Study on Digitalization in the Context of Adopting Artificial Intelligence

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Abstract

The development of artificial intelligence (AI) in recent years is correlated to the accelerated process of global digitalization. Nowadays AI is increasingly becoming into many aspects of daily life. Its development will continue to evolve as the technology improves.

Recent research on the Global Digitalization Index (GDI) 2024 indicates a strong relationship between advancements in the ICT sector and the acceleration of digital economic growth. Nations with more established ICT infrastructures typically demonstrate higher digital maturity.

This paper analyses the dependence between digitalization and artificial intelligence. To study this correlation, were selected the most relevant indicators that measure digitalization (Global Digitalization Index) respectively artificial intelligence (AI Preparedness Index). Statistical methods to study this interdependence are linear regression and correlation coefficient.

Key words: digitalization, Global Digitalization Index, Artificial Intelligence
J.E.L. classification: L81, L86

1. Introduction

The global shift toward digital and intelligent transformation presents unprecedented opportunities for economic and social development. In response, over 170 countries have introduced national strategies aimed at fostering technological integration across sectors (World Bank, 2023). The Global Digitalization Index (GDI) is used to measure the influence of such transformations on digital economies, reflecting how investments in ICT development contribute to overall economic performance. The 2024 GDI captures the changing dynamics in a post-pandemic world. The COVID-19 pandemic accelerated digital development but also highlighted the gap between digitally advanced nations and those with basic connectivity. The GDI is an important resource which shapes digital strategies and policies worldwide, in order to build a digitally empowered and sustainable future.

2. Theoretical background

The Global Digitalization Index (GDI) serves as a comprehensive metric to evaluate how effectively nations are embracing digital transformation. It provides a structured framework for comparing countries' progress in integrating digital technologies, and its findings consistently highlight the strong linkage between digital infrastructure investment and economic indicators such as GDP per capita (Huawei, 2024).

Moreover, emerging studies demonstrate a significant correlation between the GDI and the International Monetary Fund's (IMF) AI Preparedness Index (IMF, 2023). Countries with advanced digital foundations tend to be better equipped for integrating artificial intelligence due to established infrastructure in areas like connectivity, data storage, and computational capacity. For AI to function effectively on a scale, robust networks capable of supporting high-speed, low-latency communication are essential. This, coupled with scalable and efficient computing resources, becomes a critical enabler for real-time data processing and intelligent automation.

Furthermore, the environmental impact of digital transformation cannot be overlooked. The rise in AI and digital services has heightened energy consumption, making investments in sustainable energy infrastructure increasingly important. As such, green energy is not only a climate imperative

but also a key technological enabler for long-term digital advancement (World Economic Forum, 2023). AI applications have reshaped sectors that have undergone significant digital transformation:

- **Healthcare**: AI assists in diagnostics, treatment personalization, and operational efficiency
- **Finance**: Automated fraud detection, algorithmic trading, and customer service bots rely on digital infrastructure
- **Education**: Adaptive learning platforms use AI to personalize content delivery based on student performance
- **Public administration**: Digital governments are integrating AI for smart city planning and citizen services

These advancements are only possible through the strong digital foundations built by years of investment in infrastructure and connectivity.

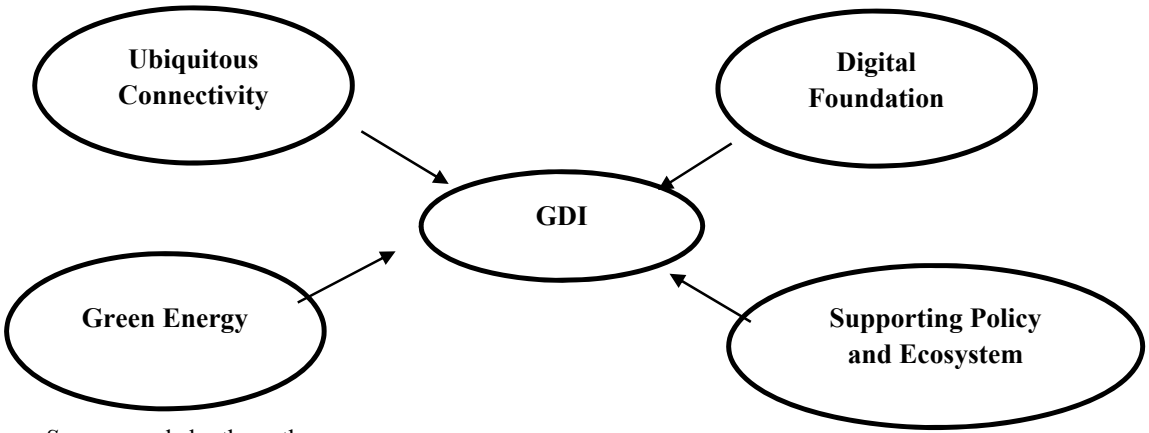
3. Research methodology

The research utilizes datasets from public reports Huawei, Global Digitalization Index 2024 Report, IMD World Competitiveness Booklet 2024, International Monetary Fund (IMF), 2023. AI Preparedness Index 2023. The analysis focuses on the top 10 ranking of countries according to Global Digitalization Index compared to AI Preparedness Index. It is noticed that the countries who have the biggest values of the Digitalization Index are most prepared to adopt Artificial Intelligence. To study this correlation there are used statistical methods like linear regression and correlation coefficient.

4. Analysis of digitalization in the context of Artificial Intelligence

The four dimensions of the GDI are the basis of successful digitalization, ensuring the inclusive, sustainable and resilient digital transformation. Ubiquitous Connectivity enables communication and data exchange worldwide. Enhancing and expanding connectivity infrastructure is very important for bridging the digital divide and ensuring that everyone regardless of their economic status have access to digital economy. Digital Foundation is about implementing advanced technologies such as AI, IoT and edge computing that offer efficiency, adaptability and innovation. This dimension of GDI is the foundation upon which are built digital enterprises, smart cities and innovative solutions, creating an intelligent and more responsive global system. Green energy is recognized as a landmark of digitalization. As digital technologies spread worldwide, the energy demands have to be met sustainably. Transition to green energy is very important not only because of climate change, but also for ensuring that digital transformation contributes to global sustainability goals. Supporting policy and Ecosystem are the elements that hold everything together.

Figure no. 1. Dimensions of the Global Digitalization Index



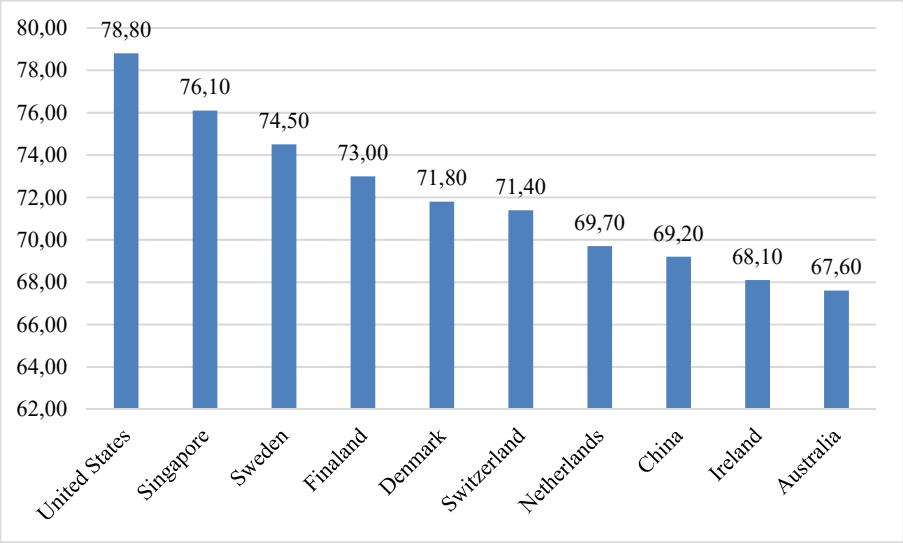
Source: made by the author

Singapore stands out as a global leader in digital transformation, consistently ranking among the top countries in the Global Digitalization Index due to its strategic investments in ICT infrastructure, regulatory innovation, and skills development (Smart Nation Singapore, 2023). The government has prioritized universal high-speed internet access, with over 98% of households now connected to broadband, and ambitious plans are underway to achieve 10 Gbps connectivity nationwide.

In terms of artificial intelligence adoption, Singapore took an early lead by introducing its first National AI Strategy in 2019. This initiative laid the foundation for integrating AI into sectors such as healthcare, transport, and public services. Building on this, the 2023 release of NAIS 2.0, titled *"AI for the Public Good, for Singapore and the World"*, aims to position the country as a global hub for responsible AI innovation (IMDA, 2023).

To align with its net-zero commitments, Singapore has also embarked on the development of a green data center roadmap. This initiative is expected to attract significant investment—estimated between USD 7.5 billion and USD 9 billion—over the next decade, supporting both environmental sustainability and digital infrastructure growth (MCI Singapore, 2024).

Figure no. 2. Ranking of countries according to Global Digitalization Index in 2024

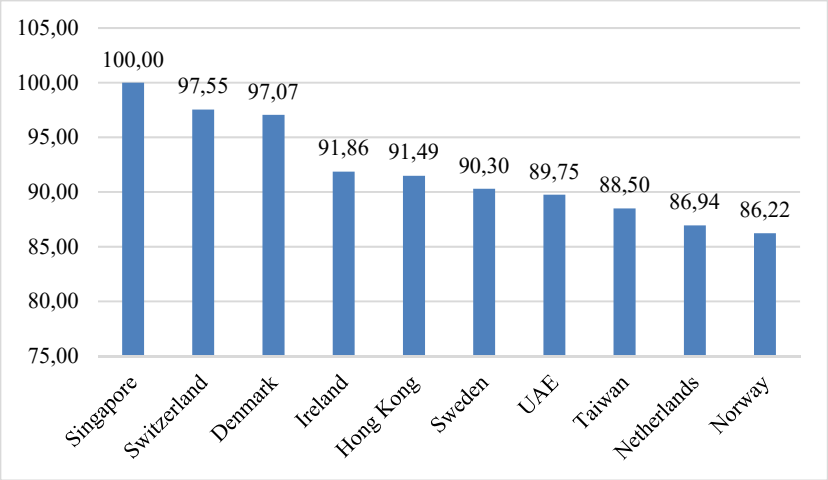


Source: made by the author based on data available Huawei, 2024. Global Digitalization Index 2024 Report https://www.huawei.com/en/reports/global-digital-economy

For more than 30 years, the IMD World Competitiveness Center researched how countries and companies compete to lay the foundations for sustainable value creation. The competitiveness of nations is one of the most significant developments in modern management. In 2024, the WCC ranked the competitiveness of 67 economies across four factors: economic performance, government efficiency, business efficiency, and infrastructure. These factors capture various aspects of competitiveness, such as macroeconomic stability, fiscal policy, institutional quality, market openness, business dynamism, innovation, education, health, and environmental performance. The 2024 ranking shows that the most competitive economies combine solid economic performance with efficient and effective public and private sectors, high-quality infrastructure, and human and social capital. These economies also balance productivity and prosperity, meaning they can therefore generate elevated levels of income and quality of life for their citizens while preserving the environment and social cohesion. Some examples of such economies are Singapore, Switzerland, Denmark, Sweden, and the Netherlands. The ranking also shows that emerging markets are catching up with more advanced economies, especially in innovation, digitalization, and diversification. Some examples of these economies are China, India, Malaysia, Thailand, and Chile.

National competitiveness rankings are an essential ingredient in the formation of national strategies because they provide comprehensive and objective assessments of countries' strengths and weaknesses vis à vis other countries. They also serve as a benchmark for measuring progress and identifying areas for improvement.

Figure no. 3. Ranking of countries according to Competitiveness Index in 2024

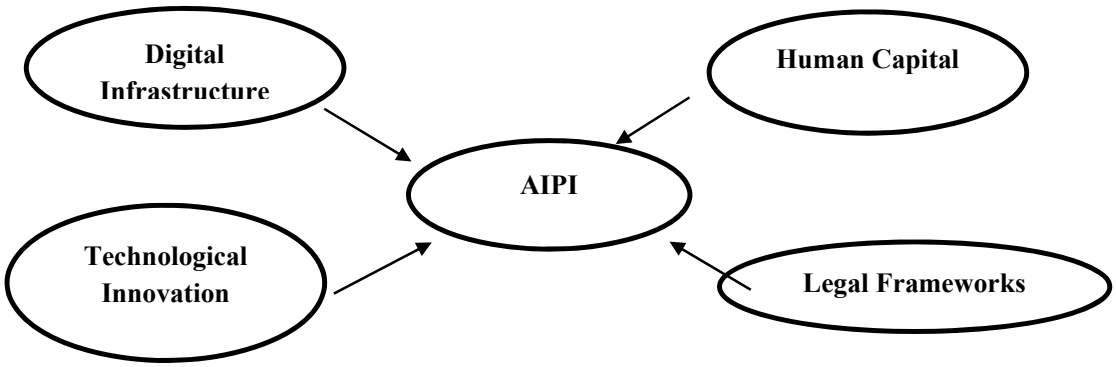


Source: made by the author based on data available IMD World Competitiveness Booklet 2024, https://www.imd.org/centers/wcc/world-competitiveness-center/rankings/world-competitiveness-ranking/

AI Preparedness Index (AIPI) assesses the level of AI preparedness across 174 countries, based on a rich set of macro-structural indicators that cover the countries' digital infrastructure, human capital and labor market policies, innovation and economic integration, and regulation and ethics.

Source data include official data, surveys of hard data and surveys of perceptions compiled by 8 institutions: Fraser Institute, International Labor Organization, International Telecommunication Union, United Nations, United Nations Conference on Trade and Development, Universal Postal Union, World Bank, and World Economic Forum.

Figure no. 4. Dimensions of the AI Preparedness Index



Source: made by the author

The AIPI is derived as the simple average of the four key dimensions: Digital Infrastructure, Human Capital, Technological Innovation and Legal Frameworks. Each dimension is composed of a set of sub indicators. The most important sub indicators are:

- Estimated internet users per 100 inhabitants
- Number of mobile subscribers per 100 inhabitants
- Number of wireless broadband subscriptions per 100 inhabitants

- Cost of internet access
- Secure internet servers per 1 million people
- Use of mobile phone for online transactions
- Public sector's online services infrastructure
- Human capital index
- Digital skills among active population
- Number of STEM graduates
- Flexibility of wage determination
- R&D spending per unit of GDP
- Free movement of capital and people
- Legal framework's adaptability to digital business models.

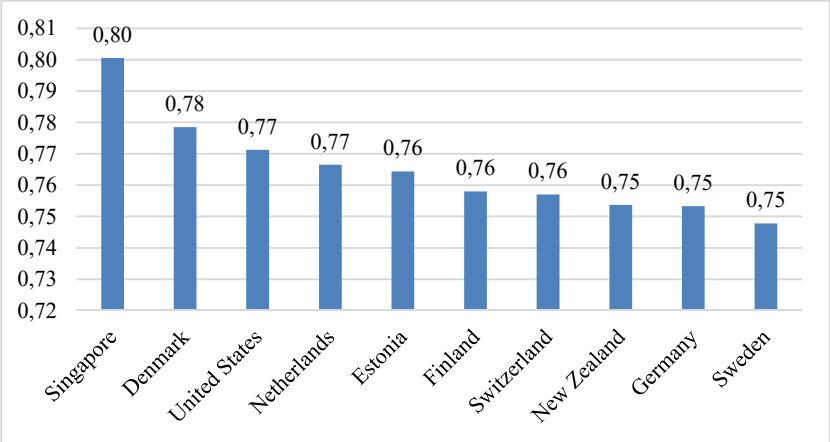
Table no. 1 Ranking of countries according to AIPI in 2023

Rank	Country	AIPI
1	Singapore	0.80
2	Denmark	0.78
3	United States	0.77
4	Netherlands	0.77
5	Estonia	0.76
6	Finland	0.76
7	Switzerland	0.76
8	New Zealand	0.75
9	Germany	0.75
10	Sweden	0.75

Source: made by the author based on data available International Monetary Fund (IMF), 2023. AI Preparedness Index 2023 https://www.imf.org/en/Publications/WP/Issues/2023/AI-Preparedness-Index

Singapore ranks first as the most prepared country for smooth AI adoption. The country invested hundreds of millions of dollars into increasing AI capabilities and supporting national AI strategies. The Singapore government has developed a suite of general-purpose AI tools for public service officers, which still adhere to strict security standards.

Figure no. 5. Ranking of countries according to AIPI in 2023



Source: made by the author based on data available International Monetary Fund (IMF), 2023. AI Preparedness Index 2023 https://www.imf.org/en/Publications/WP/Issues/2023/AI-Preparedness-Index

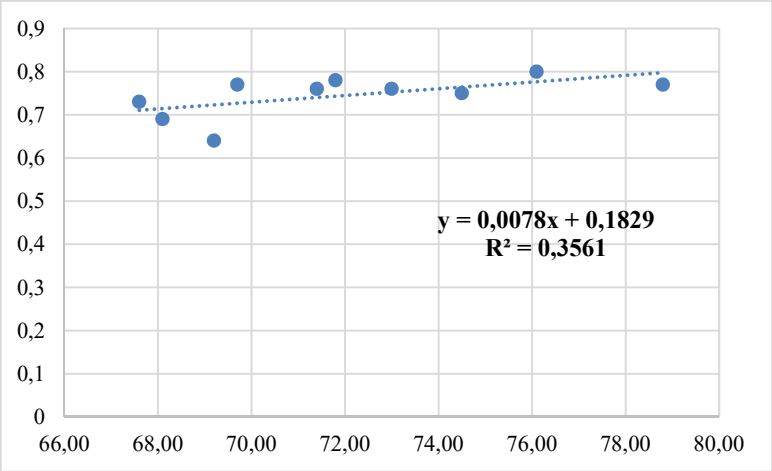
Besides Singapore, northwestern European countries like Denmark (#2), the Netherlands (#4), Estonia (#5), Finland (#6), and Sweden (#1) also scored in the top 10 for AI preparedness. Several of these European countries were also among the world's earliest adopters of national AI strategies, such as Finland's 2017 AI strategy aimed at enhancing business competitiveness and data efficiency, and Sweden's 2018 "National Approach for Artificial Intelligence" focusing on education, research, and infrastructure development.

Table no. 2. The correlation between GDI and AIPI

Rank	Country	GDI	AIPI
1	United States	78.80	0.77
2	Singapore	76.10	0.8
3	Sweden	74.50	0.75
4	Finland	73.00	0.76
5	Denmark	71.80	0.78
6	Switzerland	71.40	0.76
7	Netherlands	69.70	0.77
8	China	69.20	0.64
9	Ireland	68.10	0.69
10	Australia	67.60	0.73

Source: made by the author

Figure no. 6. The correlation between GDI and AIPI



Source: made by the author

It is noticed that the countries that have the biggest Global Digitalization Index are the most prepared for Artificial Intelligence because they have also big values of AIPI. The correlation between these indicators in presented in the following figure where is calculated the regression equation (linear regression) and the correlation coefficient (R^2).

5. Conclusions

In the past few years, the progress of artificial intelligence has been closely connected with worldwide digitalization development. The transformation of processes, services and systems through digital technologies has established the basis for AI to evolve from a niche of scientific pursuit into a mainstream driver of innovation, productivity and social change.

The accelerated pace of technological innovation—encompassing AI, robotics, biotechnology, nanotechnology, and the Internet of Things—continues to reshape economic and societal landscapes. These advancements offer transformative benefits, such as increased efficiency and

productivity, while simultaneously introducing complex ethical and regulatory challenges. Issues like data privacy, cybersecurity, digital equity, and governance are becoming increasingly urgent as digital ecosystems expand.

To fully harness the potential of these technologies, governments and businesses must pursue a dual strategy: invest in robust digital infrastructure and nurture human capital through education and upskilling. At the same time, innovation must be guided by principles of inclusiveness, resilience, and sustainability. Building an adaptive ecosystem that supports research, ethical standards, and public trust is key to achieving long-term digital development goals. However, significant disparities persist due to uneven access to reliable connectivity. Addressing these gaps requires targeted investment in digital infrastructure, implementation of effective policy frameworks, and the cultivation of skilled professionals to support ongoing technological progress.

6. Acknowledgment

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