

# AI DEPENDENCY INDEX: QUANTIFYING PREPAREDNESS FOR THE AI ERA

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## ABSTRACT

Artificial Intelligence (AI) is becoming a transformative pillar of global economic growth, pushing industries and governments to adapt rapidly. This paper presents a comprehensive framework to assess national AI dependency, designed to quantify how much countries rely on AI technologies and their readiness to embrace further AI advancements. The framework leverages a multifactorial analysis, incorporating various indicators such as the contribution of AI-related industries to GDP, adoption rates of AI technologies, availability of skilled professionals, government initiatives, and infrastructure readiness. These metrics are weighted and aggregated into an AI Dependency Index, a tool that offers actionable insights for policymakers, business leaders, and researchers. This index enables stakeholders to benchmark their AI preparedness, prioritize investments, and identify areas requiring attention to remain competitive in the AI-driven global economy.

**Keywords:** Artificial Intelligence, AI Dependency Index, Economic Competitiveness, AI Readiness, AI Adoption, Government Initiatives, AI Infrastructure, AI Workforce, Multifactorial Analysis, Policy Implications.

## სელოვნური ინტელექტის დამოკიდებულების ინდექსი: AI ეპოქისთვის მზადყოფნის რაოდენობრივი შეფასება

ლევან გაბისონია,  
სტუ-ს დოქტორანტი

## რეზიუმე

ხელოვნური ინტელექტი (AI) ხდება გლობალური ეკონომიკური ზრდის ტრანსფორმაციული საყრდენი, რაც უზიძგებს ინდუსტრიებსა და მთავრობებს სწრაფად ადაპტირდნენ. ეს ნაშრომი წარმოადგენს ეროვნულ ჩარჩოს ხელოვნური ინტელექტის დამოკიდებულების შესაფასებლად, რომელიც შექმნილია იმის დასადგენად, თუ რამდენად ეყრდნობიან ქვეყნები AI ტექნოლოგიებს და მათ მზადყოფნას აითვისონ AI-ის შემდგომი წინსვლა. ჩარჩო იყენებს მრავალფაქტორულ ანალიზს, რომელიც მოიცავს სხვადასხვა ინდიკატორებს, როგორიცაა AI-თან დაკავშირებული ინდუსტრიების წვლილი მშპ-ში, ხელოვნური ინტელექტის ტექნო-

ლოგიების მიღების მაჩვენებლები, გამოცდილი პროფესიონალების ხელმისაწვდომობა, მთავრობის ინიციატივები და ინფრასტრუქტურის მზადყოფნა. ეს მეტრიკა შენობილი და გაერთიანებულია ხელოვნური ინტელექტის დამოკიდებულების ინდექსში, ხელსაწყოში, რომელიც გვაძლევს ქმედით ინფორმაციას პოლიტიკის შემქმნელებისთვის, ბიზნეს წარმომადგენლებისა და მკვლევრებისთვის. ეს ინდექსი საშუალებას აძლევს დაინტერესებულ მხარეებს შეაფასონ თავიანთი AI მზადყოფნა, დაადგინონ ინვესტიციების პრიორიტეტი და დაადგინონ ის სფეროები, რომლებიც საჭიროებენ ყურადღებას, რათა დარჩეს AI-ზე ორიენტირებულ გლობალურ ეკონომიკაში.

## INTRODUCTION

Artificial Intelligence (AI) has emerged as a groundbreaking force, driving innovation, efficiency, and growth across global industries. As AI technologies become more sophisticated and pervasive, the dependence of national economies on AI is increasing at an exponential rate. Understanding a country's level of AI dependency is critical for policymakers, industry leaders, and researchers to make informed decisions and foster sustainable growth. This paper provides a comprehensive framework to assess AI dependency and readiness, culminating in the creation of an AI Dependency Index (AiDi), which can be applied to compare countries and guide strategic AI development efforts.

AI's influence transcends mere technological advancement; it is reshaping how societies function. From enhancing healthcare diagnostics and optimizing supply chains to transforming financial services and automating labor-intensive industries, AI is redefining the boundaries of innovation. However, this technological revolution brings challenges such as job displacement, skills mismatches, and concerns about ethical AI deployment. As economies rush to harness AI, assessing national AI dependency becomes critical to identify both opportunities and vulnerabilities.

The introduction of the AI Dependency Index offers a quantitative approach to measure AI reliance and preparedness. This index not only provides a comprehensive snapshot of how dependent a country is on AI technologies but also serves as a strategic tool for future planning.

## BACKGROUND

AI's journey from a theoretical concept to a core driver of economic growth has been marked by significant milestones. From the conceptual breakthroughs of the 1950s, when pioneers like Alan Turing and John McCarthy laid the groundwork, to the rise of machine learning and neural networks in the 21st century, AI has been on a rapid trajectory of evolution. Today, AI technologies are applied across a vast array of sectors, from autonomous driving and smart cities to personalized healthcare and finance.

The global race to lead in AI innovation has created a competitive environment, with governments investing heavily in AI research and development (R&D) to secure a competitive edge. AI's potential to revolutionize industries brings tremendous economic benefits, but it also underscores the importance of responsible deployment. Countries that do not keep pace with AI development risk falling behind in global competitiveness, widening the gap between AI leaders and laggards. The AI Dependency Index aims to bridge this gap by offering a systematic method to assess where nations stand in their AI readiness and adoption.

## FRAMEWORK DEVELOPMENT

The development of the AI Dependency framework centers on a comprehensive and scalable model, allowing countries to assess their reliance on AI across multiple dimensions. These dimensions represent critical aspects of AI adoption and development that directly influence economic growth. The framework builds on five core pillars:

1. **AI Contribution to GDP**– This indicator captures the economic weight of AI-related industries within a nation's GDP. It includes AI-powered sectors such as technology, manufacturing, finance, and healthcare, reflecting AI's direct and indirect impact on national productivity and innovation.

2. **AI Adoption Rate** – This metric measures the pace at which industries adopt AI technologies. High adoption rates indicate a nation's ability to integrate AI into existing business models and workflows. This is vital for enhancing productivity, automating routine tasks, and boosting innovation.

3. **AI Workforce Capability** – This factor reflects the availability and skill level of AI professionals in a country, capturing the depth of AI expertise in areas such as machine learning, data science, and robotics. Nations with a well-developed AI workforce are better equipped to develop, deploy, and sustain AI technologies.

4. **Government Initiatives** – Government policies and funding for AI research, infrastructure, and education are critical for fostering a supportive environment

for AI innovation. This indicator assesses how proactive governments are in supporting AI through legislation, funding programs, public-private partnerships, and regulatory frameworks.

5. **Infrastructure Readiness** – The successful deployment of AI technologies requires robust digital infrastructure, including high-speed internet, cloud computing capabilities, and data security measures. Infrastructure readiness assesses the technological foundation a country provides for AI to thrive.

These indicators are aggregated to provide a holistic view of AI dependency, allowing for both cross-country comparisons and in-depth analyses of national strengths and weaknesses.

## AI DEPENDENCY INDEX FORMULA:

### A PRACTICAL OVERVIEW

The AI Dependency Index (AiDi) formula synthesizes the five key indicators into a single score that quantifies a country's reliance on AI technologies. This formula allows policymakers, businesses, and researchers to gauge AI dependency in an actionable, data-driven manner.

Here's a breakdown of the formula:

$$AI_{DependencyIndex} = w1 \times AI_{Contribution} + w2 \times AI_{AdoptionRate} + w3 \times AI_{Workforce} + w4 \times Government_{Initiatives} + w5 \times Infrastructure_{Readiness}$$

Where:

$AI_{Contribution}$  - refers to the contribution of AI-related industries to the national GDP.

$AI_{AdoptionRate}$  - represents the speed and breadth of AI technology adoption in different sectors.

$AI_{Workforce}$  - accounts for the skill level, availability, and growth of professionals trained in AI disciplines.

$Government_{Initiatives}$  - measures the strength of government-backed policies, R&D investment, and strategic AI plans.

$Infrastructure_{Readiness}$  - evaluates the availability of necessary infrastructure (e.g., data centers, internet connectivity, and cloud systems) to support large-scale AI implementation.

Each indicator is multiplied by its respective weight ( $w1, w2, w3, w4, w5$ ), reflecting its importance within a country's overall AI dependency. These weights are assigned based on expert judgments and empirical data, making them adaptable to the unique contexts of different nations.

For example, a country with strong government support but limited AI talent may have a high score for  $Government_{Initiatives}$  but a low score for  $AI_{Workforce}$ , resulting in a moderate overall index score. Conversely, countries with robust AI ecosystems across all indicators would

achieve higher AiDi scores, indicating a deeper reliance on and readiness for AI.

### WEIGHT ASSIGNMENT AND SENSITIVITY

Assigning weights to each indicator is a crucial aspect of the AI Dependency Index. The weight of each factor is determined based on its relative importance in assessing a country's dependency on AI. For instance, a highly industrialized nation might assign a higher weight to *AI<sub>Contribution</sub>* and *AI<sub>AdoptionRate</sub>*, while a developing country with burgeoning AI talent might focus more on *AI<sub>Workforce</sub>* and *Government<sub>Initiatives</sub>*.

To ensure the robustness of the index, sensitivity analyses are performed to test how changes in indicator weights affect overall scores. This step ensures that the index provides consistent and reliable results across various contexts and scenarios.

### Data Collection and Validation

Data collection for the AI Dependency Index relies on diverse sources, including international databases, industry surveys, academic research, and government reports. To ensure the reliability and accuracy of data, cross-validation techniques are employed, such as triangulation and peer reviews. Each country's dataset is subjected to rigorous quality checks to minimize biases and inconsistencies.

## CASE STUDIES: AI IN PRACTICE

### Healthcare Sector: AI-Driven Medical Innovation

The healthcare industry is experiencing significant improvements due to AI integration. AI algorithms, particularly in medical imaging, have enabled earlier diagnosis of diseases such as cancer, transforming patient care. AI-powered tools analyze complex patient data with unparalleled precision, helping healthcare providers make informed decisions and streamline treatment protocols.

### Financial Services: Revolutionizing Risk Management and Customer Interaction

AI technologies are transforming the financial services industry by optimizing risk management and fraud detection. Real-time data analysis powered by AI enhances market predictions, while AI-driven chatbots and virtual assistants provide personalized customer service, allowing financial institutions to deliver more tailored services at reduced costs.

### Manufacturing: Optimizing Production and Supply Chains

In manufacturing, AI's ability to predict machine failures and optimize supply chains is boosting efficiency and reducing downtime. AI-driven predictive maintenance systems can forecast when equipment needs

repairs, preventing costly breakdowns. In production, AI-powered robots and automation systems enhance precision, speed, and safety on assembly lines.

## CONCLUSION

The AI Dependency Index offers a comprehensive tool for assessing AI readiness and dependency across nations. By evaluating key dimensions such as AI industry contributions, adoption rates, workforce skills, government support, and infrastructure readiness, the index provides a nuanced view of where countries stand in their AI journey. Policymakers and industry leaders can leverage this index to guide future investments, foster innovation, and ensure equitable and sustainable AI development.

As AI continues to reshape the global economy, it is vital that nations remain proactive in addressing both the opportunities and challenges it presents. The AI Dependency Index equips countries with the strategic insights necessary to navigate the complex AI landscape, ensuring they are well-positioned to lead in the AI-driven future.

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