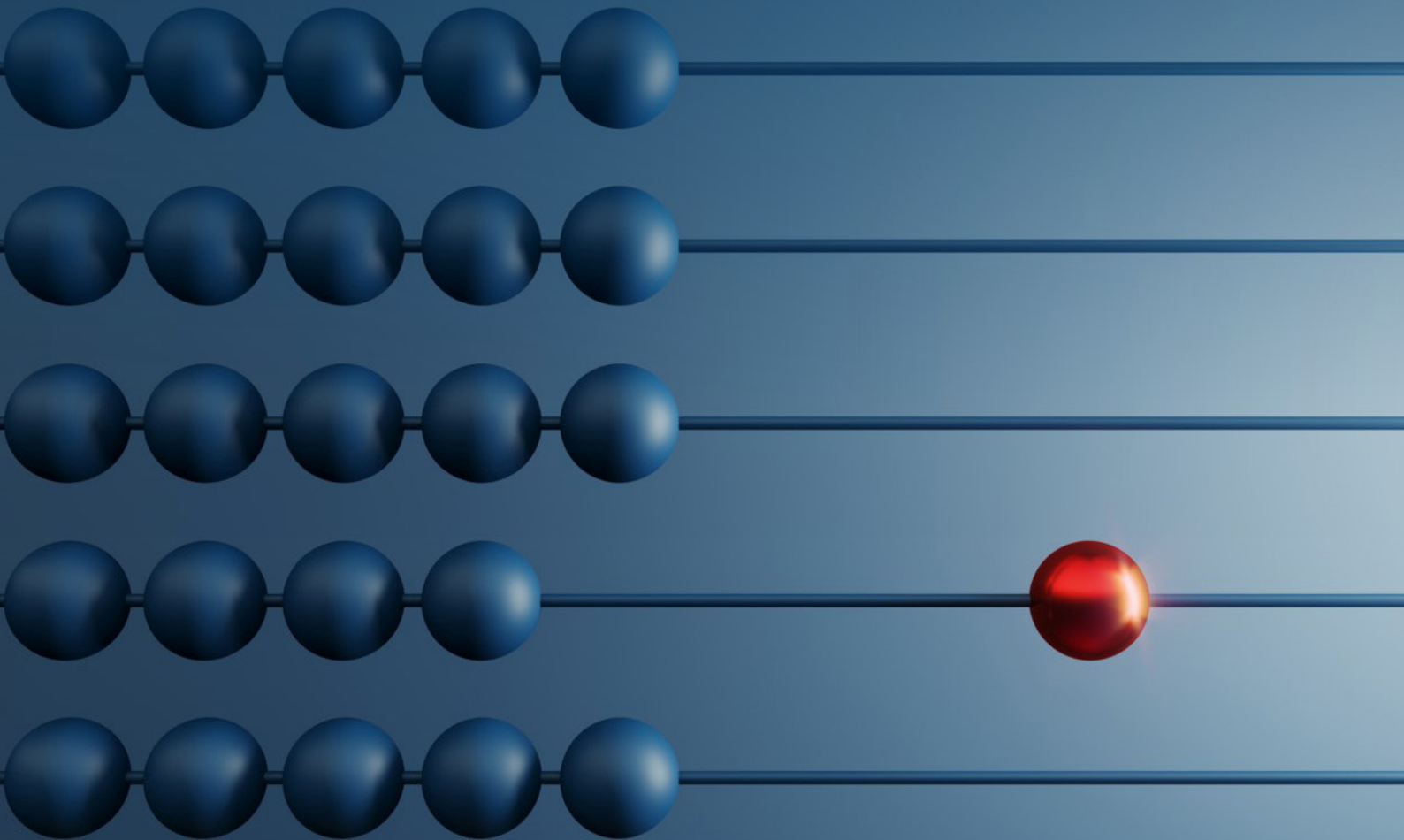

Getting National Innovation Right

Strategies for Driving Effective RDI Efforts



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Today, the importance of research, development and innovation (RDI) at the national level cannot be stressed enough. As nations face unprecedented challenges and opportunities, the strategic integration of innovation into their development agendas is emerging as a critical driver of sustainable growth and global competitiveness. This paper examines the multifaceted impacts of RDI across the economic, social and political spheres, highlighting how strategic investments in innovation can transform societies and economies. We explore the mechanisms through which RDI acts as a lever for progress, the conditions under which its impact is maximized and the best practices that can inspire nations seeking to improve their innovation ecosystems. Through in-depth analysis, this paper aims to underscore the transformative power of innovation and its indispensable role in shaping a prosperous future.

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The Significance of Innovation at the National Level

Research, development and innovation (RDI) are catalysts for the development and progress of any nation, especially given continuously evolving risks that require innovative solutions. Investment in innovation goes beyond its directly intended purposes with spillover effects that often far exceed the original purpose. The impacts can be observed at project, firm, sector and country levels with returns that impact multiple groups: businesses (including established large firms, small and medium-sized enterprises (SMEs), and start-ups); the target population of the RDI project (such as at-risk individuals and the elderly); the general public; and RDI personnel and academia, including researchers and students. This impact is typically observed across economic, social and political levels.

Economic Impact: Investing in RDI drives economic growth and prosperity. Economic growth spiked in several countries following the activation of their innovation journeys, although the time to realize the impact of the changes often lags by 5-10 years, driven by multiple factors such as the time span for development and testing, regulatory approvals, market adoption and scaling-up of production. Innovative nations share a number of attributes. These include: High GDPs per capita¹ (the top 10 innovator nations² in 2013 were among those with the highest GDP per capita in 2022);

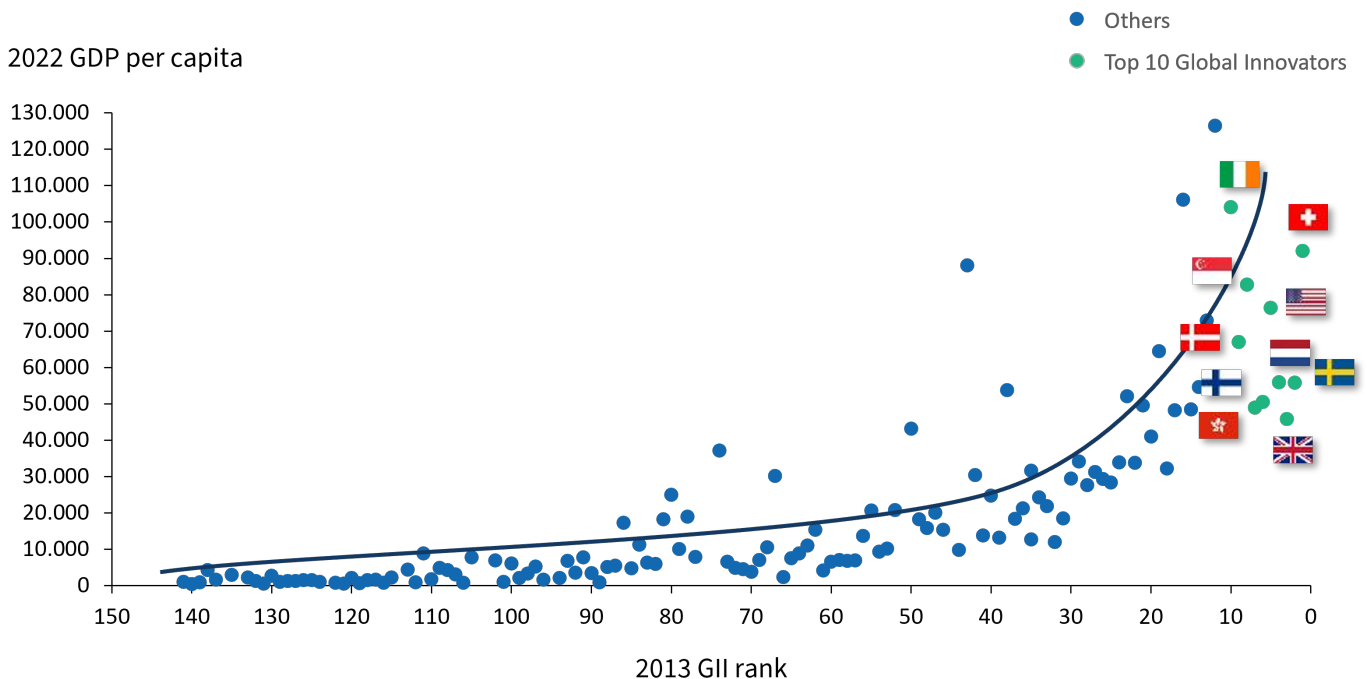
high labor productivity³ (the top 20 innovator nations have among the highest labor productivity); high-tech exports (the 1.5X increase in RDI investments in Norway between 2001 and 2016, for example, was followed by a 2X increase in high-tech exports⁴); most attractive entrepreneurship and start-up ecosystems (34 of the top 40 startup city ecosystems⁵ are among the top 16 global innovation leaders).

Social Impact: The impact of RDI activities goes beyond economic benefits and extends to some of society’s most pressing challenges, including healthcare, environment and education.

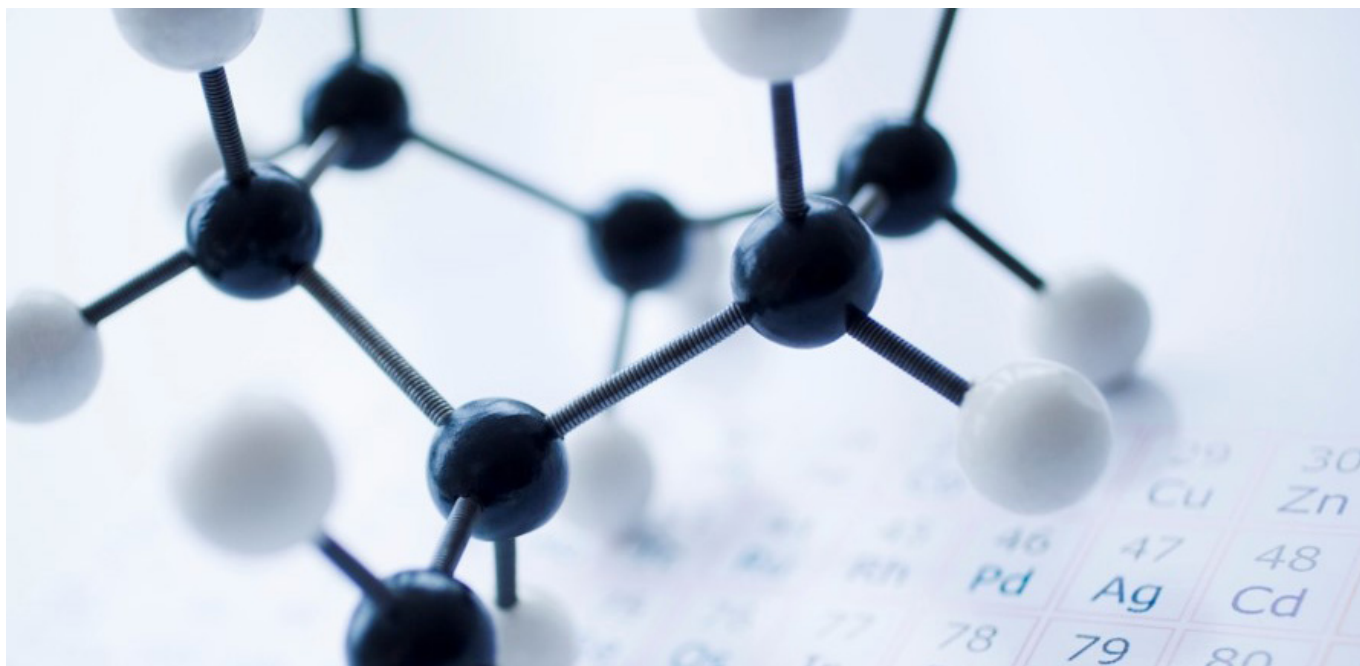
Political Impact: Global innovation leaders dominate the upper ranks of the soft power index⁶. Governments that invest in pioneering approaches diminish their reliance on external entities, particularly in the realm of vital resources such as water, renewable energy and defense technology.

Multiple frameworks can be used to evaluate the economic impact of RDI at the national level, including the production function formula and input-output tables. The European Commission has developed a cost-benefit analysis framework⁷ that is commonly used to assess the impact of RDI projects. Social and political impacts are usually measured qualitatively and vis-à-vis other metrics/indices. Monetizing these impacts using regressions has been attempted but they come with inaccuracies.

FIGURE 1: GLOBAL INNOVATION INDEX (GII) RANKIN (2013) VS. GDP PER CAPITA (2022, CURRENT USD)



Source: World Intellectual Property Organization (GII), World Bank (GDP per Capita).



An Approach to Enhancing Innovation Ecosystems

Many GCC countries have recently embarked on transformative journeys in RDI. These transformations are imperatives that need to happen today to avoid increasing the innovation gap vis-à-vis other leading economies and to build on the existing innovation momentum driven by mega-projects and ongoing transformations across different sectors. Achieving innovation excellence at the national level requires orchestrated enhancements across an array of ingredients. Looking across global efforts to foster RDI at the national level, we see that these ingredients can be grouped under three key headings: Innovation Foundations, Innovation Inputs, and Innovation Ecosystem Drivers.

Innovation Foundations: Innovation advancement starts with adequate planning at the national level guided by a consolidated innovation policy, including well-defined priorities and initiatives, a comprehensive funding model, an adequate performance and data management system, and agile innovation governance.

A key driver to achieve the desired advancement and align with national priorities is defining four to six RDI focus areas and channeling the majority of the resources to those topics. These RDI areas are typically defined based on the country's competitive advantages, development needs, aspirations and global trends. For example, the abundance of medical staff and the aging population has led Finland to

prioritize “Biotech and Healthcare” as one of its five RDI focus areas⁸. Similarly, high population density and the aspiration to be a pioneer in smart living made Singapore select “Urban Solutions and Sustainability” as one of its four RDI focus areas⁹. In the GCC, Dubai has selected “Smart Built Infrastructure” as one of its four RDI focus areas¹⁰, capitalizing on its high digital connectivity and building on rising global demand. In KSA, His Royal Highness Crown Prince Mohammed bin Salman recently announced four research focus areas¹¹: Health and Wellness, Sustainability & Essential Needs, Energy and Industrials, and Economies of the Future. These areas are in line with the Kingdom's Vision 2030 priority development areas, aspirations for playing a global role, and its resources and capabilities.

In terms of RDI governance, national RDI efforts typically include an RDI council setting national priorities and an RDI body orchestrating efforts to deliver the set priorities. The institutional setup of the RDI body is driven by multiple factors, including the maturity of the RDI ecosystem and the level of focus on RDI among national priorities. Countries with mature RDI ecosystems typically have the RDI body as an RDI department under a ministry, as is the case in Australia (under the Department of Industry, Innovation, and Science) or as an RDI agency reporting to a ministry, as is the case in Norway (an agency under the Ministry of Education and Research). Alternatively, countries in which RDI advancement is a top national priority have established offices within the Center of Government, as is the case with the National Research Foundation in Singapore. KSA's focus on accelerating its RDI transformation has led to the establishment of the

standalone Research, Development, and Innovation Authority body to orchestrate RDI efforts with the oversight of an RDI committee.

Innovation Inputs: Innovation feeds on four fundamental inputs that should be advanced simultaneously and in alignment: Human Capital, Intellectual Capital, Physical Capital, and Financial Capital. An array of initiatives has been deployed by innovation leaders to advance these inputs. For example, to advance human capital, innovation leaders have followed common policy initiatives related to compulsory primary education, attracting university branches and talent-retention programs. Additionally, countries like South Korea and Norway¹² have developed programs aiming to attract immigrant researchers. On the other hand, to advance intellectual capital, innovation leaders have developed clear IP policies and laws, like the Bayh-Dole Act in the United States¹³, which protects inventions while facilitating their commercialization.

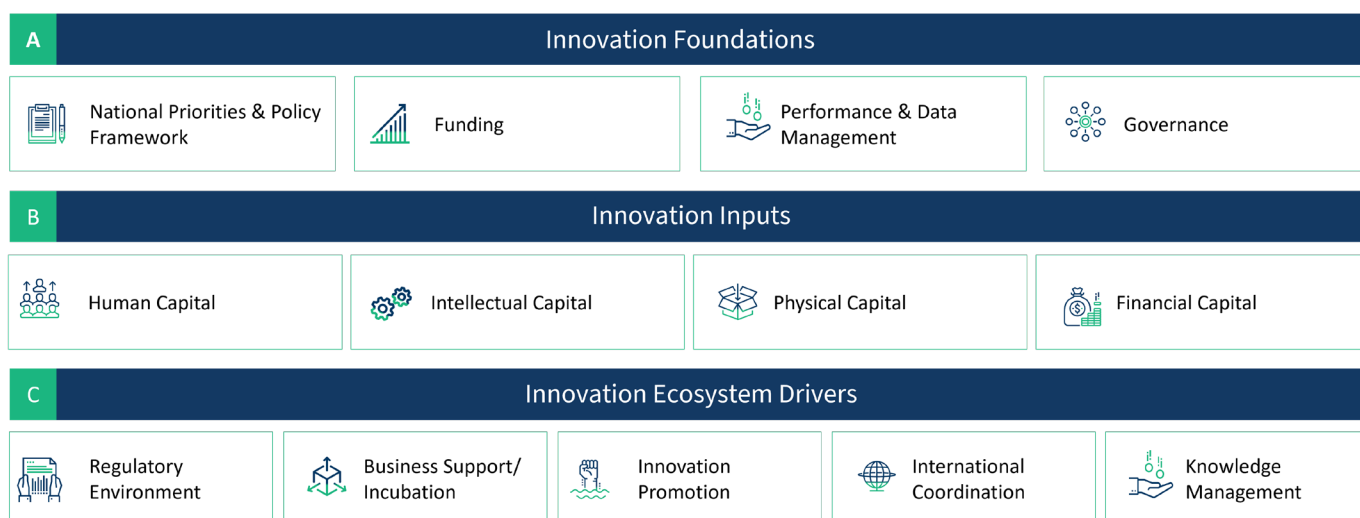
Innovation Ecosystem Drivers: On top of the foundations and inputs, innovation requires involvement by the private sector, supporting regulations, and proactive involvement from the government to keep that ecosystem healthy and growing. To create the required regulatory environment, innovation leaders focus on improving the ease of doing business, loosening insolvency regulations, strengthening minority investor protection laws, requiring transparent contracts, and aligning these

efforts with the judicial system. Innovation leaders also launch initiatives aimed at creating a market in which innovation can be fostered via providing operational support to the private sector, collaborating with local and international partners, and promoting innovation culture. Acknowledging the role of entrepreneurs and SMEs as essential innovation catalysts, innovation leaders have launched targeted initiatives to help SMEs flourish. These initiatives include support portals for SMEs (e.g., SME Instrument of Horizon Europe¹⁴), incubator programs and services (e.g., King Saud University’s Riyadh Technology Incubation Center¹⁵ in KSA), and networking forums to drive collaboration and knowledge sharing among entrepreneurs. On international collaboration, Singapore has launched a Campus for Research Excellence and Technological Enterprise¹⁶ aimed at housing international research centers. South Korea and China have launched the NRF (National Research Foundation) and NSFC (National Natural Science Foundation) Cooperation Program¹⁷ aimed at knowledge sharing and advancing research in both nations. Additionally, innovation promotion is at the core of innovation strategies and innovation policies in the GCC, where both KSA and the UAE have innovation culture promotion as a key pillar in their national innovation strategies.

A closer look into funding and performance and data management, two critical foundations for RDI success, sheds light on some of the imperatives and opportunities that countries need to act on to unlock their innovation agendas.

FIGURE 2: FTI DELTA’S FRAMEWORK FOR INNOVATION

Innovation Framework



Funding as a Vital Ingredient in Advancing Innovation

Funding plays a vital role in fueling innovation advancement by ensuring the availability of financial capital, allocating resources in alignment with national priorities, attracting talent, and monitoring performance and outputs. RDI funding in many of the GCC countries has been historically low, unstable, highly reliant on government funding, primarily institutional, basic research-focused with limited commercialization, and unaligned with national priorities. To move beyond this current state, GCC countries are following best-in-class funding models developed in other countries by innovation leaders. Common features of these funding models include: the adoption of the OECD's Frascati manual (the most commonly acknowledged classification of RDI), setting aspirational RDI spending levels and structures, and putting in place an agile funding governance model.

According to the OECD, spending on RDI has been steadily growing over the years, especially in G20 countries, where it reaches an average of ~2% of GDP and goes as high as ~5% of GDP in South Korea¹⁸. While both sectors contribute to funding RDI activities, the private sector continues to be the main funding source in innovation-leading countries, approaching ~80% of the contribution in South Korea and Japan (Figure 3). This funding is typically provided as a balanced mix of institutional funding and project-based funding

(grants). Interestingly, the contribution of project-based funding exceeds 50% of funding in some economies, such as Ireland, with the aim to create more competition and consequently drive better research outputs when funding is allocated based on competition as opposed to funds channeled directly to the entity without competition.

In terms of research focus, the funds support different projects along the RDI value chain with a growing trend to focus on experimental development, which can exceed ~80% of the funding in economies focused on output commercialization like China (Figure 3). Additionally, RDI fund allocation typically takes into consideration the focus areas defined by the national innovation agenda, with a balanced distribution across focus areas on top of buffer funding maintained for creativity and innovation beyond the focus areas.

RDI budgeting, allocation, disbursement and monitoring of funding are complex processes involving multiple stakeholders, including the RDI Custodian, Center of Government, Ministry of Finance, other intermediaries, and RDI performers from all sectors. This has led countries with successful national RDI programs to develop agile governance models with clearly delineated roles and responsibilities across the different funding flows.

Public RDI funding allocation to different recipients has been one of the most complex challenges that governments have had to navigate. In their attempt to activate a streamlined, transparent, equitable and

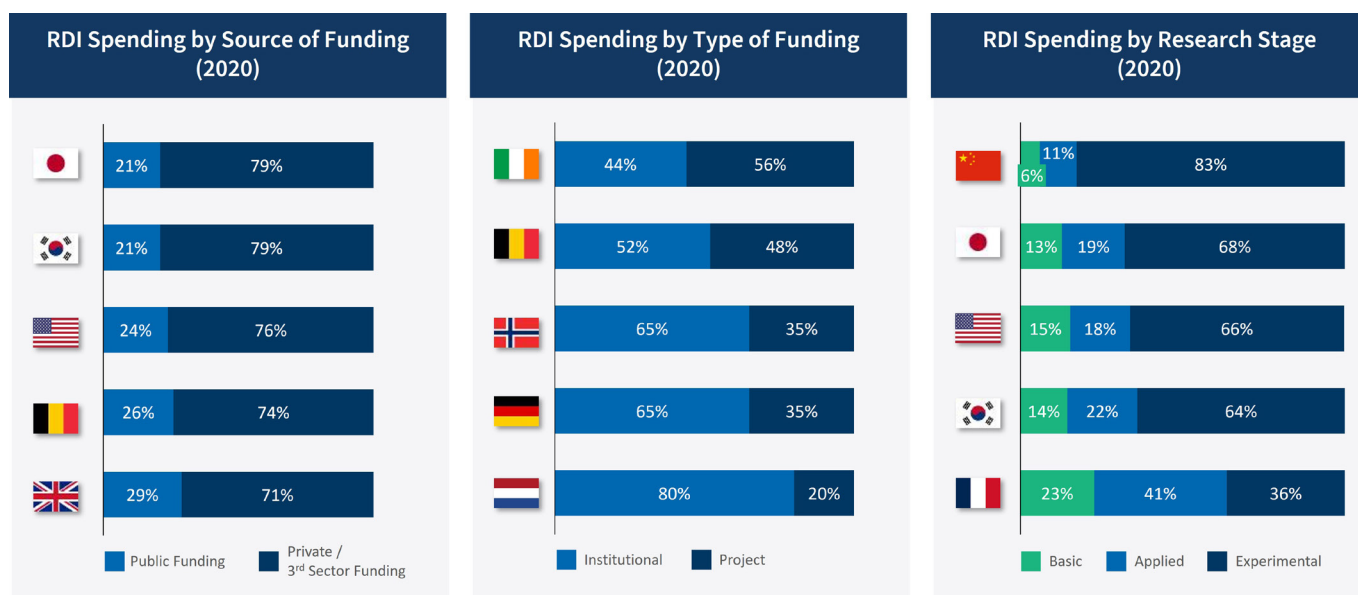


efficient allocation, governments, RDI custodians and intermediaries such as ministries of education are shifting into performance-based funding (PBF) models. Countries now allocate on average 40%-60%¹⁹ of the research institutional funds based on a PBF model. In some instances, countries have allocated 100% of their research institutional funding through PBF, as is the case with Hong Kong and New Zealand²⁰. These merit-based models often allocate available funding to recipients based on multiple metrics²¹ related to: Performance output indicators (including number of publications, number of citations and number of patents),

Environment indicators (such as the availability of other income streams), and Impact indicators (such as the expected socio-economic impact of the projects).

In some instances, more focus is put on future RDI plans and there is less consideration of historical performance, as seen in the UK Research and innovation (UKRI) Medical Research Council. To ensure maintaining business-as-usual for research performers, PBF models include adjustments related to the size of the institution, its research type/areas, and its location to account for differences in expenses even at the city level.

FIGURE 3: RDI SPENDING BY SOURCE, TYPE AND RESEARCH STAGE IN INNOVATION-LEADING COUNTRIES²²



Source: OECD Research & Development Statistics – 2020

Effective Data Management to Monitor Innovation Advancement

Performance/data management is another important ingredient in advancing the RDI agenda. A key prerequisite for performance management is an effective data management system that cultivates trust and transparency among stakeholders, promotes collaboration, and aids strategic decision-making by providing a true picture of the impact of the policies and initiatives undertaken to advance innovation. For example, global metrics and indices have underestimated innovation efforts in some GCC countries due to data-related challenges like the lack of a formal data management process and the use of unofficial or unverified sources. The impact of data inaccuracy goes beyond inaccurate ranking: the inability to assess the success of implemented initiatives and

policies consequently impedes informed planning for the future.

Adhering to a robust data management system is critical for innovation advancement. The management system needs to include clear processes for data collection, data processing and data reporting.

1. **Collection:** Data collection requires effective collaboration between ministries and the National Statistical Office (NSO) overseeing overall coordination, standardization and quality assurance of statistical activities. Data collection involves gathering information from various sources such as surveys, censuses, administrative records, and emerging data collection methods, with a particular focus on transitioning from paper-based to electronic data collection processes.

2. **Processing:** Data collected by ministries and the NSO undergo rigorous procedures to guarantee the generation of high-quality, standardized and well-documented data aligning with global quality guiding principles, such as the 2019 United Nations National Quality Assurance Framework. Subsequently, this data is organized, stored, and managed in databases to enable efficient retrieval.
3. **Reporting:** The National Statistical Office presents processed data in a structured format through publications, online data portals featuring dashboards, press releases and customized data requests. Moreover, NSOs engage in diverse forms of information exchange

with international organizations, including bilateral agreements and partnerships, data submissions, participation in surveys and conferences, and joint research initiatives.

India, for example, has launched multiple programs to improve its national statistics and, accordingly, its scoring across global indices. A US\$30 million program funded by the World Bank²³ was recently launched to improve the quality of statistics by leveraging best-in-class technology and quality assurance mechanisms. In parallel, a joint government task force with eight ministries and industry leaders has been deployed to act on specific topics related to the “Ease of Doing Business” data and indicators.



Conclusion

Today’s rapidly evolving world, with rising socio-economic, environmental, and political risks and threats, makes it imperative that nations integrate excellence in innovation into their development agendas.

GCC countries have acknowledged the imminent need to accelerate their innovation ecosystems to lay the ground for future socio-economic growth and to avoid widening the gap with global innovation leaders. Accordingly, many of them have recently embarked on transformative RDI journeys and set ambitious targets to be achieved over the next decade.

To guide this accelerated path to innovation excellence, countries should consider some of these best practices:

- Develop a consolidated national innovation policy with four to six research focus areas — defined based on the country’s competitive advantages, development needs, aspirations and global trends — and design policy initiatives to support the simultaneous development of

each of the four innovation inputs: Human Capital, Intellectual Capital, Physical Capital and Financial Capital.

- Activate a comprehensive funding model to drive increased RDI spending as a percentage of GDP, with increased funding from the private sector, increased share of project-based funding, balanced funding allocation on focus areas and the research value chain, and shifts into performance-based funding models.
- Enhance data management as a key tool to monitor performance and innovation advancement by leveraging multi-stakeholder task forces.
- Set up an agile RDI governance model with clearly delineated roles and responsibilities among the different stakeholders.
- Create an ecosystem in which innovation can be fostered through regulations, private sector involvement, innovation promotion and international cooperation.

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