference of just one position in the rankings but have huge difference (44%) in the distance they have to travel to catch-up with the highest achiever. Another important feature of the GSTIC index is the due importance given to its pillars. The nine GSTIC pillars are distinct but interconnected facets of national STI capacity. This can help countries to identify their strong and weak areas, and therefore aid them in devising appropriate policies for strengthening their STI capacities.

The results show that there are huge differences among the technology development capacities of nations; Switzerland has less than 4% achievement gap while Niger has about 88% achievement gap. A vast majority of the countries (about 77%) have achievement gaps of more than 50%, and therefore have a long way to go to be at par with the highest achiever, Luxembourg. About 22% of the countries are in the "laggards" group; they need to pay urgent attention to enhance their STI capacities. Deficiencies in the nation-wide diffusion of old technologies like "electricity" are particularly alarming in a large number of developing countries.

The study has shown that different countries are strong and weak in diverse areas of STI capacity; therefore, they may adopt different development strategies. GSTIC pillars provide the achievement gap of each country in different aspects of STI capacity. Countries need to interpret their respective achievement gaps in their own specific contexts, keeping in view their development stage, culture, geographical location, size of population, and specific socioeconomic requirements. Exposure to foreign technology may be important for countries in the early to middle stages of development, or during the "catching-up" phase. It may not be as important for the developed countries, which have already attained a certain level of development; technology creation and innovation may be more important for them. Technology absorption, or the ability to diffuse and utilize technology for socioeconomic benefits, is important for both developed and developing nations, but perhaps in different ways. Developed countries may like to derive maximum commercial benefits out of the technologies that they have developed, while developing countries may find technology absorption more important in the context of social development and wellbeing.

The study reveals that many developing countries have failed even in the nation-wide diffusion of the old technologies like electricity and telephones,which is hindering their progress in all the other spheres of socioeconomic development. At the end, it is concluded that it is not necessary for ev-

ery country to be a leader in technology creation, but it is necessary for every country to be able to make productive use of technologies being created and developed elsewhere for the socioeconomic benefits for its people. Therefore, STI capacity building is not an unaffordable luxury for developing countries; rather, the luxury developing countries cannot afford is in not paying attention to STI capacity building.

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