



DDI Methodology

The Digital Dependence Index (DDI) offers a comprehensive, evidence-based, and comparative quantitative assessment for measuring and comparing the degree of digital dependencies across 51 countries between the year 2010 and the year 2023. It encompasses a broad range of digital technologies that serve as the backbone of the global digital economy, including digital hardware, software, platforms, and ICT patents. This technical note explains how we calculated the DDI.

For the DDI, **digital dependence** refers to the extent to which actors in a particular country must rely on foreign-supplied digital technologies to perform digital activities. The DDI understands digital dependence as a multidimensional phenomenon reflecting the extent to which national economies rely on digital inputs from abroad. DDI values reflect changes in national policies, strategies, and economic choices that increase or reduce a country's digital dependence.¹ The index can consequently be used to systematically and quantitatively assess how digital dependence evolves over time for countries at all levels of economic and technological development.

■ *Key advantages include:*

01 Multidimensional Coverage

The DDI captures key factors shaping national digital ecosystems, including digital goods and services trade, platforms and patents.

02 Clear and Transparent Methodology

The DDI uses clearly defined indicators and standardized data from well-established, publicly available sources.

03 Consistent Monitoring Over Time

The DDI tracks changes in the same digital dependence dimensions annually over thirteen years.

04 Cross-Country Comparison

The DDI provides a systematic framework for comparing digital dependence across countries.

1. See Mayer, M., & Lu, Y. C. (2025). *Global structures of digital dependence and the rise of technopoles*. *New Political Economy*, 30(5), 755–774.

DDI structure, components and data sources

The DDI **measures dependence on a scale from 0 (total independence) to 1 (total dependence)**. It comprises four complementary dimensions and 23 related indicators:

Trade in ICT goods

Indicators: Computers and peripheral equipment; communication equipment; consumer electronic equipment; electronic components; miscellaneous

Data source: UNCTAD Data Centre

Trade in ICT services

Indicators: Telecommunications services; computer software; computer services; computer software licenses.

Data source: UNCTAD Data Centre

Platforms

Indicators: Browsers; search engines; desktop operating systems (OS); mobile OS; social media; smartphones; tablets

Data source: Statcounter GlobalStats

ICT patents

Indicators: Audio-visual technology; telecommunications; digital communication; basic communication processes; computer technology; IT management methods; semiconductors

Data source: WIPO IP Statistics Data Center

This complexity adds nuance to existing understandings and measurements of digital dependence. For instance, the DDI shows countries may be highly dependent on different dimensions, and that high dependence on a single channel does not necessarily imply deep or systemic digital dependence overall.

Limitations

Like all indices, the DDI also has certain limitations:

Aggregate nature of the index | The DDI measures a country's reliance on the global digital economy rather than its economic performance, competitiveness, or vulnerability.

As a result, it does not cover all areas of the economy nor does it directly cover disparities in and across sectors, companies, and industries within a country.

Equal weighting | The index assumes all four dimensions are weighted equally.

Data limitations | Some relevant factors cannot currently be included as comparable and publicly available data are limited. Some examples include data centers, cloud services, large language models (LLM), online games, and cybersecurity capabilities.

These limitations mean that the index, depending on the research question, can be used alongside complementary quantitative and qualitative approaches, such as bilateral and regional trade, supply chain analysis, and sector-specific assessments. The DDI can also be combined with other methodologies, such as stack, supply chain and sectoral analysis, to gain a more comprehensive understanding of dependencies, interconnections and dynamics.

Calculation

Digital dependence is calculated in three consecutive steps.

Step 1: Estimating digital dependence along the DDI dimensions

The DDI dimension scores reflect a country's amount of foreign-supplied digital hardware, software, platform, or ICT patents relative to that state's total demand for digital technologies (see equations below). Digital dependence for each dimension was calculated as the arithmetic mean of all indicators within that dimension. Calculating the arithmetic mean aggregates the indicators by assigning an equal weight to each indicator. This ensures that no individual indicator distorts the dimension-level measure.

■ The calculations were performed as follows:

ICT goods indicators, measured in millions USD at current prices for each year in the period 2010-2023:

$$\text{Indicator score in ICT goods} = \frac{\text{Total ICT goods imports}}{\text{Sum of total ICT goods exports and imports}}$$

Platform indicators, measured in market share calculated by Statcounter based on website page views:²

$$\text{Indicator score in platforms} = \frac{\text{Total market share of foreign platform companies}}{\text{Total market share of foreign and domestic platform companies}}$$

ICT patent indicators:³

$$\text{Indicator score in ICT patents} = 1 - \frac{\text{Total number of granted ICT patents owned by domestic entities globally}}{\text{Total number of granted ICT patents globally}}$$

2. Statcounter GlobalStats, "What methodology is used to calculate Statcounter Global Stats?", 2026, <https://gs.statcounter.com/>; "methodology."

3. This calculation includes patents granted by any patent office included in the WIPO dataset.

Modifications were necessary when calculating the ICT services dimension score due to the nature of the ICT services data. While that data does represent all ICT services indicators, it does not provide export and import data by indicator. As a result, we calculated a dimension score rather than an indicator score, with values measured in millions USD at current prices for each year in the period 2010-2023:

$$\text{Indicator score in ICT services} = \frac{\text{Total ICT services imports}}{\text{Sum of total ICT services exports and imports}}$$

Missing data imputation

Missing observations for ICT goods and services trade are replaced using two methods. First, gaps of up to three consecutive years are estimated using Holt–Winters exponential smoothing based on available historical country data.

Second, where data gaps exceed three consecutive years, missing values are imputed using the average trade value of comparable countries in the same geographic region. Finally, no ICT services data was available from the UNCTAD dataset for Qatar, Saudi Arabia, South Africa, and Switzerland. After researching available proxy datasets, we proxied these values 6 from UNCTAD’s Digitally Deliverable Services data to avoid excessive imputation. Full comparability can consequently not be assured, so please understand these values as indicators of trends rather than precise quantitative measures aligned with the other DDI scores.

Step 2: Creating the dimension indices

The value of digital dependence in a given dimension was normalized using minimum and maximum values, or goalposts, that reflect historical evidence for each dimension.⁴ These goalposts represent “the natural zero” and maximum value of digital dependence, corresponding to conditions of autarky (i.e. complete digital independence) and absolute digital dependence, respectively, and map onto DDI values of 0 and 1.

Historically, absolute digital dependence has occurred in all four dimensions.⁵ However, countries have never achieved complete digital independence in the dimensions of ICT goods and ICT patents. Rather, the historical minimum values of digital independence were 0.10 for ICT goods and 0.05 for ICT patents.⁶ These minimum values were therefore set as the new zero points in the normalized digital indices for these two dimensions, as shown in Table 1.

4. The historical context is necessary to ensure the index reflects real-world values for digital dependence. The historical data was collected from the same sources which provided the DDI index data.

5. Historical data for goods and services taken from UNCTADstat, 2026, <https://unctadstat.unctad.org/EN/Index.html>. Historical data for patents retrieved from Claude Diebolt and Karine Pellier, “Patents in the Long Run: Theory, History and Statistics”, 2018, Association Francaise de Cliométrie Working Paper Number 3; and Claude Diebolt and Karine Pellier, La Cliométrie du brevet, Rapport de recherche: Projet Exploratoire / Premier Soutien (PEPS) du CNRS, 2010. Historical data for platforms taken from Statcounter GlobalStats, 2026, <https://gs.statcounter.com/>.

6. UNCTADstat, 2026 and Diebolt and Pellier, 2018.

Dimension indicators	Minimum	Maximum
Trade in ICT goods	0.10 (as the new zero)	1
Trade in ICT services	0	1
Trade in ICT Platforms	0	1
ICT patents	0.05 (as the new zero)	1

Table 1. DDI Goalposts Having defined these minimum and maximum values, the DDI dimension indices were calculated using the following equation:

Actual value of dimension indicator in a given year-Indicator
minimum value

Indicator maximum value-Indicator minimum value

Dimension index =

Step 3: Aggregating the four dimensions into the overall DDI score

The overall DDI score for a given year is calculated as the geometric mean of the four dimension indices for that year:

$$DDI = (I_{ICT\ goods} \cdot I_{ICT\ services} \cdot I_{ICT\ platforms} \cdot I_{ICT\ patents})^{1/4}$$

The DDI uses the geometric mean to limit substitutability between its dimensions, with each dimension receiving the same weight in the overall index. Unlike the arithmetic mean, the geometric mean limits the extent to which a very high value in one dimension can compensate for a very low value in another. This is particularly important for measuring digital dependence, as low dependence in one dimension should not fully offset substantial dependence in another. Using the geometric mean consequently ensures a more balanced and meaningful representation of a country’s overall digital dependence.

Cutoff points for levels of digital dependence

Based on the digital dependence trends identified in the data, we identified three natural thresholds of digital dependence:

- Low dependence | DDI value between 0.35 and 0.57
- Medium dependence | DDI value between 0.57 and 0.83
- High dependence | DDI value between 0.83 and 1.00

Most countries fall into the medium dependence category.

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