

Audit of the WIPO Global Innovation Index (GII)

Internal Oversight Reports



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Internal Audit Section

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LIST OF ACRONYMS

ADG	Assistant Director General
AWS	Amazon Web Services
CIRS	Composite Indicator Research Section
COIN	The Competence Centre on Composite Indicators and Scoreboards
DEDA	Department of Economics and Data Analytics
EC	European Commission
EOS	Executive Opinion Survey
ERM	Enterprise Risk Management
GDP	Gross Domestic Product
GII	The Global Innovation Index
ICT	Information and Telecommunication Technology
IMF	International Monetary Fund
INSEAD	Institut Européen d'Administration des Affaires (French)
IOD	Internal Oversight Division
IP	Intellectual Property
IPIES	Intellectual Property and Innovation Ecosystems Sector
IT	Information Technology
ITU	International Telecommunication Unit
JRC	Joint Research Centre
MoU	Memorandum of Understanding
OECD	Organization for Economic Co-operation and Development
PCT	Patent Cooperation Treaty
R&D	Research and Development
ToR	Terms of Reference
UN	United Nations
WEF	World Economic Forum
WIPO	World Intellectual Property Organization

EXECUTIVE SUMMARY

1. The World Intellectual Property Organization's (WIPO) Global Innovation Index (GII) published annually, tracks the most recent global innovation trends and reveals the most innovative economies in the world by ranking the innovation performance of around 132 economies. WIPO's association with the GII started in 2011 as a "knowledge partner", and then as a co-publisher from 2012 to 2020. Since 2021, the GII has come under the responsibility of WIPO, which has led to an increased insourcing of GII-related processes and tasks, and redistribution of roles and responsibilities.
2. The Internal Oversight Division (IOD) did not find any critical issues during the audit of GII. However, IOD highlights several opportunities to enhance the governance, risk management, and controls around the GII.
3. The current governance structure around the GII is inherited from WIPO's previous status and responsibilities – knowledge partner then co-publisher. However, with the change in the role and responsibility of WIPO, there is a need to review the current governance with a view to reinforcing clarity and transparency, and redefining the components of the structure, in particular, governance and advisory boards, to better reflect their respective functions. Furthermore, a review of the governance and inherent relationships with stakeholders will help establish a forward looking governance, aligned with the vision and strategic objectives envisioned for the GII in the coming years.
4. Currently, there are various communication lines and flows for government institutions to contact WIPO on the GII, which may unnecessarily expose the GII team to risks related to perceived influence or conflict of interest, among others. Going forward, it would be useful to take additional measures to further reduce the abovementioned exposure, by further enhancing the firewalls around the GII development processes. For instance through formal internal and external communications, on the acceptable flow of requests, designated recipients, and responsible respondents.
5. The GII report provides a space for forewords written by corporate network members of the Portulans Institute¹ cofounded by the Co-editors of the GII. This is made possible through a Memorandum of Understanding signed between WIPO and the Portulans Institute, which allows members of their corporate and academic networks to publish their forewords, emphasizing achievements of their respective countries around scientific and technical innovations and economic and technological progress.
6. IOD notes that the number of corporate network members is limited, with the same three to four members over the last 10 years providing forewords. IOD further notes that three of the four members make annual financial contributions to the Portulans Institutes for their GII-related activities. Finally, IOD also notes that one member is a company, and three members are national entities/associations that represent industries/trade. IOD believes that it is important to review the current criteria and approach for publishing forewords provided by third parties to determine whether it is fit for-purpose, impartial, devoid of any perceived conflict of interest, and aligned with the purpose of the GII report.
7. WIPO uses two websites to, among other things, enhance visibility and disseminate information on the GII. One website belongs to WIPO, the other belongs to the external co-editor, and both present information on the GII. While there is no WIPO logo and no statement of affiliation with WIPO on the second website, IOD notes that the Composite Indicator Research Section (CIRS) of WIPO is responsible for managing the content for this third-party

¹ Founded in 2019, the Portulans Institute is an independent nonprofit, nonpartisan research and educational institute based in Washington DC. The institute is a co-editor of the GII report.

site and pays for its maintenance costs. There is however, no agreement that formalizes this practice.

8. Further, IOD believes that contributing to two websites serving the same purpose, is not efficient, and it is not clear on what basis WIPO incurs costs on behalf of this third-party website. While management has indicated that a part of the maintenance and management of this third-party site is the result of historical legacy and the greater flexibility that this website offered, when compared to the WIPO website, IOD is of the view that the costs and benefits of the current practice of managing two websites should be reviewed to determine a cost-efficient way forward.

9. The review of the conceptual framework and data governance surrounding the development of the GII did not identify any significant issues. Overall, IOD found that the framework and its components met international standards for computing composite indicators, data quality control, and testing indicators, among others. Further, IOD notes that the new data infrastructure has been set up to enable a complete workflow that links data storage, data quality control, and data analysis (GII rankings and GII report) in a fully integrated way. Going forward, developing a guidance document for the GII database and the GII repository for collaborative codes would benefit consistency, effectiveness, and institutional memory.

10. Finally, regarding the presentation of information, some attention should be paid to the presentation of old indicators (ten years and beyond) that are highlighted as an innovation strength for an economy in the “In-depth Economy Briefs” online². When an indicator is highlighted as an innovation strength in a particular year, it needs to be measured with recent data to reflect reality for that particular year. Hence a strength based on outdated data is not reflective of the reality and would prove not comparable if benchmarked against other countries whose data are more recent. It would be relevant for transparency and clarity to highlight the age of the data in the “In-depth Economy Briefs” online.

11. IOD makes eight recommendations, which the management has accepted and will address during 2023 and 2024.

² [Economic Trend Analysis | Economic Review 2022 | GII 2022 \(globalinnovationindex.org\)](#)

1. BACKGROUND

13. The WIPO GII published annually, tracks the most recent global innovation trends, and reveals the most innovative economies in the world by ranking the innovation performance of around 132 economies, while highlighting innovation strengths and opportunities. Envisioned to capture the fullest possible picture of innovation, the Index comprises around 80 indicators, including measures on the political environment, education, infrastructure, and knowledge creation of each economy. The different metrics offered by the GII help monitor performance and benchmark developments against economies within the same region or income group.

14. Over the years, the GII has generated increased interest as a performance indicator and has therefore become an indirect measure of success of ministries responsible for different government programs.

15. In its 2022 ranking of the world's economies on innovation capacity and output (Annex XI), the GII shows some key changes in the top 15 of the ranking, with the United States climbing to the second position, the Netherlands moving up to the fifth position, Singapore reaching the seventh, Germany eighth, and China up one place to 11th. Switzerland remains the world's leader in innovation for the 12th consecutive year. It leads globally in innovation outputs, and specifically in patents by origin, software spending, high-tech manufacturing and production, and export complexity.

16. The GII project was launched in 2007 by Professor Soumitra Dutta, Dean of Saïd Business School at Oxford University, during his tenure at INSEAD³. WIPO's association with the GII (as a "knowledge partner") started in 2011, and it began co-publishing the GII in 2012. In 2013, Cornell University joined as a co-publisher, with Professor Dutta representing the GII at Cornell University and Dr. Bruno Lanvin at INSEAD. The GII continued to be co-published by Cornell University, INSEAD and WIPO until 2020. Since 2021, the GII has been published by WIPO in partnership with the Portulans Institute⁴, various corporate and academic network partners and the GII Advisory Board. This change has triggered a substantial insourcing of the GII-related processes and tasks, and redistribution of roles and responsibilities. Annex II illustrates WIPO's role in the GII development before and after 2021.

17. The WIPO Accountability Framework sets the organizational principles of governance and accountability. The framework sets the roles and responsibilities of any WIPO organizational unit under seven broad areas: (i) Results Based Planning; (ii) Performance and Risk Management; (iii) Monitoring, Oversight, Complaints and Response Mechanisms; (iv) Control Activities; (v) Information and Communication; (vi) Ethical Standards and Integrity; and (vii) Control Environment.

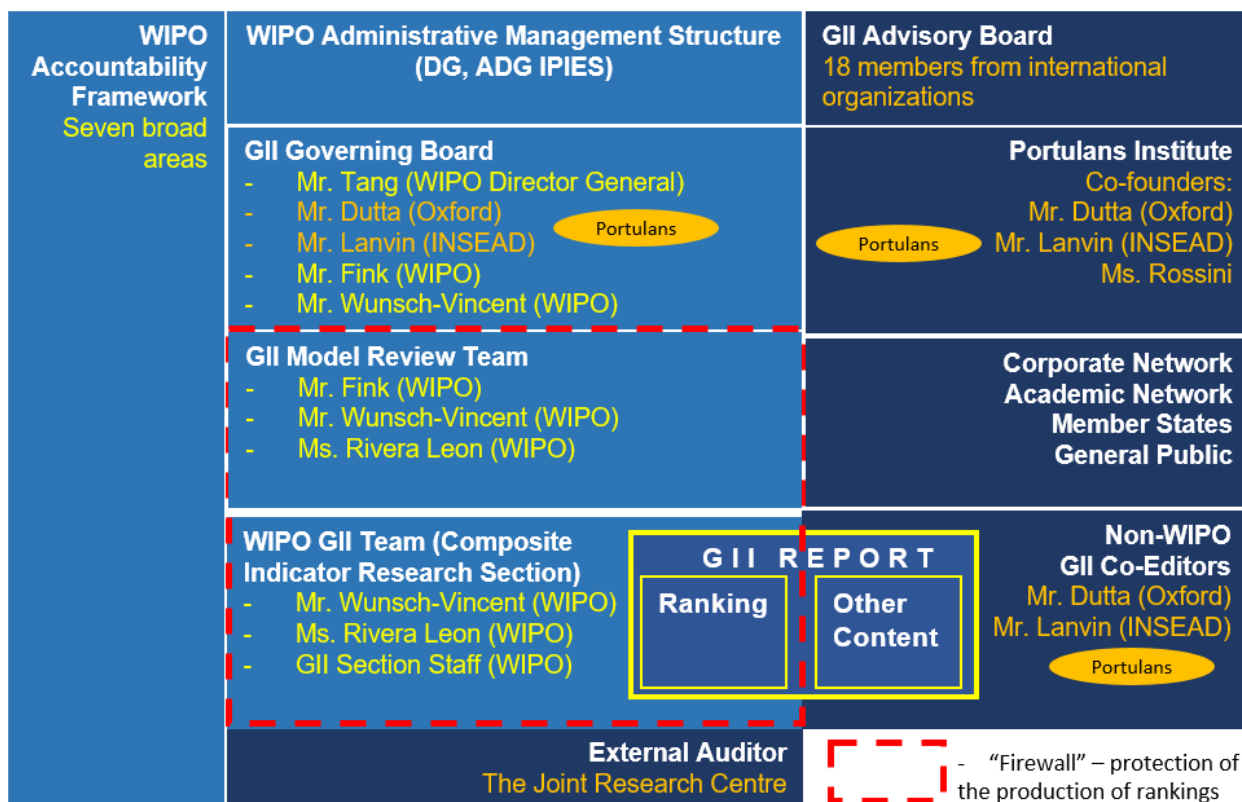
18. Figure 1 below depicts current⁵ actors, stakeholders, and the governance and accountability system around the GII report preparation process.

³ Institut Européen d'Administration des Affaires (INSEAD).

⁴ Founded in 2019, the Portulans Institute is an independent nonprofit, nonpartisan research and educational institute based in Washington DC.

⁵ Status as of March 2023.

Figure 1: Building the GII report – actors, stakeholders, and the system of governance



Source: Compiled by IOD

19. **GII Governing Board** - Established in 2020, the mandate of the Board⁶ consists of (i) providing an overall strategic guidance in view of the elaboration and publication of each future edition of the GII; (ii) monitoring the overall elaboration of each edition of the GII; (iii) promoting the GII around the world; (iv) considering strategic partnerships and operational models to advance the goals of the GII; and undertaking any other activities, as appropriate that contribute to the achievement of objectives of the GII. The Board does not provide oversight on the GII data or model.

20. The Board consists of five members: WIPO Director General, WIPO Chief Economist, WIPO Head of CIRS, Mr. Soumitra Dutta and Mr. Bruno Lanvin (or designated alternates). The last two non-WIPO members are co-founders of the Portulans Institute.

21. **GII Model Review Team** - WIPO Chief Economist, and the two WIPO co-editors (Ms. Rivera Leon and Mr. Wunsch-Vincent) regularly review the GII model, drawing on external input and taking decisions on possible model changes.

22. **GII Advisory Board** advises on the strategic direction of the GII, helps with emphasizing the role of innovation in economic and social development, and assists in sharing the GII results as they relate to different world economies and regions. The Advisory Board is not involved in the development of the GII data, or in the country rankings. The Advisory Board has 18 members and is made up of international policymakers, thought leaders and corporate executives. Members are drawn from diverse geographical and institutional backgrounds and participate in a personal capacity. No WIPO staff or member of Portulans institute serve on Advisory Board.

⁶ April 22, 2020 - Memorandum of Understanding between Mr. Soumitra Dutta, Mr. Bruno Lanvin and WIPO concerning the establishment of the Governing Board.

23. **Portulans Institute** - As per the Memorandum of Understanding⁷ (MoU) with WIPO, the Portulans Institute (i) cooperates in organizing events around the GII with its corporate and academic network partners; (ii) shares and disseminates information on innovation performance; (iii) produces communication and marketing materials to promote the GII; and (iv) provides written contributions to the annual GII report through its network partners. Further, the two co-founders of the Institute, Dr. Lanvin and Professor Dutta, are members of the GII Governing Board.
24. **Corporate and Academic Networks** - According to the MoU signed with the Portulans Institute, Corporate and Academic Networks established by the Portulans Institute serve as stakeholders that promote innovation and provide support to enhance the visibility and use of the GII among corporate and academic institutions. Further, members of the network may provide written contributions to the annual GII report. This network has no direct link to WIPO or the development of the GII data and report.
25. **GII Editors** - The GII report has two internal editors – Ms. Rivera Leon and Mr. Wunsch-Vincent, and two external editors - Dr. Lanvin and Professor Dutta. Ms. Rivera Leon and Mr. Wunsch-Vincent are responsible for the GII infrastructure, data collection, production and write-up of rankings and other report components.
26. **External Auditor** - The Competence Centre on Composite Indicators and Scoreboards (COIN) team from the European Commission’s Joint Research Centre (JRC) conducts a statistical audit⁸ of the GII on an annual basis since WIPO’s involvement with the GII in 2011. The JRC’s analysis is based on the recommendations of the Organization for Economic Co-operation and Development (OECD)/ European Commission (EC) JRC (2008) Handbook on Constructing Composite Indicators, and on more recent research from the JRC.
27. **WIPO Administrative Management Structure** - The GII report is prepared under the overall responsibility of the Director General, administered by the IP and Innovation Ecosystems Sector (IPIES) led by the Assistant Director General, and prepared by the WIPO CIRIS, which reports to the Director (Chief Economist) of the Department of Economics and Data Analytics (DEDA). The WIPO administrative structure is designed to minimize interference with the process of production of GII rankings.
28. **WIPO Composite Indicator Research Section (CIRIS)** - This Section is responsible for the GII development cycle, from data sourcing to production, and publishing the rankings. The Section applies the principle of “Firewall” to ensure non-interference, and while the whole Section contributes to the development of the GII report, the ranking process is done by two persons within the Section⁹, with input from the Chief Economist - all three forming the Model Review Team.
29. The GII is launched in September every year with a major event. The GII report is a WIPO flagship report available in an English integral version and in executive versions in the United Nations’ official languages plus German and Portuguese. Since WIPO took over the responsibility of the production of the GII report, the number of pages has reduced from 450 to 250 pages enhancing the overall readability. The GII economy profiles, which are detailed profiles for all participating economies, occupy about half of the report. The one-page profile gives a good overview of the economy and highlights in what pillars, sub-pillars, and indicators the economy is strong and weak.

⁷ April 30, 2021 Memorandum of Understanding between the WIPO and the Portulans Institute.

⁸ The audit reports are publicly available at: https://knowledge4policy.ec.europa.eu/composite-indicators_en and <https://composite-indicators.jrc.ec.europa.eu>

⁹ Mr. Wunsch-Vincent (Head of CIRIS) and Ms. Rivera Leon (Program Officer, CIRIS).

2. ENGAGEMENT OBJECTIVES

30. The objectives of this audit engagement were to:
- (a) Verify whether measures have been taken to ensure appropriate governance, independence, transparency, and integrity surrounding the management and development of the GII, including managing any potential conflict of interest; and
 - (b) Provide reasonable assurance that the Organization has put in place efficient and effective risk management and controls surrounding the accuracy, reliability and completeness of data used in developing the GII, including verifying the validity and reasonableness of assumptions and models used.
31. In more detail, the audit specifically verified, among other things:
- (a) Overall congruence of the GII methods with the OECD/JRC Handbook on Constructing Composite Indicators – Steps and Methods;
 - (b) Transparency of methods and data intake, treatment, and inclusion;
 - (c) Quality of the data;
 - (d) Methods for data integration, model composition and the inclusion or exclusion of countries; and
 - (e) Effective use of data to write up core results and country briefs and profiles.

3. SCOPE AND METHODOLOGY

32. The engagement scope covered data used to develop the 2022 edition of the GII report. However, for analytical review, corroborative purposes and gaining specific insights, the period covered in some instances was extended to 2021 and 2020.
33. The approach and methods included interviews with relevant stakeholders, review of documents and records, sample testing of controls, recalculations, and the use of statistical analytics tools, among others.
34. IOD contracted a subject matter expert to support the audit, and, in particular, areas pertaining to the conceptual framework and the development cycle of composite indices and related models.

4. ENGAGEMENT RESULTS – OUTCOME(S)

35. The objectives and outcomes of the audit are summarized below.

S/n	Objective(s)	Outcome(s)
(a)	Verify whether measures have been taken to ensure appropriate governance, independence, transparency, and integrity surrounding the management and development of the GII, including managing any potential conflict of interest.	<p>IOD found that opportunities exist to enhance the current governance structure of the GII. IOD makes recommendations on reviewing and redefining the current Boards and their relationships, supported by relevant terms of reference. IOD believes there are opportunities for the advisory and governance structures to be further adapted to effectively contribute towards the objectives of the GII, including maintaining its relevance in the years to come.</p> <p>IOD also highlighted the need to update internal guidelines and establish a specific communication protocol for the GII to help reinforce independence and impartiality, and avoid any potential conflict of interest.</p> <p>Further, the current criteria and approach for selecting and publishing forewords should be reviewed to ensure that it is transparent, impartial, and aligns with the purpose of the GII. Finally, the current practice of WIPO managing a third-party's website on the GII-related information should be reviewed to determine its efficiency and validity.</p>
(b)	Provide reasonable assurance that the Organization has put in place efficient and effective risk management and controls surrounding the accuracy, reliability and completeness of data used in developing the GII, including verifying the validity and reasonableness of assumptions and models used.	<p>Overall, effective controls have been put in place to support the GII development cycle. IOD notes however, that the risk register needs to be updated to strengthen the link between the risks and controls.</p> <p>The methodology for constructing the GII was found to be congruent with the OECD/JRC handbook. Data intake, treatment, inclusion and measures to ensure quality were found to be appropriate. Likewise, data integration, model composition, and criteria for inclusion and exclusion of countries were found to be adequate. IOD makes one recommendation concerning the use of outdated data in tables of strengths and weaknesses on the online "In-depth Economy Briefs", and another recommendation on the need to update the guidelines with relevant information of the data infrastructure.</p>

5. ENGAGEMENT RESULTS - POSITIVE DEVELOPMENTS

36. IOD notes some positive developments identified during the engagement.

Area	Positive Development
GII development	The CIRS has mature protocols for developing the GII the fully integrated GII Data Infrastructure and effectively designed “firewall” reinforces transparency, independence and noninterference.
GII Internal Guidelines	CIRS has developed Internal Guidelines that provide details on roles, responsibilities and processes surrounding the GII development. The document sets out the design of various controls over the GII development process and serves as a valuable tool to preserve institutional memory.
Outreach activities	Feedback reviewed indicates that Member States currently appreciate the support they receive from CIRS on improving their respective countries' innovation ecosystem. IOD positively notes that CIRS does not provide assistance to Member States on improving their ranking, as this is prohibited in their internal guidelines.

6. ENGAGEMENT RESULTS - OBSERVATIONS AND RECOMMENDATIONS

37. The following observations and recommendations present opportunities to further enhance the WIPO GII development framework.

(A) GOVERNANCE, RISK MANAGEMENT AND CONTROLS

(i) Structure, Roles, and Responsibilities

38. **GII Governance Board** – As a best practice, a “Board” would include at least one organization insider along with more outside or independent members with relevant expertise. Outside members do not face the same potential conflicts of interest as the organization’s insiders on the Board. Further, the Board compositions tend to include more external members than internal. Currently, the GII Governing Board has more WIPO staff members than outside members, and this could be perceived as skewed. While acknowledging that the current Board reflects the increased control of WIPO over the GII, it may be beneficial to review the naming of this body, and clarify its purpose.

39. **GII Advisory Board** - While CIRS’ internal guidelines¹⁰ touch upon the mandate of the Board, some details that make up the expected Terms of Reference (ToR) such as among others, the required number of members and their appointment length, are not formally set. Further, the term “Board,” may not be reflective of the actual role of this body, which is more similar to a committee. Going forward, a formal ToR would enhance transparency, governance, and accountability, and renaming the body to an Advisory Committee will better reflect its role.

40. **Forward looking Governance** - As WIPO’s role and responsibility in the development of the GII has evolved, there are opportunities to reinforce governance surrounding the GII and to benefit from the evolution of the current structures to better fit the strategic objectives related

¹⁰ GII: Governance Model for Data/Index Integrity and Responsible Impact, January 2023

to the GII, in particular, among others, how to keep the GII relevant in the coming years. At the impulse of the Director General, IPIES organized a GII Retreat in February 2023, which resulted in positive feedback from participants, who found the retreat to be valuable and useful to fuel creativity and innovative ideas on how the GII could remain relevant. Going forward, IOD encourages the use of a retreat as a means to garner ideas and views on how to evolve the GII. Furthermore, the governance structures should be adapted to effectively contribute towards this objective. For instance, WIPO may consider as a first step, to redefine or clarify the role of the governing bodies, including renaming these “Boards” to better reflect their functions, while considering the benefit of merging or reducing the number of governance structures for more efficiency or agility, among others.



As Part of WIPO Accountability Framework, WIPO is committed to promoting gender equality and diversity at all organizational levels and in all advisory bodies. WIPO also works proactively to mainstream gender equality considerations in all internal and external activities it carries out. IOD notes the following gender representation on the GII Advisory Board - eight female and 10 male; the GII Model Review Team - one female and two males; and the GII Governing Board - all five members are male.

41. **Relationship with the Portulans Institute** - According to the concluded MoU, the Portulans Institute shall report to the GII Governing Board concerning the funding of its GII-related activities, which includes the management of the academic and corporate networks, by providing, as appropriate and if requested, any relevant financial documentation. This measure is designed to maintain the non-partisan nature of the organization and to ensure that no countries can use the Institute as a proxy to affect the GII report’s factual content, including the rankings.

42. The Portulans Institute provides its annual activity report in the format of PowerPoint presentation to the GII Governing Board. The Institute reports on its outreach, promotion and dissemination activities, academic and corporate network members, and on money received from Corporate Partners and spent on the GII-related activities, including staff salaries. IOD notes that WIPO does not tend to request any additional or detailed financial information from the Institute.

43. Further, IOD notes that the number of Corporate Network Members is limited, with the same three to four members over the last 10 years¹¹. IOD also notes that three of the four members make annual contributions to finance the Institute’s GII-related activities, for a total amount of 150 thousand United States dollars for 2022. All four members write forewords in the GII report as provided by article 2.1(ii) of the MoU between WIPO and the Portulans Institute. These forewords emphasize achievements of respective countries or industries around scientific and technical innovations and economic and technological progress, and the use of the GII in this context. IOD notes that one member is a company, and three members are national entities/associations that represent industries/trade, thus acting as an umbrella entity with a large number of national corporate members.

44. IOD would like to point out the importance of ensuring that the premise for providing a platform for these contributions within the GII report be clear and transparent to avoid potential perceptions of conflict of interest, lack of objectivity or perceived influence or loss of impartiality in country ranking. Further, the fact that all four members of the Corporate Network provide forewords but only three contribute financially may also create ambiguity regarding the impartiality of this process. Finally, no member of the Academic Network has provided a written foreword, hence it is not clear what the criteria are for providing forewords. Going forward, it

¹¹ Corporate Network Members were called “Knowledge Partners” before 2021.

would be relevant to review the current practices, with a view to ensuring transparency and clarity.

Recommendation 1

The Department for Economics and Data Analytics in collaboration with relevant internal stakeholders should review the Governance structure including clarifying the roles, reviewing the current designations of the Governance and Advisory Boards, with a view to ensuring that the structure is fit-for-purpose and aligned with the vision and objectives for the GII, while ensuring that gender balance is achieved to the extent possible. Appropriate Terms of References should be subsequently developed.

(Priority: Medium)

Closing criteria: The GII Governance structure is reviewed and changes are made including:

- (a) Renaming the components of the Governance structure to better reflect the roles and responsibility;
- (b) Establishing new Terms of Reference for the components of the new structure; and
- (c) Terms of Reference should include: mandate, objectives, composition (including the reference to the gender equality principle), members' selection criteria and the length of terms, and frequency of meetings, among others

Recommendation 2

The Department for Economics and Data Analytics in collaboration with relevant internal and external stakeholders, should review the current approach for publishing forewords provided by third-parties, with a view to determining whether it is fit for-purpose and impartial, and aligned with the underlying purpose of the GII report.

(Priority: Medium)

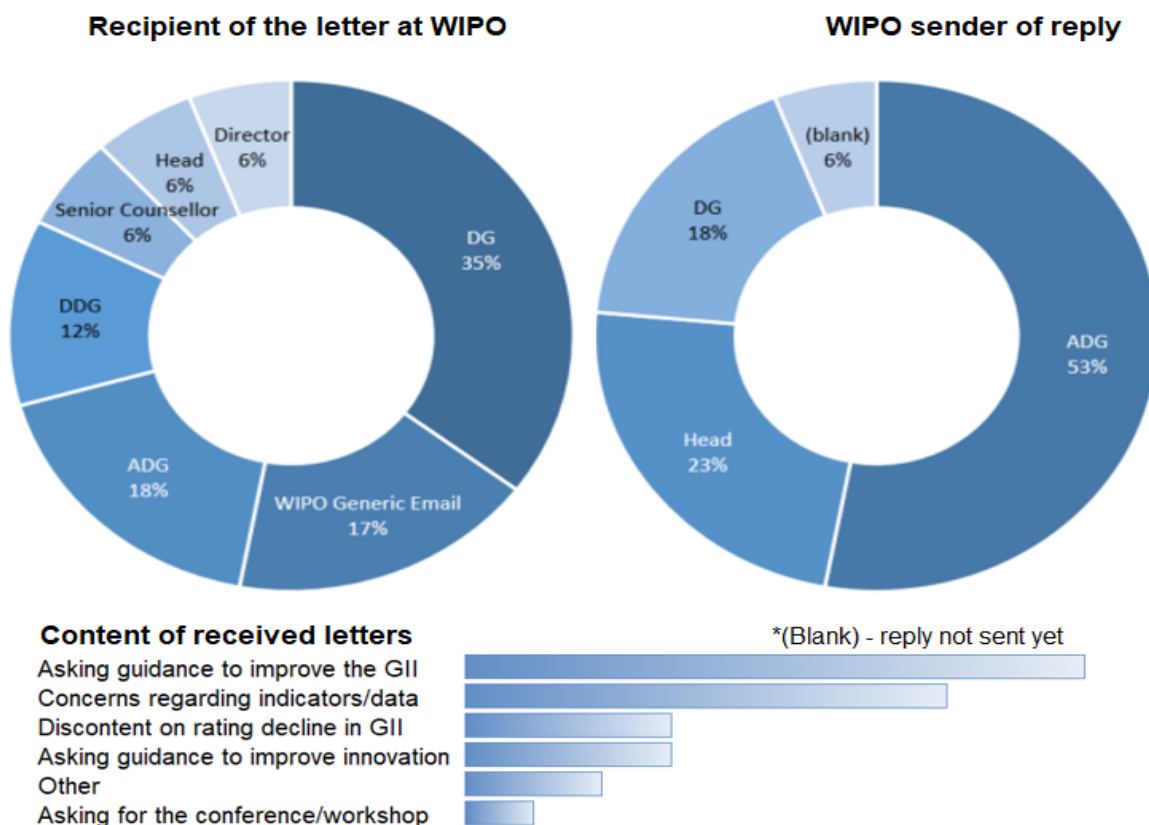
Closing criteria: A decision is made and communicated on the methodology for publishing forewords.

(ii) Communications

45. **Communication rules with stakeholders** - CIRS internal guidelines clearly prohibit interactions with Member States regarding the “improvement of ranking” or “review” of the GII model. WIPO receives letters, emails and phone calls from governments concerning: their ranking and willingness to improve their innovation metrics or ecosystem, questions on the GII model, or suggestions to modify the GII model. Any such request is followed by a standard reply in line with principles of neutrality, transparency, and independence. CIRS may offer country-specific workshops or consultations on enhancing the innovation ecosystem as a whole; however, the CIRS has strict internal guidelines on their content in order to avoid any perception of conflict of interest.

46. IOD analyzed a sample of 17 incoming letters from government institutions and representatives of different countries and respective replies sent by WIPO in 2021 and 2022. Figure 2 represents statistics on the reviewed GII correspondence.

Figure 2: Statistics on GII Related Correspondence with Countries



Source: Compiled by IOD. Data is prepared based on a sample of 17 incoming letters during 2021 and 2022.

47. The analysis shows that most correspondence concerned the possibilities to improve the national innovation system as captured in the GII ranking, and the data used in the model. IOD reviewed WIPO replies and found they were in line with CIRS internal guidelines.

48. According to the figure above, stakeholders may send their communication to different WIPO departments; similarly, WIPO replies may be sent by different senders. The WIPO Guidance on approval processes for correspondence and internal memoranda (March 24, 2021)¹² guides the workflow of correspondence.

49. IOD notes that the variety of communication lines and flows may unnecessarily expose the GII team. Going forward, it may be useful to take additional measures to further reduce the abovementioned exposure, by further enhancing the firewalls around the GII development processes. Some potential measures, among others, can be to:

- (a) Add an information notice to the GII report and webpages that all inquiries with respect to the GII should be sent through the generic GII mailbox¹³, WIPO GII Contact form¹⁴ or WIPO physical address, indicating the Office of the Assistant Director General (ADG) - IPIES (administrator) as recipient. The Office will identify the best means to address the request, either by engaging DEDA, CIRS, or another internal stakeholder. That will reinforce the principle of “firewall” and enhance segregation of duties; and

¹²https://intranet.wipo.int/export/sites/intranet/office/en/misc/pdf/guidance_on_correspondence_workflows_and_internal_memoranda_approval_processes.pdf

¹³ gii@wipo.int

¹⁴ <https://www3.wipo.int/contact/en/area.jsp?area=gii>

(b) Publish a formal internal communication to inform all WIPO staff, who receive GII-related inquiries from stakeholders, to engage with the Office of ADG-IPIES, and not to directly contact CIRS.

50. IOD encourages the current practice of keeping a register of incoming and outgoing GII-related correspondence. The register is an effective way to show the transparency of dialogue with stakeholders about GII matters and serves as a useful control over sensitive communication. The register and its functioning should be included in the internal guidelines.

51. **Country Workshops and Events** - CIRS and other internal stakeholders also communicate with Member States through workshops and events. Annex IV shows the outreach activities of IPIES between January 2021 and February 2023, representing over 70 events spread across around 55 countries. IOD has reviewed materials used during the workshops and events and concluded that the content of the materials provided was in line with the CIRS internal guidelines; the content was not geared at providing advice on how to improve the ranking in the GII.

Recommendation 3

The Office of the ADG for IP and Innovation Ecosystems Sector should:

- (a) Develop and issue a communication guideline for the GII with clear accountability and responsibilities for receiving and responding to requests, including designating the Office of ADG IPIES as main recipient, to maintain the firewall and segregate duties;
- (b) Update the website and the publication with a statement on the appropriate communication workflow for GII related inquiries; and
- (c) Formally communicate to all WIPO staff, the workflow for receiving request and addressing GII related request, as per the communication guideline.

(Priority: High)

Closing criteria: Guidelines issued, website and publication updated with appropriate information on communication workflow, and internal communication to WIPO staff issued.

(iii) Controls to Support Independence, Integrity, and Accountability

52. In line with its core values WIPO is committed to developing the GII in a transparent and independent manner, avoiding external interventions and potential conflicts of interest. For this purpose, a series of mitigating actions and controls are in place, such as:

53. **CIRS internal guidelines** - The GII Governance Model for Data/Index Integrity and Responsible Impact developed in January 2023, provides details on actors and processes surrounding the GII development. The document sets out the design of various controls around the GII development process and serves as a valuable tool to preserve institutional memory. Going forward, IOD suggests regularly updating the document and expanding on such areas as, (i) registering incoming and outgoing GII-related correspondence with stakeholders; (ii) stakeholders notification before the Global GII Launch; (iii) guidance for accessing the GII databases and GitHub; and (iv) relationships with external data providers, among others.

54. **Application of the “Four eyes principle”** - This control mechanism requires that for any critical GII-related activity, there should be at least two competent and independent individuals

involved. IOD's analysis of this mechanism (Annex III) shows that there are at least three individuals involved at each step of the GII development life cycle.

55. Principle of "Firewall" around the ranking process - The rankings and the GII model review is done by two persons within the CIRS¹⁵, and with input from the Chief Economist (Annex III). GII rankings are not made available to the WIPO Management for consideration or feedback. Subsequently, ADG-IPIES and the Director General are notified about the ranking four to eight weeks before the GII Launch event, as this information is relevant for organizing, and inviting participants to the event.

56. Member States are not invited to participate in the model review process – although their substantive general comments can be considered for the general elaboration of the model by the GII Model Review Team, if factually of interest. Any intent, however, to influence their own ranking or alter the model in view of improving their ranking is strictly discouraged and ignored. Upon request, the WIPO Member States may receive the results around 48 hours before the GII Launch. Further, WIPO may invite high level officials to participate or submit a prerecorded video presentation, in which case the results may be shared four weeks before the Launch to facilitate the elaboration of talking points for the speeches/presentations.

57. GII model Version Control - All data used for the development of the GII is stored and managed in the relational database built on MariaDB¹⁶ and stored in AWS¹⁷ cloud services. The GII development workflow process uses an integrated development environment RStudio for R¹⁸, a programming language for statistical computing and graphics, which ensures transparency, audit trail and unified approach to data treatment. Moreover, the repository of codes is stored at WIPO/GII institutional account in GitHub¹⁹, which provides the GII model version control.

58. The WIPO Code of Ethics sets WIPO core values and principles such as independence, loyalty, impartiality, and integrity to guide conduct and behavior of WIPO personnel. Staff members sign a Declaration of Oath, confirming their adherence to the WIPO Code of Ethics, including adhering to rules regarding the acceptance of gifts. For instance, while WIPO policy on gifts limits the value to 200 United States dollars, IOD notes that CIRS has established a no gift policy regardless of the value.

59. External Audit - Every year the GII is statistically audited by JRC of the European Commission. IOD reviewed the three last statistical audit reports for 2020, 2021, and 2022. In all three cases, the GII met relevant quality standards for statistical soundness, indicating that the GII is a reliable benchmarking tool.

(iv) Risk Management

60. There is currently one strategic risk identified and recorded by CIRS in the WIPO Enterprise Risk Management (ERM) system specific to the GII - Negative reaction to the GII, negatively affecting the WIPO's reputation. Further, another risk - Information received is unreliable, leading to inaccurate statistical data, or analytical shortcomings in WIPO publications and reports - has been recorded at Department level to cover activities of the DEDA. IOD concurs that these risks are relevant to the GII development process. However, IOD also notes that while multiple controls have been designed around other significant operational risks specifically related to the GII, perceived conflict of interest, among others, these risks are

¹⁵ Section Head and Program Officer

¹⁶ MariaDB Server is an open source relational database management system

¹⁷ Amazon Web Services

¹⁸ R, is a programming language for statistical computing and graphics

¹⁹ GitHub is a website and cloud-based service that helps developers store and manage their code, as well as track and control changes to their code.

however not recorded in the ERM risk register. Going forward, these risks should be formally recorded in the ERM risk register and associated with existing mitigating actions and controls.

61. Finally, IOD notes that over the years, CIRS has done much to professionalize the GII processes and related documentation. However, there is invariably substantial tacit knowledge involved in producing the GII, which rests with the staff members of CIRS. In addition, there are relationships with external data providers that rely on the team's institutional memory. Consequently, a loss of talent in the Section could seriously impair the GII. CIRS currently mitigates this risk through, among other measures, the establishment of the internal guidelines, which need to be regularly updated.

Recommendation 4

The Composite Indicator Research Section should expand its internal guidelines and include more detailed process descriptions and steps on: internal and external stakeholders' notifications before the GII Global Launch and relationships with external data providers, among others.

(Priority: Medium)

Closing criteria: The CIRS internal guidelines are updated with the above-mentioned additions and any other relevant information.

Recommendation 5

The WIPO Composite Indicator Research Section should update the ERM risk register and record additional operational risks and related controls around the GII, such as perceived conflict of interest.

(Priority: Medium)

Closing criteria: WIPO ERM risk register updated with additional operational risks and related controls around GII, including perceived conflict of interest.

(v) Capacity and Resources

62. CIRS consists of four full-time staff members – Section Head, Program Officer, Data Scientist, and Project Manager. In addition, since 2022, one Fellow assists the Section. EPM data (Figure 3) shows that most staff efforts are allocated to the GII development and publication; the Section Head and Program Officer allocate 10 per cent of their time to the GII-related capacity building in developing countries. IOD however notes that CIRS outreach activities in 2022 (Annex IV) indicate higher actual resource consumption – i.e. over 70 events between January 2021 and February 2023, with at least 25 events in 2022.

Figure 3: CIRS Staff allocation to program activities in 2022 and 2023

Position/Incumbent	Staff allocation to program activities 2023			Staff allocation to program activities 2022		
	IV.1.02	IV.2.02	Total Allocation of Personnel %	IV.1.02	IV.2.02	Total Allocation of Personnel %
	Program Activity 1 GII-related capacity building in developing countries	Program Activity 1 Development and publication of Global Innovation Index		Program Activity 1 GII-related capacity building in developing countries	Program Activity 1 Development and publication of Global Innovation Index	
P5_Head	10%	90%	100%	10%	90%	100%
P3_Project Manager	-	100%	100%	-	100%	100%
P3_Program Officer	10%	90%	100%	10%	90%	100%
P3_Data Scientist	-	100%	100%	-	100%	100%

Source: WIPO EPM

63. Discussions with the Management indicate that CIRS have sufficient capacity to deliver on the core analytical elements of the GII. At the same time, as the GII gains prominence, there has been a substantial increase in the number of requests from Member States. So far CIRS has been able to accommodate these requests, partly due to the efficiency of virtual meetings. Further, there is a need to reserve some capacity for the GII outreach efforts (beyond Member State requests). Going forward, CIRS may benefit from reviewing the allocation of resources against the priorities of the Program of Works and Budget, as well as aligning with its areas of strategic focus.

(vi) GII Information Asset

64. The GII development process is based on and supported by tangible and non-tangible assets such Information Technology (IT) infrastructures and software, among others. As part of the independence and integrity, it is relevant for WIPO to maintain substantial control over assets that contribute to the achievement of the WIPO GII-related objectives.

65. **Computers and IT Infrastructure.** Only equipment, premises and IT infrastructure under the control of WIPO, can be used in the GII development and ranking process. Only trusted partners are used when the infrastructure is used as a service.

66. **GII branding.** From 2021, WIPO is solely in charge of the GII framework, the data collection and quality process, the analysis, the write-up, and dissemination, as well as all interactions with Member States and other external parties. The GII has significantly grown in prominence, and for reputational considerations, credibility, and to accurately reflect the change in responsibilities it is important that the “Global Innovation Index” be associated with WIPO, which is currently done through various outreach and marketing campaigns.

67. **GII Web-sites.** IOD notes that WIPO uses two websites to among other things, enhance visibility and disseminate information on the GII. In addition to the official webpage, which presents information on the GII, there is another website, belonging to the external co-editor, which also presents information on the GII. This website existed before WIPO’s involvement in the GII production. Further CIRS is responsible for managing the content of this third-party website and has also incurred expenditure of 27 thousand Swiss francs between 2020 and 2022, corresponding to maintenance costs paid to a service provider for this site.

68. IOD’s comparison of both websites shows that while both sites have material on the GII, the third-party website has a richer content. Further, while CIRS manages the content of this site, there is no WIPO logo and no statement of affiliation with WIPO on that site.

69. Contributing to two websites serving the same purpose, is not efficient, and it is not clear on what basis WIPO incurs costs on behalf of this third-party website. CIRS has indicated that the current condition is the result of historical legacy and the greater flexibility that this website offers, when compared to the WIPO website

70. IOD further notes that to address the constraints in flexibility and functionality, in early 2023, CIRS signed a three-year contract with an external contractor²⁰ to enhance the visualization of information on the GII and to produce a more dynamic version of the GII 2023-2025 country briefs – on the www.wipo.int domain. Going forward, it would be important to review the costs and benefits of the current relationship with the third-party website and determine efficient solutions that better reflect the current role and responsibility of WIPO, including potentially redirecting traffic.

Recommendation 6

The Department for Economics and Data Analytics and other relevant internal stakeholders, should review the costs and benefits of the current practice of managing two websites and determine a cost-efficient way forward, taking into consideration:

- (a) The use of WIPO funds and human resources on a third-party website with no formal agreement;
- (b) The value and relevance of running two websites on the GII; and
- (c) The ramifications of the future investment on enhancing the GII information on the WIPO website.

(Priority: Medium)

Closing criteria: A formal decision is made and communicated, which considers the above points.

(B) GII CONCEPTUAL FRAMEWORK

71. Establishing a conceptual framework is one of the first steps when building an index and needs to be done sensibly and judiciously. The conceptual framework of the GII is a mapping of the concept innovation performance into sub-indices divided into different pillars, sub-pillars and indicators.

72. The GII is a well-established index founded by Professor Soumitra Dutta in 2007. After 15 iterations of the index, with inputs from distinguished worldwide experts, the conceptual framework building blocks are well established as a good measure of the multidimensional concept of innovation. Nevertheless, it should be tested with every version of the index, to see that all new aspects of innovation are included and measured.

73. The original idea of the index was to find a novel and holistic way to capture innovation which goes beyond the traditional innovation measures such as the number of patents issued, number of research articles produced or research and development (R&D) expenditures, just to mention a few. The GII embraces indeed a broad notion of innovation, originally elaborated in the fourth edition of the Oslo Manual²¹ developed by the Statistical Office of the European Communities and the OECD: “An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).”

²⁰ Contract amount 43 thousand Swiss francs.

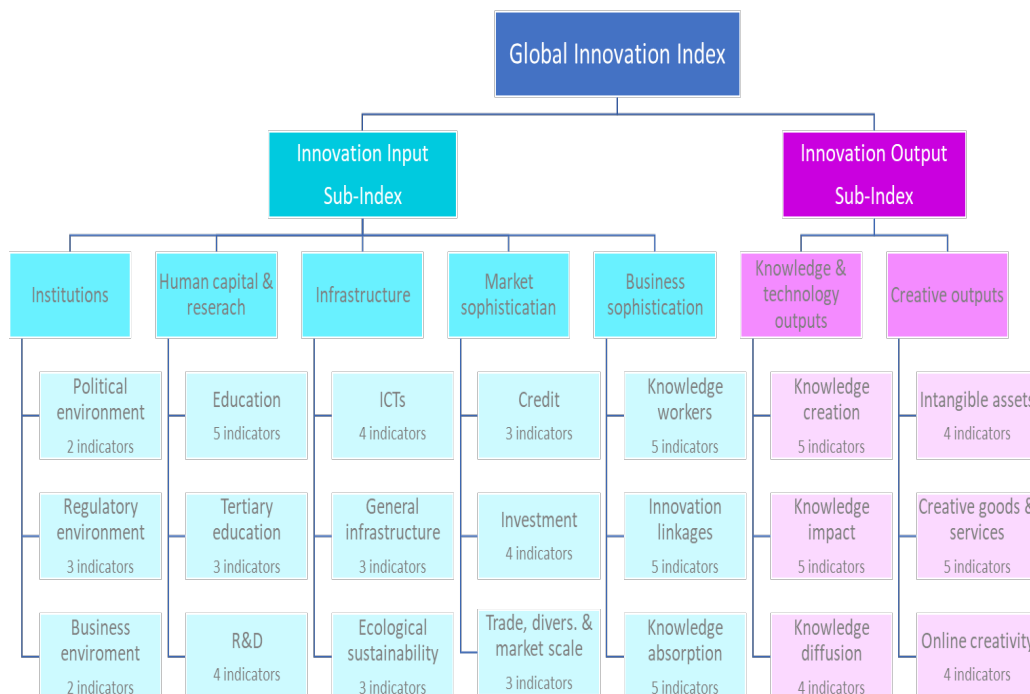
²¹ Eurostat and OECD (2018). Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data (fourth ed.). Paris: OECD. <https://doi.org/10.1787/9789264304604-en>

74. The GII is updated and improved with every edition to better reflect the improved availability of data and statistics, as well as integrate theoretical advances in the field. There are five layers in the hierarchical structure of the GII framework; from index, sub-index, pillar, sub-pillar and finally down to indicator level. The current version of the GII is composed of three indices: the overall GII, the Innovation Input Sub-Index, and the Innovation Output Sub-Index. The overall GII score is the average of the Input and Output Sub-Indices' scores. The Input Sub-Index is comprised of five pillars that capture elements of the national economy that enable innovative activities: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication.

75. The Output Sub-Index provides information about outputs resulting from the innovative activities of economies. There are two output pillars: (6) Knowledge and technology outputs and (7) Creative outputs. Each pillar has three sub-pillars, and each sub-pillar is composed of individual indicators, in total 81 indicators are included in the last version. There are two to five indicators in each of the 21 sub-pillars. A hierarchical view of the framework is depicted in Figure 4, where the number of indicators in each sub-pillar is also shown.

76. The GII conceptual framework clearly defines the phenomenon innovation that is being measured, as what is required according to international guidelines²² for constructing sound composite indicators. Moreover, the sub-components (sub-indexes, pillars, sub-pillars and indicators) are distinctly characterized. The linkages of the sub-components are well described theoretically. The GII is conceptually divided into two groups (sub-indexes) of innovation; the input group (sub-index) that captures elements that enable innovative activities, and the output group (sub-index) that measures outputs resulting from the innovative activities. Experts and stakeholders were involved in this foundation step of the index, which is essential and mandatory.

Figure 4: GII framework 2022



Source: Compiled by IOD

²² Nardo M, Saisana M, Saltelli A, Tarantola S, Hoffmann A, Giovannini E. Handbook on Constructing Composite Indicators: Methodology and User Guide. Paris (France): OECD publishing; 2008. <https://knowledge4policy.ec.europa.eu/sites/default/files/10-step-pocket-guide-to-composite-indicators-and-scoreboards.pdf>

(C) DATA GOVERNANCE

(i) Data sources

77. The choice of indicators that feed into the composite indicator must be guided by the theoretical framework, and the data selection process can be challenging as there may be no single definitive set of indicators. If no comparable quantitative (hard) data are available, composite indicators often include qualitative (soft) data from surveys, and even other composite indicators are chosen into the framework.

78. The GII 2022 model comprises 81 indicators derived from 32 different reliable and external data providers and WIPO, as illustrated in the Annex V. All indicators apart from the six WIPO indicators²³ are sourced from international bodies (e.g., International Monetary Fund (IMF) and World Economic Forum (WEF)) or private data providers (e.g., Clarivate Analytics and Bureau van Dijk, Moody Analytics). The data providers have comprehensive approaches to quality through coverage of governance, statistical processes and observable features of the outputs. The data providers must be reputable and have robust data quality processes for data comparability across economies.

79. Three of the data sources are purchased (Bureau van Dijk-Moody Analytics, Clarivate Analytics and IHS Markit), 13 are on a *pro bono* basis and the rest are free downloadable. Either the GII section collects the data from websites (free downloadable ones), or the data providers send the data within the project timeline.

80. WIPO pairs up with statisticians and data analysts belonging to a network of the GII data organizations to among others:

- (a) Improve their data collection (with the increased popularity of the GII, more countries seek to be covered and submit data to these bodies);
- (b) Improve their data accuracy (through the GII audits, mistakes in the data partner data collections have been found); and
- (c) Discuss indicator improvements (what data should be collected) and other statistical best practices as regards data collection or dissemination.

81. Of the 81 indicators, 65 variables are hard data (quantitative), 13 are composite indicators and four are soft data (qualitative, survey questions from the WEF's Executive Opinion Survey (EOS)).

82. Indicators are often correlated with population, Gross Domestic Product (GDP), or another size-related factors. To make valid comparisons between economies these indicators need to be scaled by a relevant factor. Scaling affected most of the indicators deriving from hard data (6124 of the 65). They are rescaled by either GDP (in current United States dollars), GDP (in purchasing power parity current international dollars), population or total trade. Appendix III of the GII 2022 report contains complete information on the 81 indicators.

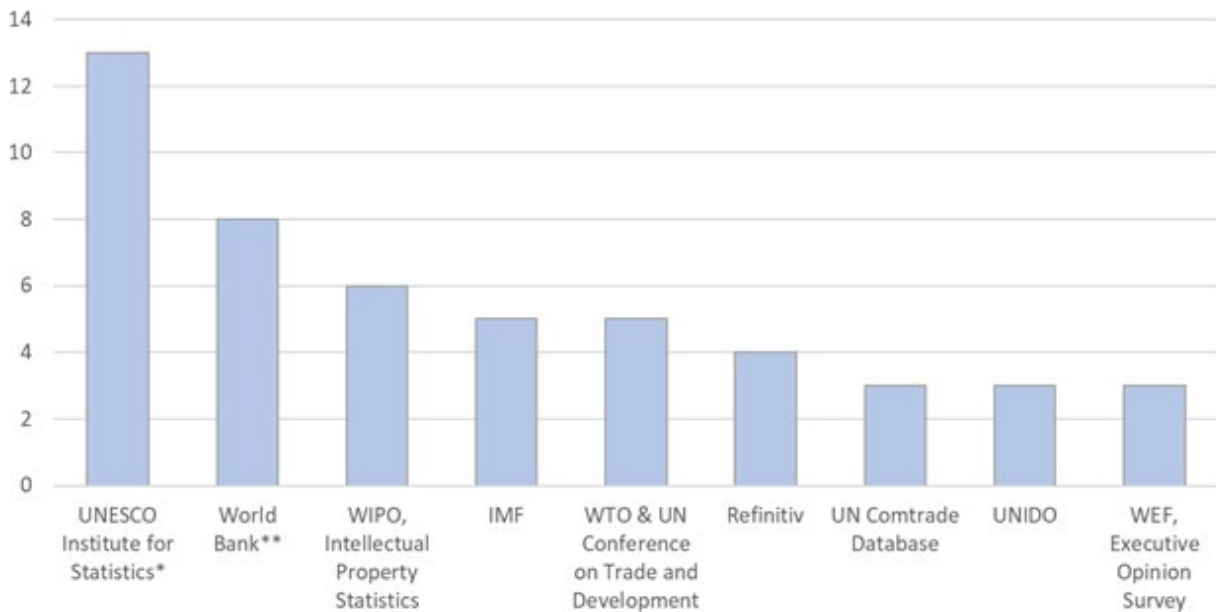
83. The most common data providers for the 81 indicators are illustrated in Figure 5 below. Here the "scaling factor" data providers are not included in the figure, which are often the IMF's data for GDP and the Trade Data Monitor for trade. Thirteen indicators derive from the United

²³ The following six indicators derive from WIPO, Intellectual Property Statistics database (5.2.5. Patent families/bn PPP\$ GDP, 6.1.1. Patents by origin/bn PPP\$ GDP, 6.1.2. PCT patents by origin/bn PPP\$ GDP, 6.1.3. Utility models by origin/bn PPP\$ GDP, 7.1.2. Trademarks by origin/bn PPP\$ GDP and 7.1.4. Industrial designs by origin/bn PPP\$ GDP). Two other indicators are produced in-house with data from the World Telecommunication, ICT indicators Database (3.1.1. ICT access and 3.1.2. ICT use).

²⁴ The following indicators are not scaled: 1.2.3. Cost of redundancy dismissal, 4.3.2. Domestic industry diversification, 4.3.3. Domestic market scale, 6.3.2. Production and export complexity.

Nations Educational, Scientific and Cultural Organization Institute for Statistics online database, eight from the World Bank and six from WIPO Intellectual Property (IP) Statistics database. Nine data providers²⁵ deliver data for two indicators and 13 data providers²⁶ for one indicator.

Figure 5: Most common data providers in the GII 2022 model



Source: Compiled by IOD

* Whereof seven also include the Eurostat database, OECD, Main Science and Technology Indicators database and for six also the Ibero-American and Inter-American Network of Science and Technology Indicators.

** Enterprise Surveys, TRAINS & CTS databases, Employing Workers Project, Entrepreneurship Database, Logistics Performance Index, Worldwide Governance Indicators.

84. WIPO IP Statistics indicators - Six WIPO IP indicators (5.2.5. Patent families/bn PPP\$ GDP, 6.1.1. Patents by origin/bn PPP\$ GDP, 6.1.2. Patent Cooperation Treaty (PCT) patents by origin/bn PPP\$ GDP, 6.1.3. Utility models by origin/bn PPP\$ GDP, 7.1.2. Trademarks by origin/bn PPP\$ GDP and 7.1.4. Industrial designs by origin/bn PPP\$ GDP) in the GII 2022 model are collected through the IP Statistics Data Center,²⁷ which provides the most up-to-date global IP data. Data are collected from:

- (a) National and regional IP offices;
- (b) The international filing and registration systems administered by WIPO; and
- (c) Extracted/compiled from the Patstat database²⁸.

²⁵ Brand Finance database and Global Intangible Finance Tracker, United Nations Department of Economic and Social Affairs, E-Government Survey 2020, Global Entrepreneurship Monitor National Expert Survey, IHS Markit, International Energy Agency, World Energy Balances, International Labour Organization, ILOSTAT Database of Labour Statistics, International Organization for Standardization Survey, World Telecommunication/ICT indicators Database and ZookNIC Inc.

²⁶ Clarivate, Web of Science, data.ia, GitHub, OECD Programme for International Student Assessment (PISA), OMDIA, PwC, Global Entertainment and Media Outlook, QS Quacquarelli Symonds Ltd, QS World University Rankings, SCImago, SJR – SCImago Journal & Country Rank, The 2021 EU Industrial R&D Investment Scoreboard, The Atlas of Economic Complexity, Growth Lab at Harvard University, The Conference Board Total Economy Database™, World Federation of Exchanges database and Yale University, 2022 Environmental Performance Index.

²⁷ www.wipo.int/ipstats

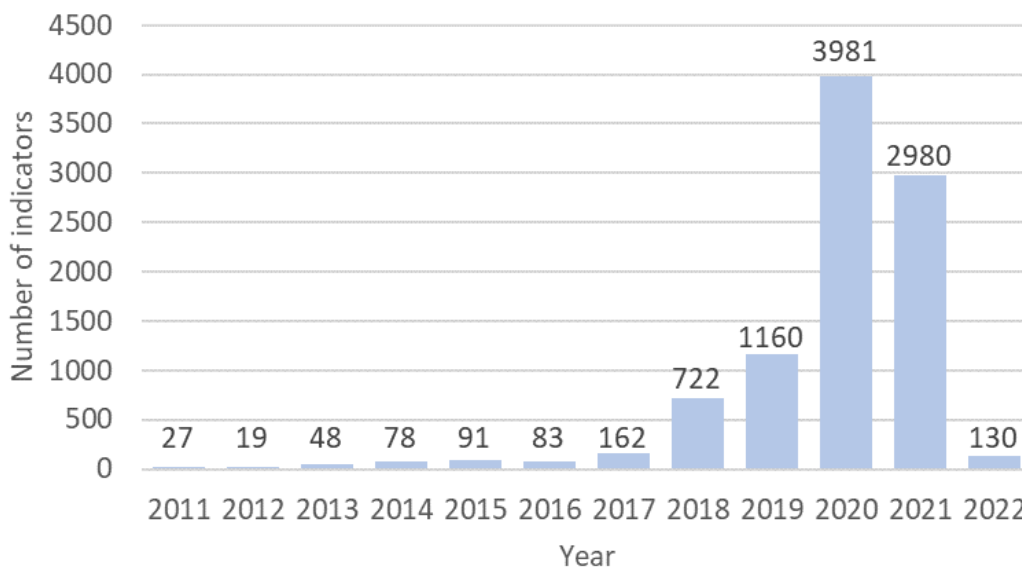
²⁸ <https://www.epo.org/searching-for-patents/business/patstat.html>

85. Data is collected directly from offices through a set of questionnaires sent each year to all IP offices worldwide. The accuracy of data remains the responsibility of the offices. The database covers the following types of indicators: patent, trademark, industrial design, utility model, as well as those under PCT, Madrid and Hague systems.

86. **Data Availability:** For the GII 2022 model, for each indicator and economy, the most recently released data was used within the period from 2011 to 2022 (a ten year cut-off is in place). In total, there are 10692 data points (132 economies x 81 indicators) with 11.3 per cent²⁹ of missing values. The GII developers are not estimating the missing values for the sake of transparency and replicability of results.

87. Forty-two per cent of the indicators come from 2020, which is the most common year of data collection, as illustrated in Figure 6 below. Around 75 per cent of the indicators derive from 2020 or later. One indicator (3.3.2. Environmental performance) originated from 2022. For clarification, it must be said that indicator 3.3.2. is a composite indicator itself and relies on 40 indicators. The time span of the data collection is different from the index edition of year 2022. For all 13 composite indicators within the GII 2022 model, the year of edition of the index is different from the year of the individual indicators. For 30 indicators, the year of origin was one single year, as illustrated in Annex VI. For the other 51 indicators, there were more than one year of origin, as shown in Annex VII.

Figure 6: Yearly distribution of indicators in the GII 2022 model



Source: Compiled by IOD

88. The above figure shows that there are indicators over 10 years old within the framework. A cut off year of 2011 was set for the GII 2022 model. During discussions with CIRS, it became known that the cut off year had been set a few years ago. Internal tests showed that a more recent cut off year (eight years old data) would exclude more economies from the model and hence was not preferred. Although the number of indicators from 2011 and 2012 is low, only 0.5 per cent, they can still play a role if they are highlighted as a country's strength.

89. Attention should be paid when indicators with old and outdated data are highlighted as an innovation strength for an economy. Indicators from 2011 do not pose a significant problem since all ranks are mostly at the lower end. However, the table below shows cases where indicators rank higher between 2012 and 2014.

²⁹ 1211 data points

Table A: Highly Ranked Indicators with Outdated Data

Year	Indicator	Country	Ranking
2012	5.1.2. Firms offering formal training	China	1st
2012	2.1.2. Government funding/pupil	Morocco	5th
2013	2.1.2. Government funding/pupil	Mozambique	2nd
2014	4.1.3. Loans from microfinance institutions	The United Republic of Tanzania	1st

Source: Compiled by IOD

90. When an indicator is highlighted as an innovation strength in a particular year, it needs to be measured with recent data to reflect reality as of that particular year, hence a strength based on outdated data is not reflective of the reality and would prove not comparable if benchmarked against other countries whose data are recent.

91. Data that are older than the base year (most common year used for an indicator) are highlighted with a clock symbol in the GII 2022 “Economy Profiles” (which are one-pager summaries) in the GII 2022 report. This is not the case in the “In-depth Economy Briefs” online³⁰. For consistency, it would be relevant to highlight the age of the data in the Briefs.

Recommendation 7

The WIPO Composite Indicator Research Section should exclude or clearly highlight outdated data in the tables of strengths and weaknesses on the online “In-depth Economy Briefs”.

(Priority: Medium)

Closing criteria: Strengths and weaknesses tables in “In-depth Economy Briefs” online, do not contain old data or these data are highlighted as “outdated”.

(ii) New indicators in the GII model

92. Every year a review of the indicator framework is done in line with what is required for updating a composite indicator framework. New indicators are evaluated and tested to better reflect the improved availability of data and statistics, and also to combine new theoretical advances in measuring innovation performance. An assessment of innovation economics literature and inputs from the diverse GII actors (such as the Advisory Board, Data collaborators and the GII Governing Board) is considered when testing new possible indicators.

93. New indicators need to adhere to the following quality dimensions of data:

- (a) Relevance has to be evaluated considering the overall purpose of the indicator;
- (b) Careful evaluation and selection of basic data have to be carried out to ensure that the right measurement is covered in a balanced way;
- (c) Accuracy and credibility of the basic data is the degree to which they correctly estimate or describe the quantities or characteristics that they are designed to measure -

³⁰ [Economic Trend Analysis | Economic Review 2022 | GII 2022 \(globalinnovationindex.org\)](https://www.wipo.int/presscenter/2022/economic-trend-analysis-economic-review-2022-gii-2022-globalinnovationindex.org)

the accuracy of basic data is important and the credibility of the data source is crucial;
and

(d) The timeliness of data products reflects the length of time between their availability and the event or phenomenon they describe - punctuality is also important and implies the existence of a publication schedule and reflects the degree to which data are released.

94. The following three rules apply for the selection of indicators in the GII model:

(a) Minimum data coverage of at least 45 per cent of the total number of economies covered in a given GII year (timeliness and punctuality);

(b) The indicator should be updated on an annual or bi-annual basis (timeliness and punctuality); and

(c) The data source/data provider should be reputable and have robust data quality processes for data comparability across economies (relevance, accuracy and credibility).

95. As required, the GII rules for selecting new indicators cover the quality dimensions of relevance, accuracy, credibility, timeliness and punctuality.

(iii) Data quality control and data auditing

96. Each collected indicator undergoes a data quality control and data audit process every year. The following tests are done for each indicator as described in the CIRS internal guidelines:

(a) Analysis of means;

(b) Comparison of year-to-year changes of model data e.g., comparison of the data used in GII_{t-1} vs. the latest available for GII_t ³¹;

(c) Identification of outliers based on mean and z-scores for unscaled and scaled data;

(d) Analysis of economies with the largest rank changes (GII_t vs. GII_{t-1});

(e) Analysis of missing data (e.g., data missing in GII_t vs. GII_{t-1}); and

(f) Analysis of economies for which data was more recent in GII_{t-1} vs. what is available for GII_t .

97. When observed changes are significant, CIRS goes back to data providers for clarification of the deviation. Any mistakes spotted are corrected by the data providers. CIRS does not alter any deviating observations.

98. Two measures related to the shape of the data distributions, namely the skewness and the kurtosis, are used to spot outliers in the 65 indicators of hard data (quantitative). Thirty four out of the 65 indicators of hard data type were treated.

99. In the GII 2022, 132 countries had fulfilled the data availability criteria to be included in the GII. Economies are only included if data availability reached at least 66 per cent within each of the two sub-indices and if at least two of the three sub-pillars in each pillar could be computed.

100. The CIRS data quality control and data audit tests are in line with best practices for testing indicators in a composite indicator.

³¹ Where "t" represents the current year in a time series

(i) GII calculations

101. Once the indicators have been assembled and quality checked, specific steps follow for the construction of the composite indicator, the GII. All indicators are brought onto a common scale, namely through a normalization step. The min-max normalization method, one of the most popular ways to normalize data, is used. The minimum value of that feature gets transformed into 0, and the maximum value gets transformed into 100, and every other value gets transformed into a value between 0 and 100. The min-max method is used (while paying attention to the directions of the indicators) for all indicators apart from the four indicators coming from the survey questions of the WEF's EOS. For these indicators, the original series range of values was kept as min and max.

102. The indicators are weighted, and should align with the goals of the index. The weighting scheme of the indicators, which has been discussed and decided with JRC in the yearly external statistical audits since 2012, sets indicator weights at 0.5 or 1.0 depending on the correlation structure. Consequently, the weights are the scaling coefficients, while ensuring that statistical coherence is maintained.

103. Highly collinear indicators are treated as a single indicator, with half weight. Eight out of 81 indicators and two sub-pillars – 7.2 Creative goods and services and 7.3 Online creativity – were assigned a weight of 0.5, while all other indicators and sub-pillars were assigned a weight of 1.0. The five innovation input pillars were assigned a weight of 0.2 and the two innovation output pillars a weight of 0.5.

104. Finally, to calculate the GII scores, the indicators are aggregated following a fully compensatory aggregation method, namely the arithmetic aggregation method (normal averages) at all levels in the framework; from sub-pillar to pillar level, from pillar to sub-index level and finally from the two sub-indexes to index level.

105. As mentioned, the statistical coherence of the GII structure has been evaluated every year in a statistical audit (since 2012) by the Competence Centre on Composite Indicators and Scoreboards at the European Commission's Directorate-General Joint Research Centre. The audit is an independent statistical assessment of the GII, analyzing the statistical soundness of the calculations and assumptions used to arrive at the final index rankings. The JRC statistical audit is included as an annex in the GII report. Recommendations from the statistical audit are included to refine and fine-tune the GII model every year. In the JRC, statistical audit uncertainty and sensitivity analysis are also prepared. It is relevant to note that the GII is one of the few international indexes that publish the rankings with (uncertainty) confidence intervals for the economies.

106. Further, Annex VIII illustrates steps in building the GII model according to the CIRS internal guidelines. These steps were found to be coherent and in line with the international guidelines for building a sensible composite indicator.

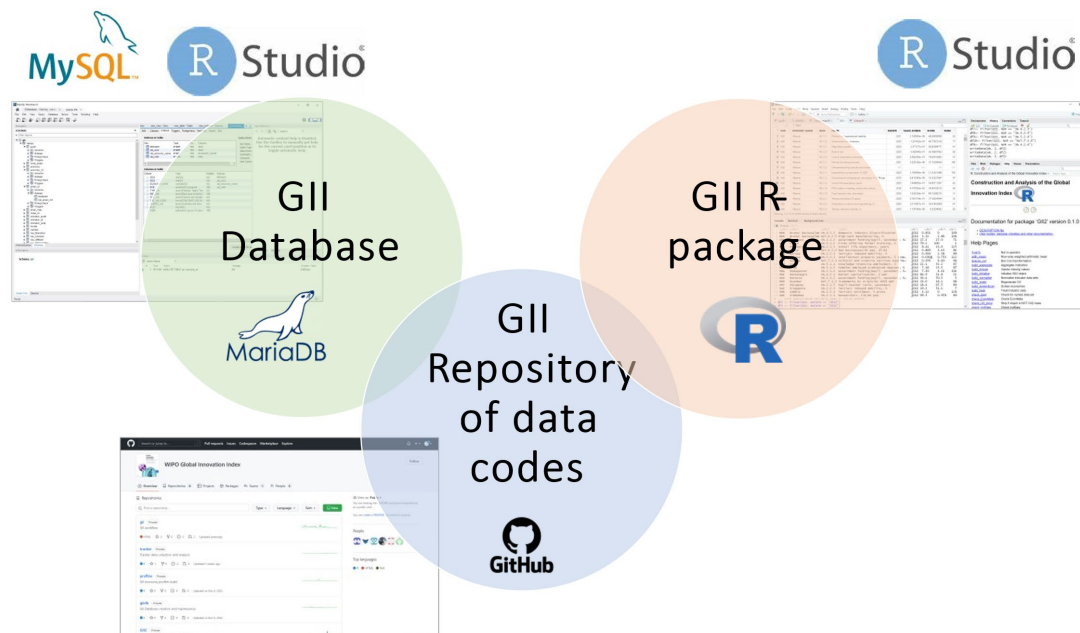
(ii) GII data infrastructure

107. To facilitate and permit a comprehensive workflow of the GII model, from data storage to the GII calculations, a new data infrastructure was developed in 2021, after WIPO became solely responsible for the GII. The data infrastructure contains three parts, as shown in Figure 7:

- (a) The GII database;
- (b) The GII repository of collaborative codes; and
- (c) The GII R-package for the calculation of the GII model.

108. This new infrastructure enables a complete workflow that links data storage, data quality control with data analysis (GII rankings and GII report) in a fully integrated way. Prior to this, there was no integrated data environment for the GII; for instance, the model calculations and GII rankings were done in Excel when Cornell University was responsible for these tasks.

Figure 7: The GII data infrastructure



Source: Compiled by IOD

109. **Data storage** – the GII database: All GII data are stored, maintained and managed in the GII Database. The GII Database is a relational database built on MariaDB and stored in AWS (Amazon Web Services) cloud services. MariaDB Server is an open-source relational database.

110. The database stores all collected data in a structured manner for all WIPO Member States (not only the ranked GII economies) and for all indicators (already included in the GII model and the new ones). Database interaction is done through RStudio or through MySQL Workbench. However, there are no written documents describing the GII Database, its contents and structure.

111. **The GII repository:** The GII repository of collaborative codes is on GitHub³², which is one of the largest code hosting platforms for version control and collaboration. When using open-source software, it is common to use GitHub to store the codes. The GII repository contains eight repositories with R-codes³³, which are linked to diverse elements of the GII workflow and the GII report. Similarly, there are no written documents describing the GII repository, its contents and structure.

112. **The GII R-package for the calculation of the GII model:** The GII R-package is a customized built package of tools built in R to calculate the GII model and analyze its results, including extracting data for use in the economy profiles in the report. The tailored made GII R-package follows the general COINr³⁴ R-package in structure, which was developed by the EC JRC and follows the steps in the OECD/JRC Handbook for constructing composite indicators.

³² <https://github.com/>

³³ <https://www.r-project.org/>

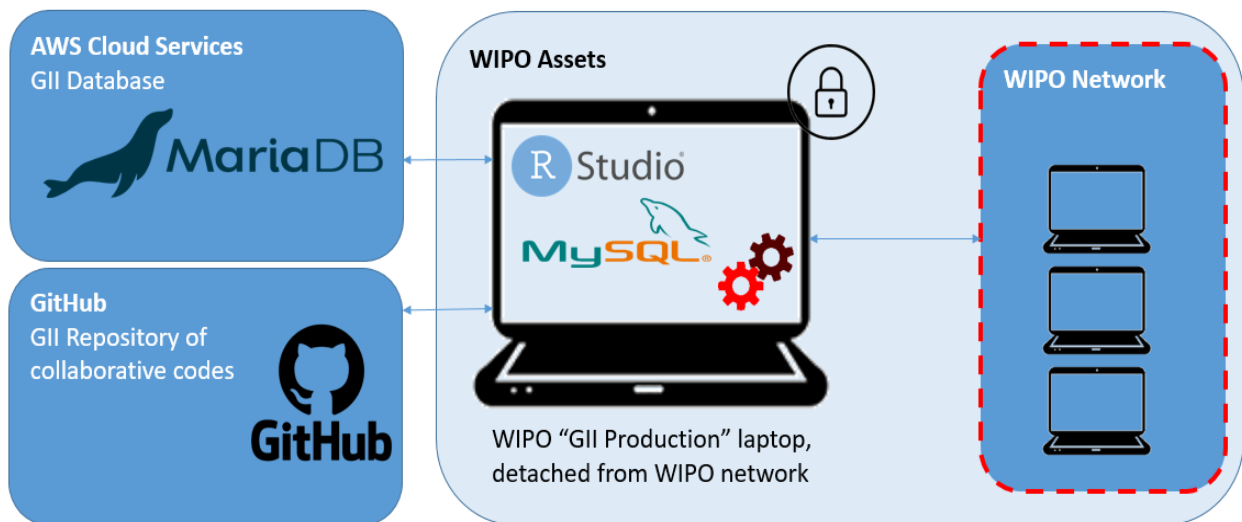
³⁴ <https://bluefoxr.github.io/COINr/>

The COINr package is the reference R-package for building composite indicators. The GII R-package was developed by the same team as the COINr package. The source codes are stored on the private GitHub domain. The GII R-package contains reader friendly and descriptive guides (called vignettes in R terminology) and steps are well documented and easy to follow.

113. The first version of the R-package was set up in April 2021, which was used to build the 2021 GII. The second version of the R-package was set up in April 2022 and used for the GII 2022 production. The first versions of the GII database and the GII repository were set up for the GII 2022, from December 2022 to September 2022.

114. IOD notes that the current GII Data Infrastructure is placed outside of WIPO network because of certain security restrictions.

Figure 8: The GII Data infrastructure and WIPO network



115. The RStudio and MySQL Workbench (database management tool), are both open-source software that may pose a cybersecurity risk. As a result, and as depicted above, the GII production environment is placed on the WIPO machines that are isolated from the main WIPO network. Only final outputs (processed data) are brought back into the WIPO secure environment. While presenting some inconvenience, this setup proves to be more secure for the Organization.

116. Going forward, CIRS is assessing the cost benefit of migrating into the WIPO environment, while maintaining the organizational cybersecurity defense stance.

Recommendation 8

The Composite Indicator Research Section should develop a guidance document for the GII database and the GII repository for collaborative codes.

(Priority: Medium)

Closing criteria: The guidance is developed, or existing internal guidelines are updated to include guidance on the database and repository for codes.

(D) CHANGES TO THE GII FRAMEWORK

117. The GII is not a static metric of how innovation is measured. It is continually updated to reflect both how innovation is evolving and to capture the availability of better statistics.

118. The hierarchical structure of the GII with its two sub-indices (the Innovation Input Sub-Index and the Innovation Output Sub-Index) each built around specific pillars, has been kept since the first version of the index (in 2007). The number of pillars in each Sub-Index has changed to better capture innovation progress. In the first version of the Index, there were three pillars in the Output Sub-Index, but in the third edition, there were two still maintained, albeit the different pillar names. The pillar and sub-pillar structure has been kept the same in the last three editions of the index. The only minor modification is one sub-pillar name change. With every edition of the index, new indicators are tested following a strict protocol, and changes are made at indicator level.

Figure 9: Modifications of Indicators between 2019 and 2021

Year	Nr of modifications	Type	Year
GII 2019	9 (and 1 code change)	6 methodology, source 2 methodology 1 replaced	GII 2020
GII 2020	9 (and 1 name change)	5 methodology 2 new 1 replaced 1 removed	GII 2021
GII 2021	13 (and 6 code changes)	4 methodology 2 new 5 replaced 2 removed	GII 2022

Source: Compiled by IOD

119. In the 2020 edition, nine indicators (Figure 9 and Annex IX) were modified. The data providers changed the methodologies for calculating six indicators (3.3.2., 3.3.3., 4.2.1., 4.2.3., 6.2.4., and 7.2.3), the methodology for calculating indicator 5.2.3. (GERD financed by abroad, % GDP) was altered (the indicator is scaled by current GDP rather than as a percentage of total gross expenditure on R&D in a country). Indicator 7.2.1. (Cultural & creative services exports) is based on a revised list of cultural and creative services (page 366 in GII 2020 report). Indicator 7.1.3. (ICT and business model creation) was replaced by 7.1.2. (Global brand value, top 5,000). One indicator code (Industrial designs by origin/bn PPP\$ GDP) was changed from 7.1.2. to 7.1.3.

120. In the 2021 edition, nine indicators (Figure 9 and Annex IX) were also modified. The methodologies for calculating five indicators (4.2.3., 5.2.4., 6.1.4., 6.2.5. and 6.3.3.) were changed. Further, three new indicators were introduced (4.2.4., 4.3.2. and 6.3.2.). Indicator 4.3.2. (Domestic industry diversification) replaced the indicator of Intensity of local competition. Indicator 6.3.4. (Foreign Direct Investment net outflows, % GDP) was removed from the framework. Finally, the name of indicator 6.2.1., was changed to Labor productivity growth.

121. In the last edition, some more modifications in the framework were made due to compulsory exclusion of the World Bank Doing Business 2020 indicators, as shown in the Figure 9 above. Annex IX summarizes the indicator modifications in the last three editions of

the GII. In total, there were 13 modifications in the GII 2022 plus six indicator code changes. Here it must be highlighted that a change in indicator code that stays within the same sub-pillar does not have a methodological change in the model and is thus not considered as a model modification. These code changes are illustrated as for completeness of all changes between the different editions of the GII.

122. Because of the data irregularities in the World Bank Doing Business 2020 reports, four indicators previously used in the framework were removed and three were replaced with appropriate substitutes. The indicators 1.3.1. (Ease of starting a business), 1.3.2. (Ease of resolving insolvency), 4.1.1. (Ease of getting credit) were replaced by 1.3.1. (Policies for doing business), 1.3.2. (Entrepreneurship policies and culture), 4.1.1. (Finance for startups and scaleups). No suitable indicator was found to replace the indicator 4.2.1. (Ease of protecting minority investors), hence it was removed from the GII model.

123. In the 2021 GII model, there were two indicators deriving from the World Bank Doing Business 2020 reports; indicators 1.2.3. (Cost of redundancy dismissal) and 6.2.2. (New businesses) still in the framework because they were derived from independent projects of the World Bank (Annex X). The projects are still running, and data are collected bi-annually. Indicator 4.2.4. (Venture capital received) was introduced to provide additional information on the importance of access to finance and investment in support of innovation.

124. The methodology for computing the Information and Communication Technology (ICT) indicators; 3.1.1. (ICT access) and 3.1.2. (ICT use), was modified. Since the GII 2019, CIRS produces internally these composite indicators based on the International Telecommunication Union's (ITU) methodology. It uses the ITU's original file for the calculation of these indices. The indicator for ICT access in the previous editions of the GII used five ICT indicators; in the GII 2022 the number dropped to four³⁵ indicators. The composite indicator for ICT - Mobile broadband internet traffic (gigabytes/subscriptions) was added.

125. The methodology for calculating 6.2.1. (Labor productivity growth, %) was changed, a five-year average instead of a three-year average was taken. Indicator 7.2.2. (National feature films/mn pop. 15–69) used a new data source³⁶. Indicator 7.3.3. was replaced from Wikipedia edits to GitHub commits, to better represent more countries of the world.

126. Indicator 4.1.3. (Microfinance gross loans, % GDP) was replaced by Loans from microfinance institutions (% GDP). The previous data provider (Microfinance Information Exchange, MIX Market database) stopped collecting data in 2019 and had no plans to collect data on microfinance further. The current data provider (IMF – Financial Access Survey) has a comparable and more representative indicator on microfinance and has a historical time series, which is updated yearly. The country coverage (62 economies) is lower than the former data source (83 economies).

127. Indicator 7.1.1. (Intangible asset intensity, top 15, %) was introduced into the framework, while indicator 7.1.4. (ICTs and organizational model creation) was removed. It was removed since the data provider (WEF) stopped collecting this survey question since 2019 in its EOS, and WEF does not have plans to re-introduce the question in the survey.

128. Overall, IOD found that modifications in the GII model during the reviewed years are justified with satisfactory explanations. All new indicators introduced into the GII model undergo strict controls aligned with international guidelines for testing new indicators in a composite indicator framework.

³⁵ The indicator for Fixed telephone subscriptions per 100 inhabitants was removed.

³⁶ OMDIA (<https://omdia.tech.informa.com/products/cinema-and-moviesintelligence-service>).

ACKNOWLEDGMENT

IOD wishes to thank all relevant colleagues for their assistance, cooperation, and interest during this assignment.

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Reviewed and Approved by: Alain Garba, Officer-in-Charge, IOD

TABLE OF RECOMMENDATIONS

No.	Recommendations	Priority	Person(s) Responsible	Other Stakeholder	Management Comments and Action Plan	Deadline
1.	The Department for Economics and Data Analytics in collaboration with relevant internal stakeholders should review the Governance structure including clarifying the roles, reviewing the current designations of the Governance and Advisory Boards, with a view to ensuring that the structure is fit-for-purpose and aligned with the vision and objectives for the GII, while ensuring that gender balance is achieved to the extent possible. Appropriate Terms of References should be subsequently developed.	Medium	Head CIRS	Chief Economist (Director DEDA)	DEDA will execute this change for the GII2024 cycle and will adjust its documentation accordingly, i.e. after September 2023.	October 2023
2.	The Department for Economics and Data Analytics in collaboration with relevant internal and external stakeholders, should review the current approach for publishing forewords provided by third-parties, with a view to determining whether it is fit for-purpose and impartial, and aligned with the underlying purpose of the GII report.	Medium	Project Manager CIRS Head CIRS	Chief Economist (Director DEDA)	As of the next GII cycle, DEDA will abandon guaranteed forewords for the Portulans Institute's Corporate Network Partners. It will replace them with short quotes from a diverse set of organizations, which could include Portulans Corporate or Academic Networks Partners but also other organizations. The GII report would then feature a limited number (4-8) of quotes, with clear selection criteria that specifically address questions of	September 2024

No.	Recommendations	Priority	Person(s) Responsible	Other Stakeholder	Management Comments and Action Plan	Deadline
					perceived conflict of interest and lack of impartiality.	
3.	<p>The Office of the ADG for IP and Innovation Ecosystems Sector should:</p> <p>(a) Develop and issue a communication guideline for the GII, with clear accountability and responsibilities for receiving and responding to requests, including designating the Office of ADG IPIES as main recipient, to maintain the firewall, and segregate duties.</p> <p>(b) Update the website and the publication with a statement on the appropriate communication workflow for GII related inquiries; and</p> <p>(c) Formally communicate to all WIPO staff, the workflow for receiving request and addressing GII related request, as per the communication guideline.</p>	High	ADG IPIES	Chief Economist (Director DEDA) Head CIRS Senior Counsellor Office of ADG - IPIES	OADG and DEDA will act on this recommendation as suggested.	May 2023
4.	The Composite Indicator Research Section should expand its internal guidelines and include more detailed process descriptions and steps on:	Medium	Program Officer CIRS Head CIRS	Head CIRS Chief Economist (Director DEDA)	CIRS will act on this recommendation before the publication of GII2023	June 2023

No.	Recommendations	Priority	Person(s) Responsible	Other Stakeholder	Management Comments and Action Plan	Deadline
	internal and external stakeholders' notifications before the GII Global Launch and relationships with external data providers, among others.					
5.	The WIPO Composite Indicator Research Section should update the ERM risk register and record additional operational risks and related controls around the GII, such as perceived conflict of interest.	Medium	Senior Counsellor Office of ADG - IPIES	Chief Economist (Director DEDA) Head CIRS	DEDA will revise the risk register, as part of the planning for the 2024-25 biennium.	December 2023
6.	The Department for Economics and Data Analytics and other relevant internal stakeholders, should review the costs and benefits of the current practice of managing two websites, and determine a cost-efficient way forward, taking into consideration: (a) The use of WIPO funds and human resources on a third-party website with no formal agreement; (b) The value and relevance of running two websites on the GII; and (c) The ramifications of the future investment on enhancing	Medium	Project Manager CIRS Head Web Communications Section	Head CIRS Chief Economist (Director DEDA) Director IDOD	DEDA and the Information and Digital Outreach Division (IDOD) will only publish future GII reports on the WIPO website and not invest any more funds into the external website, starting with the publication of the 2023 GII report. This action is further reinforced by the rollout of WIPO's new website and the development of new web-enabled GII content. The feasibility of this action depends on the smooth integration of the GII content into the new WIPO website, which still poses numerous technical challenges. DEDA/IDOD will address these challenges in close collaboration, resorting only to the external website in	September 2023

No.	Recommendations	Priority	Person(s) Responsible	Other Stakeholder	Management Comments and Action Plan	Deadline
	GII information on the WIPO website.				case the technical challenges pose a severe obstacle, which would undermine a successful GII launch.	
7.	The WIPO Composite Indicator Research Section should exclude or clearly highlight outdated data in the tables of strengths and weaknesses on the online “In-depth Economy Briefs”.	Medium	Program Officer CIRS	Head CIRS	CIRS will act on this recommendation, as of the GII2023 report.	May 2023
8.	The Composite Indicator Research Section should develop a guidance document for the GII database and the GII repository for collaborative codes.	Medium	Program Officer CIRS	Head CIRS	CIRS will act on this recommendation, mindful that the infrastructure and database are too recent for any envisaged guidance document to be final. CIRS proposes to finalize the guidance document in 2024.	March 2024

ANNEXES

Annex I.	Risk Rating and Priority of Recommendations
Annex II.	WIPO's Role in GII Development Before and After 2021
Annex III.	GII Development – Roles Matrix (Analysis of Four Eyes Principle in GII Main Processes)
Annex IV.	GII Related Events - IP and Innovation Ecosystems Sector's Outreach, Jan 2021 – Feb 2023
Annex V.	External Data Providers of the GII Model
Annex VI.	Single Year of Origin for 30 Indicators in the GII 2022 Model
Annex VII.	Multiple Years of Origin for 51 Indicators in the GII 2022 Model
Annex VIII.	The GII Model Workflow
Annex IX.	GII Indicator Changes From 2019 to 2022
Annex X.	World Bank Doing Business 2020 Indicators in the GII 2021 Framework
Annex XI.	Movement in the GII, Top 10, 2018–2022

ANNEX I: RISK RATING AND PRIORITY OF RECOMMENDATIONS

The risk ratings in the tables below are driven by the combination of likelihood of occurrence of events and the financial impact or harm to the Organization’s reputation, which may result if the risks materialize. The ratings for recommendations are based on the control environment assessed during the engagement.

Table 1: Effectiveness of Risks/ Controls and Residual Risk Rating

		Compound Risk Rating (Likelihood x Impact)		
		Low	Medium	High
Control Effectiveness	Low	Low	Medium	High
	Medium	Low	Medium	High
	High	Low	Low	Medium

Table 2: Priority of Recommendations

Priority of Recommendations	Residual Risk Rating
Requires Urgent Management Attention	High
Requires Management Attention	Medium
Routine in Nature	Low

[Annex II follows]

ANNEX II: WIPO'S ROLE IN GII DEVELOPMENT BEFORE AND AFTER 2021

TASK	WIPO'S ROLE BEFORE 2021	WIPO'S ROLE AFTER 2021
Data/indicator collection	<ul style="list-style-type: none"> ▪ Cornell University was responsible for the overall collection of all GII indicators, while WIPO limited its contribution to the analysis of selected indicators (e.g., WIPO IP Portal/statistics data). ▪ WIPO provided a supportive role in the collection of data and liaison with all relevant data providers. ▪ WIPO provided suggestions for the introduction and sourcing of new indicators to the GII framework. 	<ul style="list-style-type: none"> ▪ WIPO is fully responsible for the collection of all GII indicators (around 80 every year), as well as to liaise with all data providers from other international organizations and the private sector. ▪ WIPO also holds the full responsibility for including and excluding new indicator to the GII conceptual framework, as well as to have a thorough analysis of all indicators that are included or excluded in the index. ▪ WIPO also built and hosts a database for all GII data and has integrated this database in a workflow that links data storage, data quality control and data analysis to produce the GII rankings and the GII report.
GII data audit and quality assurance	<ul style="list-style-type: none"> ▪ Cornell University was responsible for the overall data quality of all indicators used in the GII. ▪ WIPO provided targeted supported for the revision and analysis of specific indicators. 	<ul style="list-style-type: none"> ▪ WIPO is fully responsible for the data audit and quality assurance of all indicators that go into the GII. ▪ WIPO develops and runs a systematic process for the data audit and quality assurance of all GII indicators and maintains close collaboration with all data providers for the collection of all indicators, as well as for providing and maintaining a technical dialogue with all data providers.
GII model and ranking calculations	<ul style="list-style-type: none"> ▪ Cornell University was responsible for the overall model calculations and the GII rankings (Excel environment). ▪ WIPO provided technical and substantive support when needed.in the process 	<ul style="list-style-type: none"> ▪ WIPO is fully responsible for the GII model calculations and GII rankings. It developed, runs, updates, and maintains a statistical software package to calculate the GII rankings and perform sensitivity analyses of the ranking results.
Production of GII outputs	<ul style="list-style-type: none"> ▪ Cornell University and WIPO, with subcontractors, were responsible for the production of the GII report outputs, such as the economy profiles and the economy briefs. 	<ul style="list-style-type: none"> ▪ WIPO is responsible for the production, design, and population of the GII economy briefs and profiles. WIPO has integrated the production of all GII outputs using the GII database.
Production of GII report chapters and annexes	<ul style="list-style-type: none"> ▪ Cornell University, INSEAD and WIPO were jointly responsible to produce all GII report chapters and report annexes. 	<ul style="list-style-type: none"> ▪ WIPO is responsible for the production of all GII report chapters and annexes, including figures, tables, and infographics.
Editing and design	<ul style="list-style-type: none"> ▪ The editing and design of the GII report was subcontracted to an external editing and design company, located in the United States. 	<ul style="list-style-type: none"> ▪ WIPO – led by the Publications and Design section, is fully responsible for the editing and design of all GII report elements, including the report

TASK	WIPO'S ROLE BEFORE 2021	WIPO'S ROLE AFTER 2021
		itself, but also, all promotional material related to the publication and global launch.
Website	<ul style="list-style-type: none"> ▪ Cornell University was fully responsible for the content and maintenance of the https://www.globalinnovationindex.org website. ▪ WIPO was fully responsible for the content on the www.wipo.int/gii website. 	<ul style="list-style-type: none"> ▪ WIPO is fully responsible for the content and management of the https://www.globalinnovationindex.org website. ▪ WIPO is also fully responsible – led by the Web Communications Section for the technical aspects, for maintaining the content of the https://www.wipo.int/gii website.
Knowledge partners, Advisory Board and Academic Network	<ul style="list-style-type: none"> ▪ Cornell University was fully responsible for the management of Knowledge partners and Advisory Board members. ▪ WIPO proactively suggested new Advisory Members and maintained an active relationship with them. 	<ul style="list-style-type: none"> ▪ The Portulans Institute is responsible for the management of the Corporate and Academic Network partners. ▪ WIPO is responsible for the management of the GII Advisory Board.

Data source: CIRS

[Annex III follows]

ANNEX III: GII DEVELOPMENT – ROLES MATRIX (ANALYSIS OF FOUR EYES PRINCIPLE IN GII MAIN PROCESSES)

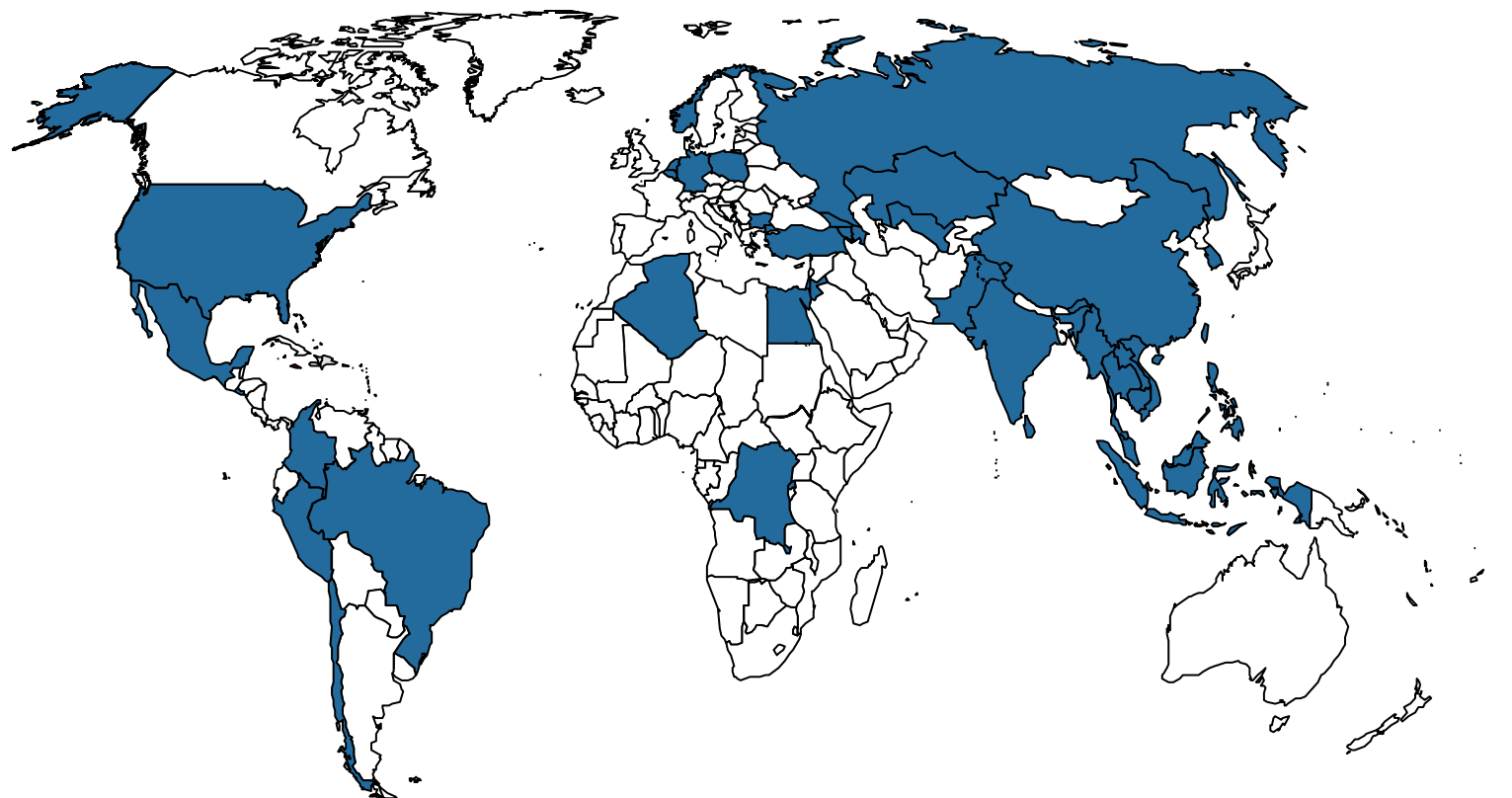
Process	ACTORS							
	WIPO CIR section - other staff	WIPO CIR section Head Mr. Sacha WUNSCH-VINCENT	WIPO CIR Program Officer Ms. Lorena RIVERA LEON	WIPO Chief Economist Mr. Carsten FINK	WIPO ADG, IPIES Mr. Marco ALEMAN	WIPO DG Mr. Daren TANG	18 members of the GII Advisory Board (non-WIPO)	Portulans Institute Mr. Bruno Larvin and Mr. Soumitra Dutta
GII Governing Board		X		X	X	X		X
GII Advisory Board	A	B	A	B	B	C	X	
GII Model Review Board		X	X	X				
Provision of GII Workshops and Info sessions for Countries	X	X	X	X	X	X		
Official correspondence with Countries on behalf of WIPO		X		D	D	D		
Report editing - Other information		X	X	X		E		x and E
Report editing - Ranking information	X	X	X	F				
GII Ranking Process		X	X	F				
Customizing scripts for GII calculation	X	X	X					
Quality Control of collected data	X	X	X					
Data Collection from sources	X	X	X					

- X participated as an observer; not formally assigned as a member
- A observer status, collecting information, suggesting the composition of the Board
- B consult DG on the selection of members of the Board
- C approves the composition of the Board, invites members
- D signing-off communication prepared by WIPO CIR section Head
- E writing a report foreword
- F acting as a reviewing officer

Data source: Compiled by IOD

[Annex IV follows]

ANNEX IV: GII RELATED EVENTS - IP AND INNOVATION ECOSYSTEMS SECTOR'S OUTREACH, JAN 2021 – FEB 2023



Source: CIRS data on GII related events where WIPO staff were organizers or contributors. January 2021 – February 2023.

[Annex V follows]

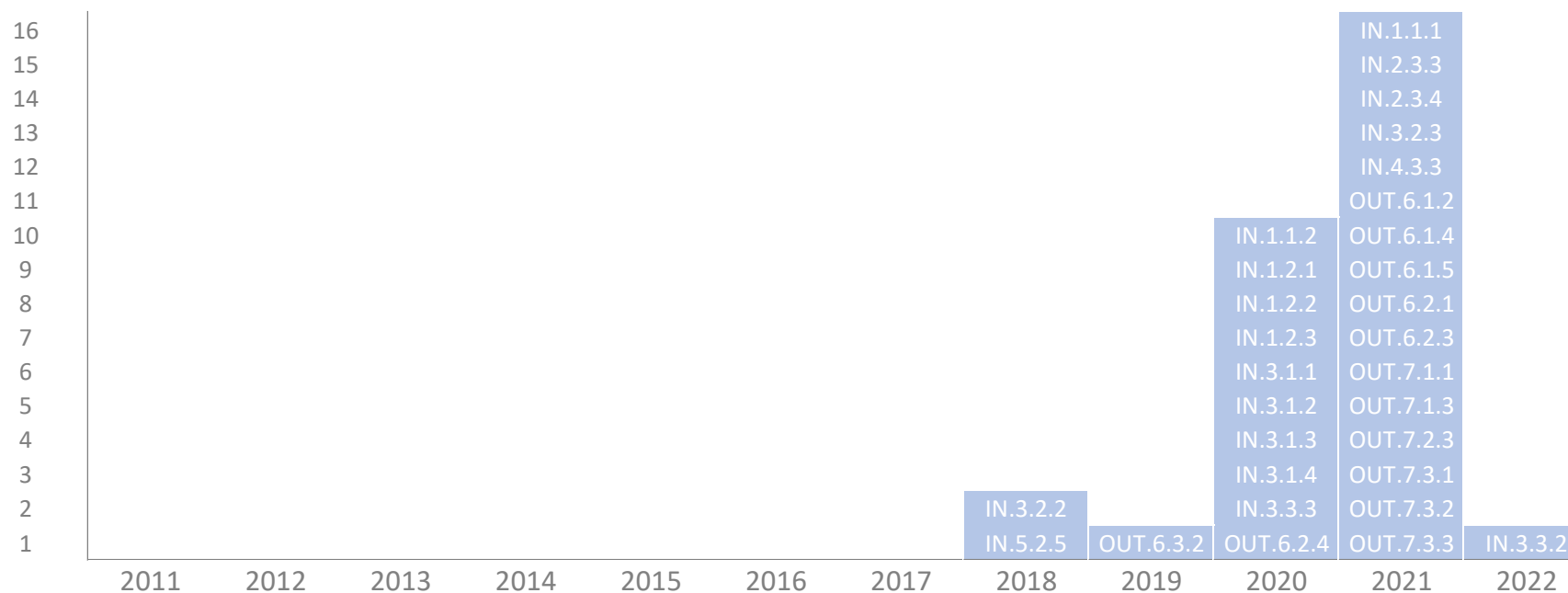
ANNEX V: EXTERNAL DATA PROVIDERS OF THE GII MODEL

Data providers	Purchased	Free downloadable	Pro Bono
1 Bloomberg			X
2 Brand Finance			X
3 Bureau van Dijk, Moody Analytics	X		
4 Clarivate Analytics	X		
5 data.ai			X
6 European Commission's Joint Research Centre (EC JRC)		X	
7 GitHub			X
8 Global Entrepreneurship Monitor (GEM)			X
9 IHS Markit	X		
10 International Energy Agency (IEA)			X
11 International Federation of Robotics			X
12 International Labour Organization (ILO)		X	
13 International Monetary Fund (IMF)		X	
14 International Organization for Standardization (ISO)		X	
15 International Telecommunication Union (ITU)		X	
16 Omdia			X
17 Organisation for Economic Co-operation and Development (OECD)		X	
18 PricewaterhouseCoopers (PwC)			X
19 QS Quacquarelli Symonds Ltd		X	
20 Refinitiv, an LSEG business			X
21 SCImago			X
22 The Conference Board			X
23 UNESCO Institute for Statistics (UIS)		X	
24 United Nations Commodity Trade Statistics Database		X	
25 United Nations Industrial Development Organization (UNIDO)		X	
26 United Nations Public Administration Network		X	
27 World Bank		X	
28 World Economic Forum (WEF)		X	
29 World Federation of Exchanges		X	
30 World Trade Organization (WTO)		X	
31 Yale University		X	
32 ZookNIC Inc			X

Source: Compiled by IOD

[Annex VI follows]

ANNEX VI: SINGLE YEAR OF ORIGIN FOR 30 INDICATORS IN THE GII 2022 MODEL



Source: Compiled by IOD

[Annex VII follows]

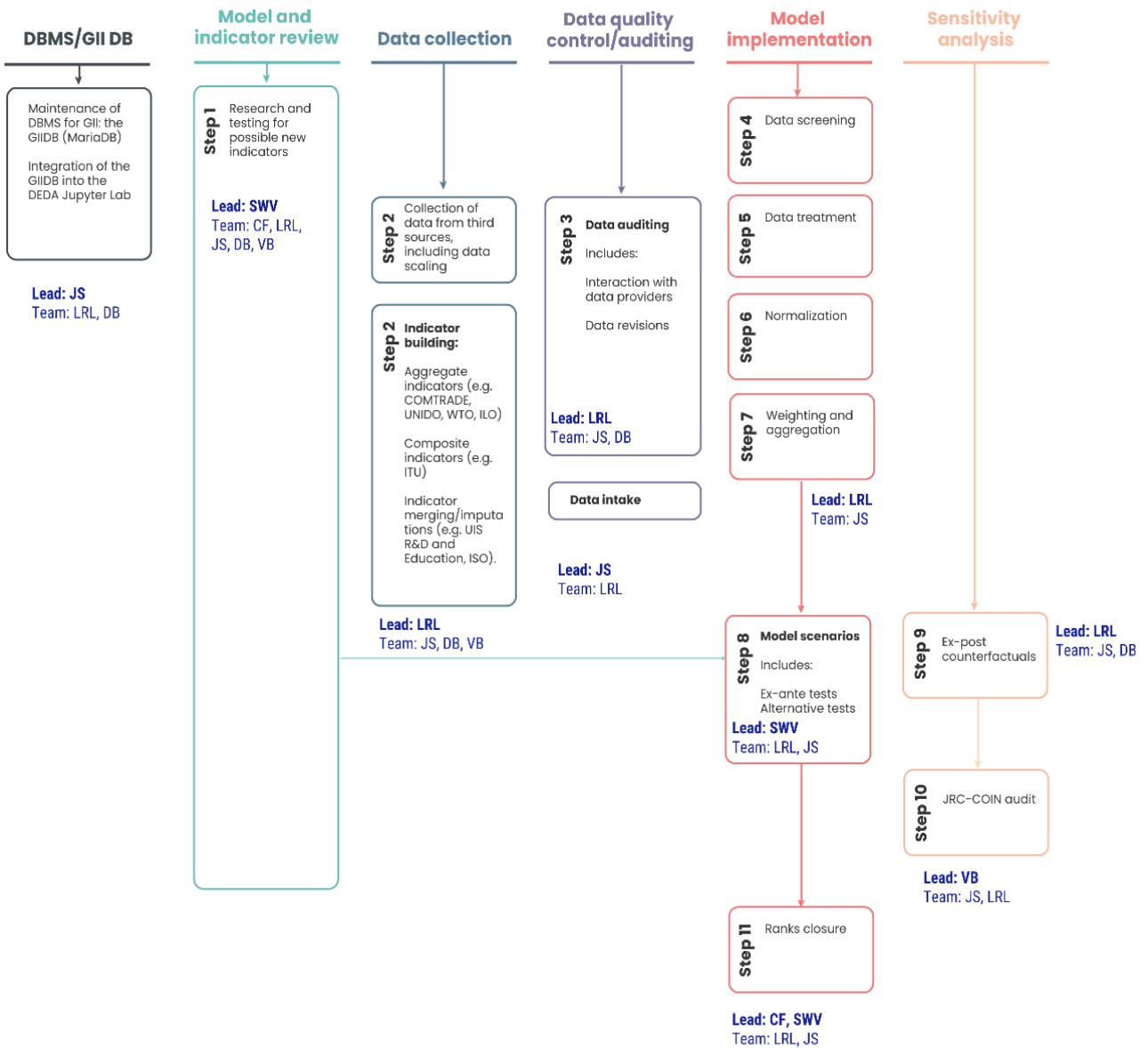
ANNEX VII: MULTIPLE YEARS OF ORIGIN FOR 51 INDICATORS IN THE GII 2022 MODEL

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
OUT.7.2.4	2011								2019				1
IN.2.1.2										2020			2
IN.2.1.3													3
IN.2.2.3													4
IN.4.2.1													5
IN.5.1.3													6
IN.5.1.4													7
IN.2.1.1											2021		8
IN.2.1.5													9
IN.2.2.1													10
IN.5.1.1													11
IN.5.1.2													12
IN.4.3.2		2012											13
IN.5.3.1													14
OUT.6.2.2													15
OUT.6.2.5													16
OUT.7.1.2													17
OUT.7.2.1													18
IN.2.3.1											2021		19
IN.5.1.5													20
IN.4.1.2			2013										21
IN.4.3.1													22
IN.5.2.3													23
IN.5.3.5													24
IN.2.3.2											2021		25
IN.4.1.3				2014									26
OUT.6.1.1													27
OUT.7.1.4													28
IN.5.2.1											2021		29
IN.2.1.4					2015			2018					30
OUT.7.2.2													31
IN.2.2.2													32
IN.5.3.2													33
OUT.6.1.3													34
OUT.6.3.1													35
OUT.6.3.3													36
OUT.7.2.5													37
IN.1.3.1											2021		38
IN.5.2.2													39
IN.5.3.3						2016							40
OUT.6.3.4													41
IN.1.3.2							2017				2021		42
IN.4.1.1													43
IN.5.3.4								2018					44
IN.3.2.1									2019				45
IN.3.3.1													46
IN.4.2.2											2021		47
IN.4.2.3													48
IN.4.2.4													49
IN.5.2.4													50
OUT.7.3.4													51

Source: Compiled by IOD

[Annex VIII follows]

ANNEX VIII: THE GII MODEL WORKFLOW



Source: CIRS

[Annex IX follows]

ANNEX IX: GII INDICATOR CHANGES FROM 2019 TO 2022

Year	Code	Indicator name	Modification	Year	Code	Indicator name
GII 2019	3.3.2	Environmental performance	Methodology changed, source	GII 2020	3.3.2	Environmental performance
	3.3.3	ISO 140001 environment certificates/bn PPP\$ GDP	Methodology changed, source		3.3.3	ISO 140001 environment certificates/bn PPP\$ GDP
	4.2.1	Ease of protecting minority investors	Methodology changed, source		4.2.1	Ease of protecting minority investors
	4.2.3	Venture capital deals/bn PPP\$ GDP	Methodology changed, source		4.2.3	Venture capital deals/bn PPP\$ GDP
	5.2.3	GERD financed by abroad, %	Methodology changed		5.2.3	GERD financed by abroad, % GDP
	6.2.4	ISO 9001 quality certificates/bn PPP\$ GDP	Methodology changed, source		6.2.4	ISO 9001 quality certificates/bn PPP\$ GDP
	7.1.3	ICTs & business model creation	Replaced		7.1.2	Global brand value / bn PPP\$ GDP
	7.1.2	Industrial designs by origin/bn PPP\$ GDP	Code changed		7.1.3	Industrial designs by origin/bn PPP\$ GDP
	7.2.1	Cultural & creative services exports, % total trade	Methodology changed		7.2.1	Cultural & creative services exports, % total trade
7.2.3	Entertainment & Media market/th pop. 15-69	Methodology changed, source	7.2.3	Entertainment & Media market/th pop. 15-69		
GII 2020	4.2.3	Venture capital deals/bn PPP\$ GDP	Methodology changed New indicator	GII 2021	4.2.3	Venture capital investors, deals/bn PPP\$ GDP
	4.3.2	Intensity of local competition†	Replaced		4.2.4	Venture capital recipients, deals/bn PPP\$ GDP
	5.2.4	Joint venture/strategic alliance deals/bn PPP\$ GDP	Methodology changed		4.3.2	Domestic industry diversification
	6.1.4	Scientific & technical articles/bn PPP\$ GDP	Methodology changed		5.2.4	Joint venture/strategic alliance deals/bn PPP\$ GDP
	6.2.1	Growth rate of PPP\$ GDP/worker, %	Indicator name changed		6.1.4	Scientific and technical articles/bn PPP\$ GDP
	6.2.5	High- & mediumhigh-tech manufacturing, %	Methodology changed New indicator		6.2.1	Labor productivity growth, %
	6.3.2	High-tech net exports, % total trade	Methodology changed		6.2.5	High-tech manufacturing, %
	6.3.4	FDI net outflows, % GDP	Removed		6.3.2	Production and export complexity
GII 2021	1.3.1	Ease of starting a business*	Replaced	GII 2022	1.3.1	Policies for doing business†
	1.3.2	Ease of resolving insolvency*	Replaced		1.3.2	Entrepreneurship policies and culture*
	3.1.1	ICT access*	Methodology changed		3.1.1	ICT access*
	3.1.2	ICT use*	Methodology changed		3.1.2	ICT use*
	4.1.1	Ease of getting credit*	Replaced		4.1.1	Finance for startups and scaleups*
	4.1.3	Microfinance gross loans, % GDP	Replaced		4.1.3	Loans from microfinance institutions, % GDP
	4.2.1	Ease of protecting minority investors*	Removed		4.2.1	Market capitalization, % GDP
	4.2.2	Market capitalization, % GDP	Code changed		4.2.2	Venture capital investors, deals/bn PPP\$ GDP
	4.2.3	Venture capital investors, deals/bn PPP\$ GDP	Code changed		4.2.3	Venture capital recipients, deals/bn PPP\$ GDP
	4.2.4	Venture capital recipients, deals/bn PPP\$ GDP	Code changed New indicator		4.2.4	Venture capital received, value, % GDP
	6.2.1	Labor productivity growth, %	Methodology changed New indicator		6.2.1	Labor productivity growth, %
	7.1.1	Trademarks by origin/bn PPP\$ GDP	Code changed		7.1.1	Intangible asset intensity, top 15, %
	7.1.2	Global brand value, top 5,000, % GDP	Code changed		7.1.2	Trademarks by origin/bn PPP\$ GDP
	7.1.3	Industrial designs by origin/bn PPP\$ GDP	Code changed		7.1.3	Global brand value, top 5,000, % GDP
	7.1.4	ICTs and organizational model creation†	Removed		7.1.4	Industrial designs by origin/bn PPP\$ GDP
7.2.2	National feature films/mn pop. 15-69	Methodology, new data source	7.2.2	National feature films/mn pop. 15-69		
7.3.3	Wikipedia edits/mn pop. 15-69	Replaced	7.3.3	GitHub commits/mn pop. 15-69		

Source: Compiled by IOD

[Annex X follows]

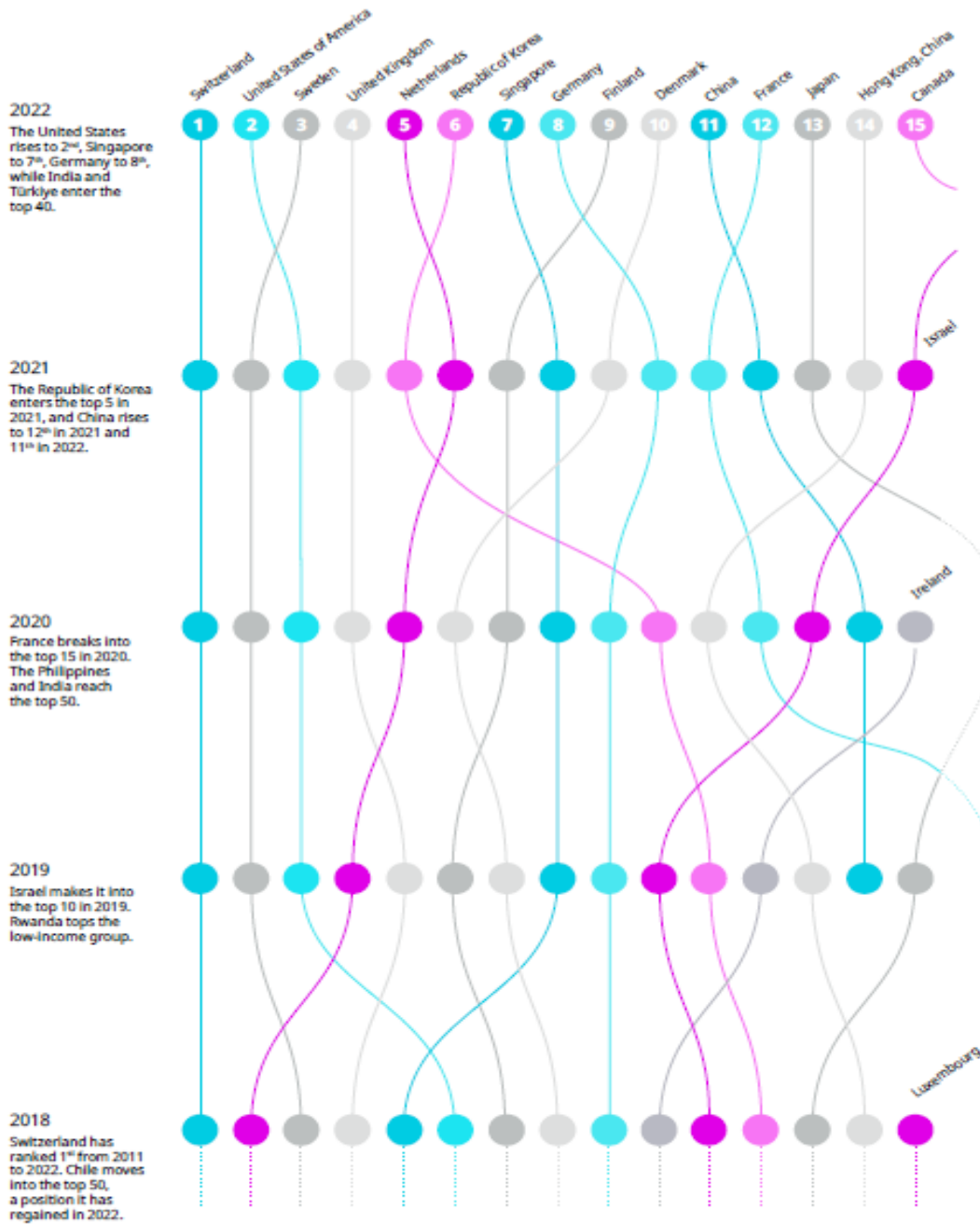
ANNEX X: WORLD BANK DOING BUSINESS 2020 INDICATORS IN THE GII 2021 FRAMEWORK

GII 2021	Modification	GII 2022	Source
1.3.1 Ease of starting a business	Removed	1.3.1 Policies for doing business	Source: World Bank, Doing Business 2020, Comparing Business Regulation in 190 Economies. https://www.doingbusiness.org/en/reports/global-reports/doing-business-2020
	New indicator		Source: World Economic Forum, Executive Opinion Survey 2021 (https://www.weforum.org/)
1.3.2 Ease of resolving insolvency	Removed	1.3.2 Entrepreneurship policies and culture	Source: World Bank, Doing Business 2020, Comparing Business Regulation in 190 Economies. https://www.doingbusiness.org/en/reports/global-reports/doing-business-2020
	New indicator		Source: Global Entrepreneurship Monitor (GEM), National Expert Survey (NES) (https://www.gemconsortium.org/wiki/1142)
4.1.1 Ease of getting credit	Removed	4.1.1 Finance for startups and scaleups	Source: World Bank, Doing Business 2020, Comparing Business Regulation in 190 Economies. https://www.doingbusiness.org/en/reports/global-reports/doing-business-2020
	New indicator		Source: Global Entrepreneurship Monitor (GEM), National Expert Survey (NES) (https://www.gemconsortium.org/wiki/1142)
4.2.1 Ease of protecting minority investors*	Removed		Source: World Bank, Doing Business 2020, Comparing Business Regulation in 190 Economies. https://www.doingbusiness.org/en/reports/global-reports/doing-business-2020
1.2.3 Cost of redundancy dismissal	Remain	1.2.3 Cost of redundancy dismissal	Source: World Bank, Doing Business 2020, Comparing Business Regulation in 190 Economies. https://www.doingbusiness.org/en/reports/global-reports/doing-business-2020
			Source World Bank, Employing Workers Project (https://www.worldbank.org/en/research/employing-workers)
6.2.2 New businesses/th pop. 15–64	Remain	6.2.2 New businesses/th pop. 15–64	Source: World Bank, Doing Business 2020, Entrepreneurship Project (2009–18). (https://www.doingbusiness.org/en/data/exploretopics/entrepreneurship)
			Source: World Bank, Entrepreneurship Database (https://www.worldbank.org/en/programs/entrepreneurship)

Source: Compiled by IOD

[Annex XI follows]

ANNEX XI: MOVEMENT IN THE GII, TOP 10, 2018–2022



Source: Global Innovation Index Database, WIPO, 2022.

[End of Annexes and of Document]

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