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Artificial Intelligence Landscape in the European Union. A Comparative Study

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Abstract. *This paper analyses and compares Artificial Intelligence (AI) national strategies of European Union (EU) Member States based on factors like education, investments, workforce upskilling and reskilling and country specific initiatives. The analysis expands into AI usage of EU enterprises based on Eurostat data. Using a mixed-methods approach, document and content analysis along with descriptive statistics, the study classifies EU countries into four clusters (leaders, followers, moderates, and laggards) based on AI usage rates of the European enterprises, showing significant differences for each cluster. The first cluster – the leaders in AI usage, such as Denmark, Sweden or Finland presented strong policies for early digital education, consistent investments, and comprehensive workforce training programs. In contrast, the countries from the fourth cluster – the laggards – with slower rates of AI usage, rely extensively on EU funding and seem to face infrastructural or regulatory barriers. The findings show significant disparities in the usage of AI by European enterprises. Large companies recorded the highest AI adoption while small and mid-size enterprises seem to be less prepared for this. The study also indicated limitations such as statistical analysis performed only for 2023 and 2024 data, limited criteria for comparing strategies, and reliance on Web of Science literature base. Also, the study provides additional recommendations for further research directions, advocating for more advanced quantitative analyses. Overall, this research highlights the need for coordinated EU-level policies aimed at ethical, inclusive, and cohesive AI development across all Member States.*

Keywords: Artificial Intelligence, European Union, AI Strategies, AI Usage, Comparative Analysis.

Introduction

Artificial intelligence (AI) has rapidly evolved into an important factor for economic progress (Brynjolfsson and McAfee, 2017). In the context of the technical progress and globalization, AI has attracted investments with a significant impact on the competitiveness and development potential of nations.

In the European Union (EU), AI has been marked as a strategic priority, playing an important role in shaping economic and social development, implementing strategic initiatives

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such as Digital Compass 2030 (European Commission, n.d.-a) and the AI Act (European Commission, n.d.-b). The adoption of AI in various EU sectors has been a priority for European Commission since many years (European Commission, n.d.-c).

These starting points aim to support the development and implementation of AI technologies through an appropriate regulatory framework and by improving collaboration between the public and private sectors. The AI Act has marked a significant progress in regard to AI regulation reflecting the EU's commitment to trustworthy AI, emphasizing human oversight, transparency and accountability. Thus, the rate of AI adoption and implementation varies among European Member States (EU MS), raising questions about the region's cohesion and competitiveness (Draghi, 2024). There's also the question of whether current regulations are flexible and innovative enough to support the rapid development of AI while still protecting the fundamental rights and safety of citizens (European Commission, n.d.-a).

AI impact is not limited to just the technology sector. It influences many other sectors, from manufacturing to financial services and education. Rapid progress in machine learning, natural language processing, and intelligent robotics offers new opportunities for economic process efficiency, performance improvement, and enhancing quality of life. Furthermore, AI can contribute to solving global issues, ranging from better medical diagnosis to implementation of sustainable solutions for environment protection. The importance and the significance of this field is evident from the level of investments in the research and development (European Commission, n.d.-b).

Nonetheless, AI adoption also presents noteworthy financial, ethical, and social risks. In terms of finances, AI-driven decision-making can lead to increased volatility in markets and systemic risks in financial institutions if not appropriately controlled. The Financial Stability Board (2024) raised questions about how automation powered by AI can exacerbate market volatility, while the International Monetary Fund (2024) highlighted how important regulatory supervision is preventing financial crises. Cañas (2022) found that the two main ethical risk factors influencing AI-based decision-making are technological uncertainty and inadequate data. As AI develops further, governance frameworks must be created to strike a balance between the threats it poses and its economic advantages. In this respect, businesses need to be proactive in managing the risks connected with AI, even while it presents enormous opportunities (Fritz-Morgenthal et.al, 2022).

Going forward, the implementation and development of AI across EU is a great opportunity, but not without challenges and risks. Against this context, researching what are the key policy elements that could foster AI sustainable adoption in the EU is a necessity.

This study compares national AI policies to identify important strategy components that could accelerate AI adoption throughout the EU. That is something we aim to accomplish, by analyzing the elements that influence the effectiveness of AI adoption and assist in identifying policies that may be scaled up through a comparative analysis. In the current paper, we have followed a comparative approach. This has been commonly used in research regarding AI, as seen in studies by Cath et al. (2018), John et al. (2024), and Aksoy Ercan and Akin (2024). With this, we aim to identify similarities and differences across EU countries. Furthermore, a comparative study can reveal practices and frameworks that can serve as models, benchmarks, or sources of inspiration for decision-makers.

This is one of the first studies to analyze the EU landscape in all EU MS using official EU documents and the AI national strategies and to compare them with AI usage of EU MS enterprises. It uses descriptive statistics and comparative-analysis, complemented by the academic literature review. It provides original perspectives on to EU AI landscape highlighting the patterns and difficulties related to AI uptake and utilization across MS. The findings help create a better

understanding of countries' AI strategies and initiatives related to education, investments and workforce and inform recommendations for AI growth across countries.

Literature Review

The literature review aims to briefly identify relevant papers that researched AI usage, AI strategies, and policies across the EU against common research trends: the impact of AI across European sectors, comparison with the US and China, policy governance, cross-EU collaboration, and partnerships, as well as main gaps identified in the research sector on the topic.

AI technologies are impacting multiple industries more and more. Such impact has been investigated by Espina-Romero et al. (2023) in a comprehensive bibliometric analysis based on SCOPUS-indexed research papers, showing that AI technologies are increasingly impacting sectors like healthcare, finance, technology, environment, or construction. Furthermore, the authors asserted that Europe and Asia were the most impacted regions, while the Americas, Africa, and Oceania were the least impacted.

Numerous researchers have investigated the usage of AI technologies in enterprises in various European contexts. Thus, Mihai, Aleca, and Gheorghe (2023) investigated the impact of AI-related technologies in the EU regarding digital intensity, economic processes impacted, or technologies used most often. The authors asserted that enterprises were interested in adopting AI technologies in management or personnel recruitment. Kovič et al. (2024) explored AI usage in enterprises from the manufacturing sector in Slovenia, Slovakia, and Croatia. The authors revealed that enterprises with integrated cyber-physical systems and well-developed digital infrastructures are most likely to adopt AI technologies. Călinescu (2024) used document analysis and case study methods to explore AI use in small and medium enterprises (SMEs) from Romania. Although the dataset used in the analysis was older (2021), the analysis showed AI usage across EU MS and highlighted the positive role of implementing AI for SMEs. The author stated that the SMEs' benefits of efficiency and creativity are higher than the difficulties faced in implementing AI technologies. Similarly, del Olmo-García et al. (2024) explored the role of AI technologies among EU enterprises, highlighting AI's positive role in business efficiency.

AI is considered a fundamental technology for future economic development. Based on a large firm-level and patent data dataset, Grashof and Kopka (2022) investigated the role of AI in radical innovation or knowledge generation. The authors differentiated between the concepts of AI techniques and AI applications. They argued that SMEs can benefit from AI techniques when creating radical knowledge that allows them to pursue technological opportunities that are unlikely to be captured by large firms via a formalized research process.

Reis et al. (2020) investigated the impact of AI on political governance within the EU through a comparative analysis of scientific research across a limited number of EU countries: Portugal, Greece, Austria, Belgium, and Sweden. The authors suggested improving cooperation in the AI research domain to enhance political governance and to identify potential gaps in existing literature regarding the research potential of EU countries in AI. The authors further suggested that collaboration among countries is a possible option to advance in AI research. A significant corpus of research literature has focused on comparative studies between the EU and other major players in the AI domain, such as the US or China. For example, Arora et al. (2025) performed a comparative analysis of AI governance strategies between the EU and China. The authors highlighted the EU's human-centric approach through the AI Act and explored how technological advancements are related to ethical aspects. The authors suggested that a harmonized approach could promote responsible global AI development. Similarly, Roberts et al. (2023) compared the

AI strategies of the EU and China by reviewing similarities and differences. The authors asserted that China's strategy seems to be primarily focused on developing innovation and "common prosperity", and the EU's strategy seems to be primarily focused on promoting ethical outcomes.

Cyman, Gromova, and Juchnevicius (2021) focused on a comparative analysis of the regulation of AI. Although the comparative analysis method has been applied to EU and BRICS countries, the paper is still relevant for the current research topic since it shows the role of AI on the EU's economy and societal structures, contributing to GDP growth, enhancing financial risk management, and improving crime detection. This suggests the need for a common European approach to AI to avoid market fragmentation and improve ethical development based on shared values, in this way building public trust in technology.

In an older study, NíFhaoláin, Hines, and Nallur (2020) reviewed the national AI strategies of European countries through a thematic analysis. The authors asserted that there was an appetite from EU countries for regulating AI, with a focus on regulating AI solutions. Based on the Declaration of Cooperation signed by EU MS and non-member states, the authors identified homogeneity and convergence in the AI national strategies.

Foffano, Scantamburlo, and Cortés (2022) performed a qualitative analysis of the available AI National strategies of 15 EU countries based on the investment dimension. Their research analyzed which investments mentioned from the AI national strategies promote social good or positive social impact. The authors researched this topic from a policy perspective. The study discovered that investments in relevant areas of AI for social good (such as education) are limited, suggesting the existence of a gap between the declarative and implementation aspects of AI national strategies. Finally, the authors argued in favor of considering resource investments as a proxy for assessing AI for social good.

The reviewed literature confirms the strategic relevance of AI at EU MS level. Furthermore, it shows a significant interest in comparing EU with major AI players, highlighting similarities and differences regarding AI governance. Additionally, the current research seems to show the potential of AI adoption for SMEs. However, it can be noticed a lack of research that examines both AI national strategies and the practical AI adoption among EU enterprises. The current study will address this gap.

Methodology

Research Design

The current research has adopted a mixed-method approach, combining content analysis and document analysis methods with quantitative methods such as descriptive statistics. This approach has been used in order to answer to the following research questions:

RQ1: What are the differences and similarities of AI national policies across EU countries considering four elements:education and the impact of AI in education, AI investments, workforce reskilling and upskilling, and other country-specific initiatives?

RQ2: In light of the strategies' analysis, what are the common themes that all EU countries should follow to promote the use of AI at a larger scale, while enhancing convergence within EU?

RQ3: How are AI-related technologies used in the various EU MS and what does this tell us about national AI strategies?

Literature Review - Search and Selection

A comprehensive literature review has been performed on Web of Science (WoS) and SCOPUS databases, based on the following inclusion criteria: English language, publication types (articles

or proceeding paper or review articles) and research published between 2014 and 2025. The relevance criteria were applied.

Content and Document Analysis

Document and content analyses were performed based on the official resources available on AI Watch, in order to analyze the AI national strategies (European Commission, n. d.-d) along with other official data regarding national AI strategies of EU MS publicly available on governmental websites.

The following four criteria have been used to review each AI national strategies: 1) investments in AI; 2) education; 3) workforce reskilling and upskilling; and 4) specific initiatives for each country. Although other criteria may bring an added value in a comparative study, these four criteria were found sufficient for the current analysis due to several reasons: a) education, investments, and workforce reskilling cover main areas that influence the AI adoption at national scale. b) countries 'specific initiatives help detect what can make a difference in AI adoption. c) these criteria are fundamental pillars of any AI ecosystem. c) these criteria are present in all AI strategies, thus allows for comparison across EU MS.

Statistical Analysis and Country Grouping

The countries analyzed were split into clusters based on the AI Usage Percentage values. A quantitative analysis has been performed based on the official datasets extracted from Eurostat (isoc_eb_ai dataset). The AI Usage Percentage values have been sorted in descending order. They are ranging from 27,58% (maximum) to 3,07% (minimum). Starting from these values, we have noticed that clear gaps are visible at approx. the 20–21%, 11–12%, and 8–9% levels. Based on these observations, the EU MS have been grouped into four clusters (see Table 1 below) - leaders, followers, moderates and laggards- based on the percentage of AI usage of the enterprises from each country (Eurostat, 2025). Additionally, the identified clusters are equivalent with the four quartiles of the dataset.

Table 1. EU MS based on the usage % of the AI in companies in 2024

Cluster 1 (AI usage: 27.5% - 20.89%):	**Cluster 3 (AI usage 11.26% - 8.63):**
Denmark	Czechia
Sweden	Slovakia
Belgium	France
Finland	Greece
Luxembourg	Latvia
Netherlands	Lithuania
Slovenia	Portugal
Cluster 2 (AI usage 20.27% -11.31%):	**Cluster 4 (AI usage 8.20% - 3.07%):**
Austria	Italy
Germany	Cyprus
Malta	Hungary
Ireland	Bulgaria
Estonia	Poland
Croatia	Romania
Spain	

Source: Authors' own representation, based on Eurostat (2025).

Splitting the EU MS into four clusters will provide a good granularity in terms of identifying similarities and differences of AI national strategies. This will also help in improving clarity and interpretability so that comparative results may become more actionable.

Descriptive statistics (mean, median, standard deviation) was used to examine the percentage of companies' AI usage at national level for each cluster as a potential output of the AI national strategy of EU member states. This will offer an empirical framework for discussions regarding similarities and differences.

Results and discussions

AI National Strategies

The review of the AI national strategies of the EU MS as they were reflected by the AI Watch revealed a series of characteristics that have been grouped into four clusters considering the AI usage (see Table 1).

The Cluster 1 countries (see Table 2) stand out in AI leadership in the EU due to their commitment to promote AI at all levels through a balanced approach across education systems, workforce transformation, investments through national strategic initiatives. Whereas ethical and responsible AI development emerge as the cross – cutting theme across all the AI strategic initiatives, few elements could be depicted as having a critical role in their success. On one hand, AI in education and training is approached from all perspectives (teacher and pupil/student/worker training, private/public initiatives), throughout all life periods, in all learning settings such as formal education, employer trainings, massive open online courses (MOOC), co-working spaces and with various financing sources (public, private, mixed – partnerships, international cooperation). On the other hand, investments are substantial and targeted to R&D with a special focus on AI developments. Likewise, various sources of investments are explored, from private, mixed, to public, including tax incentives.

Table 2. Summary of AI national strategies for cluster 1 – The Leaders

Cluster 1: Denmark, Sweden, Belgium, Finland, Luxembourg, Netherlands, Slovenia	
Education	• Digital literacy and improving AI competence. • Dedicated AI study programs and interdisciplinary approaches in universities, including Partnerships with the private sector (Sweden, Netherlands, Slovenia, Finland). • Reskilling educators to incorporate AI into teaching methods (Sweden, Denmark).
AI Investments	• Substantial dedicated public and private investments in AI research, infrastructure, and innovation. • Dedicated AI R&D funds backed by the government (Sweden, Netherlands, and Slovenia). • financial incentives for AI startups and SMEs (Belgium, Slovenia); • Focus on international collaboration on AI research (Finland, Slovenia, Luxembourg)
Workforce Upskilling and Reskilling	• Prioritize lifelong learning programs that include AI, digital transformation, aiming to develop a highly skilled workforce (Finland, Netherlands, Belgium). • AI training courses under the government umbrella, as well as MOOCs (Belgium, Finland, Slovenia). • Reskilling programs supporting displaced workers, financed from the state budget.
Countries' specific initiatives	• Belgium – MOOCs, training hubs with AI curriculum (BeCode, MolenGeek, Digitalcity). • Finland – AI driven automation enhances work quality instead of replacing human jobs. • Netherlands – STAP scheme (training, including AI-related subjects, with yearly budget of €1,000 / participant). • Sweden - 275 million allocated to innovation projects, with AI as focus area.

Source: Authors owns research, based on European Commission. (n.d.-d).

Cluster 2 – The followers (see Table 3) are characterized by strong AI education foundations, high levels of government and EU investments. However, workforce reskilling is lagging and needs to be further expanded.

Table 3. Summary of AI national strategies for cluster 2 - The Followers

Cluster 2: Austria, Germany, Malta, Ireland, Estonia, Croatia, Spain	
Education	• Austria – funds research for AI; • Germany – a strong AI presence in higher education and vocational training; • Malta - AI education included in digital skills programs; • Ireland - AI courses in universities and AI-related PhD funding; • Estonia - AI in schools and universities, digital skills programs; • Croatia- Developing AI university programs, focus on STEM education; • Spain - AI integrated into national education plans, support for AI research.
AI Investments	• Austria- government funding for AI startups and research; • Germany- Multi-billion-euro investments in AI R&D; • Malta - investments in AI regulatory framework, attracting AI startups; • Ireland - AI funding for innovation, collaboration with tech companies; • Estonia - Government-backed AI projects, public-private partnerships; • Croatia - investments in AI R&D, support for startups; • Spain - EU and national funding for AI projects.
Workforce Upskilling and Reskilling	• Austria - AI training programs for professionals; • Germany - upskilling programs for industry workers; • Malta - training in AI for IT professionals and small businesses; • Ireland - AI training for businesses, incentives for digital transformation; • Estonia- workforce AI training in the public and private sector; • Croatia - AI courses for employees in tech industries; • Spain- AI workforce upskilling in digital economy.
Countries' specific initiatives	• Austria - AI strategy focuses on sustainable AI, ethics, and international collaboration; • Germany - AI policy focuses on industry 4.0, automation, and international leadership; • Malta - national AI strategy emphasizes governance and ethical AI; • Ireland - AI strategy linked to economic competitiveness and research collaboration; • Estonia - AI strategy focused on digital governance and public sector AI adoption; • Croatia - AI policy aims to boost digital transformation and automation; • Spain - AI strategy supports industrial AI adoption and innovation hubs.

Source: Authors owns research, based on European Commission. (n.d.-d).

The Cluster 3 countries: The Moderates (see Table 4) are diverse. One country excels in AI adoption, some are emerging and exhibit growing investments, while others focus on digital skills with minor funding. Nevertheless, France is at the forefront of AI across all sectors. Slovakia, Portugal, and Czechia are advancing the use of AI in education, the public sector, and business. Overall, except from France, almost all countries rely on EU financing to stimulate AI usage across the analyzed policy areas.

Table 4. Summary of AI national strategies for the cluster 3 – The Moderates

Cluster 3: Czechia, Slovakia, France, Greece, Latvia, Lithuania, Portugal	
Education	• Incorporating AI into the Education system – France; • Incorporating AI into the university Education system (and less into the primary and secondary school) – Czechia, Slovakia, Portugal, and Lithuania; • Fewer programs and teacher preparations – Latvia, Greece.
AI Investments	• France – substantial financing (government & business sector); • Czechia, Slovakia, Portugal, Greece – EU subsidies; • Lithuania, Latvia – no significant private investment;
Workforce Upskilling and Reskilling	• France, Portugal – government-supported initiatives and business partnerships; • Slovakia, Czechia – AI training, localized in tech industry; • Lithuania, Latvia – lack corporate AI training; • Greece – weakest AI reskilling initiatives.
Countries' specific initiatives	• France – explicit innovation and governance rules; • Slovakia, Czechia, Portugal – AI integration into smart cities and health care systems; • Lithuania, Latvia – lack robust national policies.

Source: Authors owns research, based on European Commission. (n.d.-d).

Cluster 4 (see the Table 5) stands out with uneven AI development – while some countries like Italy and Poland have well-defined AI strategies and government support, others, such as Cyprus and Bulgaria, have more limited investments and infrastructure for AI adoption. Whereas strong academic integration is present, there is a weak industry adoption, as there is a gap in transferring AI innovations into industry applications. Nevertheless, reliance on EU funding is high. Hungary, Bulgaria, and Poland rely heavily on EU funds for AI development rather than focusing on establishing strong national investment policies. Workforce reskilling needs to become a priority, as they cannot support employees' efforts in traditional industries to transition to AI-driven roles. Last but not least, all these countries have developed AI strategies tied to digitalization and economic growth, while enforcement is challenging.

Table 5. Summary of AI national strategies for cluster 4 – The Laggards

Cluster 4: Italy, Cyprus, Hungary, Bulgaria, Poland, Romania	
Education	• Italy- Integration of AI into the education system, development of specialized study programs; • Cyprus - Introduction of AI in university curricula; • Hungary - partnerships between universities and companies for AI; • Bulgaria - creation of AI centers of excellence; • Poland - AI programs in universities, support for research; • Romania - implementation of AI in education, academic partnerships.
AI Investments	• Italy - support for AI startups, public-private collaborations; • Cyprus- limited investments, focus on digitalization; • Hungary - EU funds for AI development; • Bulgaria - EU funds for AI projects; • Poland- government support for AI startups; • Romania - investments in AI research and infrastructure;
Workforce Upskilling and Reskilling	• Italy - programs for employee retraining in AI; • Cyprus - training for sectors affected by automation; • Hungary- AI training for public administration and the private sector; • Bulgaria - upskilling programs for IT and engineering; • Poland - AI training for the private sector; • Romania - retraining programs for IT and automation;

Cluster 4: Italy, Cyprus, Hungary, Bulgaria, Poland, Romania	
Countries specific initiatives	• Italy - national AI program focused on industry and education; • Cyprus - AI strategy based on digitalization and infrastructure; • Hungary - initiatives for digital transformation of the economy; • Bulgaria - AI strategy in development, international partnerships; • Poland - AI initiatives for digital transformation;

Source: Authors owns research, based on European Commission. (n.d.-d).

Given the leaders cluster' countries strategic experience in AI policies, holistic policy development emerges as a key driver for AI results. Thus, AI countries strategic initiatives should aim to achieve a cohesive intervention by addressing all dimensions of AI effects, from education and workforce transformation to R&D investments. Moving forward, strong collaboration partnerships across all EU MS should be leveraged between all countries, from the leaders to the laggards, to enhance cohesion and make best use of all AI opportunities.

Moving forward, cluster 2 and 3 could learn from cluster 1 experience and extended AI instruction to elementary and secondary school levels and enhance AI literacy by funding teacher training, particularly in the case of Latvia and Greece. Nonetheless, facilitating the development of AI learning platforms, including MOOCs should become a must, so that everyone has accessible access to AI expertise and learning. Moreover, initiatives encouraging cooperation between academics and industry to match AI expertise with commercial demands, could be strengthened. Likewise, the initiative of offering tax breaks and subsidies for research and development may boost financing for this already stretched sector. To fill the investment gaps in Latvia, Lithuania, and Greece, EU funds should become more accessible way, while drawing on its ethical capital. National AI training schemes should be launched to guarantee workforce preparedness, while corporate-led AI training schemes to workforce reskilling should be promoted by employers, particularly in Greece and the Baltic countries. Nevertheless, efforts encouraging AI literacy to make people ready for AI-driven employment marketplaces remains a critical issue to be solved.

The laggards' efforts to catch up with the EU most advanced AI countries should be incentivized. Investments beyond EU funding should be increased, either from the state budgets, through tax incentives, or through the creation of Public-Private Partnerships that stimulate AI incubators that connect startups with established businesses. AI education and especially adult education (workforce skilling and reskilling) should be systematically developed and supported by the Government and through EU funding. Such initiatives could entail free or subsidized AI training programs for employees in traditional industries, or the development of AI training hubs where businesses can access short-term upskilling programs for their workforce.

AI Ethical considerations and Regulatory Challenges

Denmark, Sweden, Belgium, Finland, Luxembourg, Netherlands, Slovenia (Cluster 1) have strong ethical frameworks, some countries also having AI Ethical Certification & Guidelines.

Austria, Germany, Malta, Ireland, Estonia, Croatia, Spain (Cluster 2) are somewhat divided, with Germany and Austria emphasizing AI legal compliance, Estonia and Spain focusing on responsible AI in public services, aligning with the EU AI Act.

Czechia, Slovakia, France, Greece, Latvia, Lithuania, Portugal (Cluster 3) have some initiatives, like France which created the National Digital Ethics Committee, the rest of the countries showing limited regulatory advancements and focusing on Open Data initiatives.

Italy, Cyprus, Hungary, Bulgaria, Poland, Romania (Cluster 4) are in the early stage of AI Ethics Development, still in the process of setting up AI ethics bodies.

Descriptive Statistics

A statistical analysis has been performed based on the AI Usage of the companies from countries from each cluster. Overall, there is a significant increase in AI usage from EU enterprises. If in 2023, over 8% of EU enterprises (with at least 10 employees) used AI technologies, in 2024, this percentage increased to 13.4%. The EU MS with the highest percentage of the enterprises that use AI technologies are illustrated in Figure 1 below. As it can be noticed the differences between the leaders and the laggards in AI usage are significant, ranging from 27.58% (Denmark) to 3.07% (Romania). The Table 6 below shows descriptive statistics data for AI usage in EU enterprises from 2023 and 2024.

Table 6. Descriptive statistics for AI Usage percentages from 2023 and 2024

Descriptive Statistics	EU 27		Leaders		Followers		Moderates		Laggards	
	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024
Mean	8.21	14.28	13.38	24.20	9.40	15.60	5.72	9.71	3.70	6.49
Standard Error	0.7958	1.3813	0.7002	0.7712	1.0089	1.3670	0.5247	0.3916	0.5022	0.7704
Median	7.86	11.31	13.81	24.37	9.18	14.9	5.88	9.81	3.675	6.94
Standard Deviation	4.1353	7.1773	1.8526	2.0405	2.6693	3.6167	1.3882	1.0361	1.2302	1.8870
Sample Variance	17.1011	51.5134	3.4321	4.1637	7.1254	13.0809	1.9272	1.0734	1.5134	3.5607
Kurtosis	-1.2193	-1.2088	-0.705	1.4094	-0.344	-1.7292	-0.914	-1.412	2.0655	2.0514
Skewness	0.3301	0.4402	-0.847	0.0353	-0.174	0.1874	0.3900	0.4472	-1.149	-1.416
Range	13.66	24.51	4.8	6.69	7.98	8.96	3.88	2.63	3.54	5.13
Minimum	1.51	3.07	10.37	20.89	5.19	11.31	3.98	8.63	1.51	3.07
Maximum	15.17	27.58	15.17	27.58	13.17	20.27	7.86	11.26	5.05	8.2
Count	27	27	7	7	7	7	7	7	6	6
Confidence Level (95.0%)	1.6359	2.8392	1.7134	1.8872	2.4687	3.3449	1.2839	0.9582	1.2910	1.9803

Source: Generated by authors, based on Eurostat (2025).

It can be noticed (see Table 6) that the range and standard deviation have significantly increased in 2024. This suggests that the inequalities in AI usages between leaders and laggards have increased. The above statistics confirm the ascending trend of AI usage in UE along with growing differences between leaders in AI adoption and the countries with a low adoption of AI technologies (See Figure 1 below).

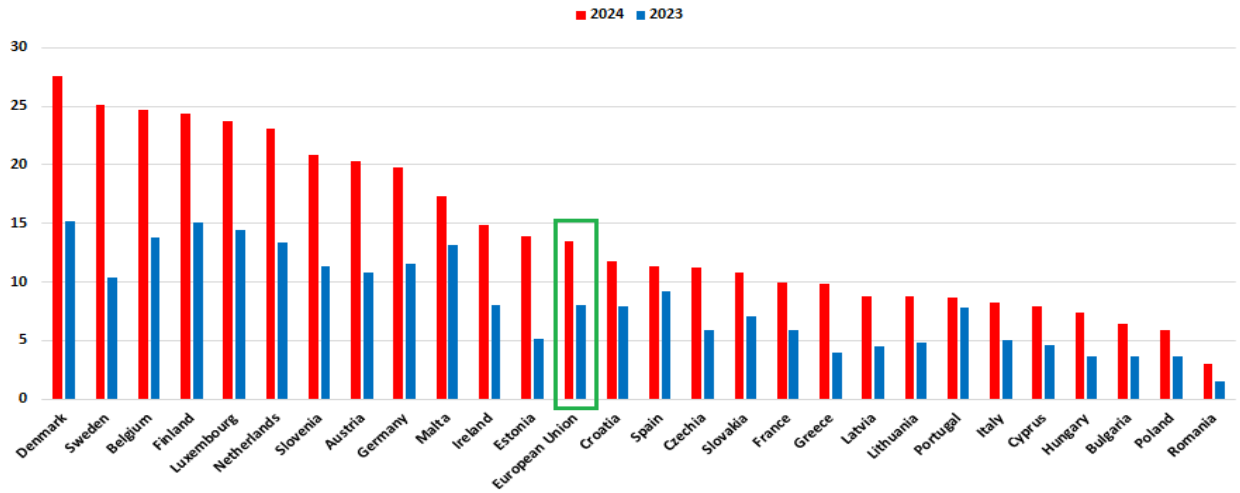

Figure 1. EU Enterprises using AI technologies in 2024

Source: Eurostat (2025).

Overall, there is an increase in AI usage on all the EU countries from 2023 to 2024. The highest increase in AI usage was recorded in Sweden and the slowest increase in Portugal. Differences between 2023 and 2024 suggest that the countries with high percentages of using AI in in 2023 tend to have more consistent growth in 2024 as well.

Across 2023 and 2024 large enterprises utilized AI the most (see Figure 2). Thus, in 2024, AI has been used by 41.17% of large enterprises, 20.97% of medium enterprises and 11.21% of small enterprises. In 2023, the AI has been used by 30.40% of large enterprises, 13.04 % of medium enterprises and 6.38 % of small enterprises.

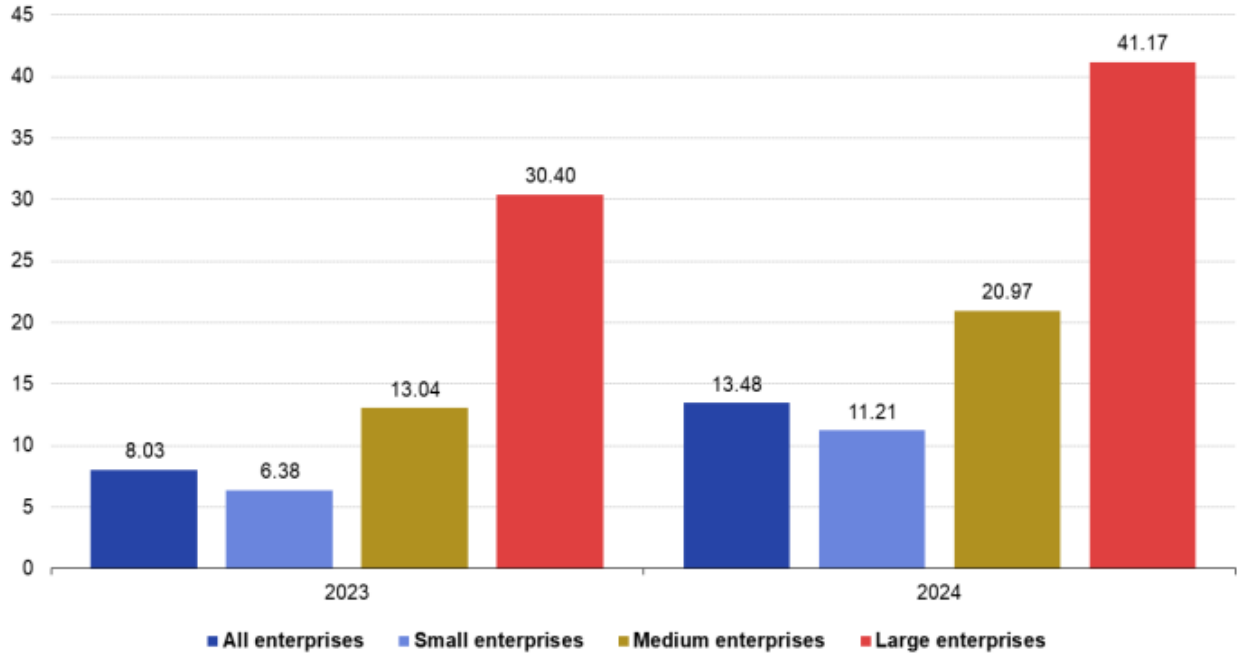

Figure 2. The percentage of EU Enterprises that have used AI technologies in 2023 and 2024
Source: Eurostat (2025).

The larger percentage of AI usage in large enterprises from EU countries can be explained by a number of factors including the investments needed to implement AI, complexity of such implementation projects or economies of scale (Eurostat, 2025). Given the higher percentage of AI usage in large enterprises comparing with medium and small enterprises, an extra focus should be granted to the relevant local, regional or EU level policies to increase the adoption of AI technologies in medium and small enterprises.

Conclusion

Following the comparative analysis of the AI national strategies in the EU and correlating them with the AI usage percentages of EU enterprises, the following major observations can be drawn:

Education and Training: Countries with high AI usage percentages among enterprises (such as Denmark, Sweden, Finland, etc.) support early education in digital skills, support teachers on specific training and offer diverse programs such as MOOCs or public-private partnerships. By contrast, the countries from cluster 4, lack sufficient own funding for more training initiatives or rely heavily on EU funding.

Investments: High-performing countries have successfully attracted investments from private sources and, also allocated significant government funding to R&D, promoting AI startups

and establishing innovation hubs (e.g. Belgium, the Netherlands, Finland). By contrast, countries from the clusters 3 and 4 face challenges related to AI infrastructure or regulatory constraints that may impact the private investments.

Workforce: lifelong learning and upskilling and reskilling programs are important in reaching high levels of AI usage in enterprises. Countries like Belgium, Finland, Slovenia have organized national training campaigns, however, the majority of the EU countries still haven't completely integrated AI in the training programs.

Significant disparities in AI adoption: The data shows consistent growth for the countries from cluster 1 (the leaders) that have succeeded in allocating investments in R&D, education, and lifelong learning. By contrast, the countries from cluster 4 (the laggards) record a slower growth rate, suggesting the need for additional commitments and more focused efforts.

Although countries from the clusters 2 and 3 (followers and moderates) have recorded progresses in the digital education programs and in stimulating the private investments such as Austria, Germany (followers) and France (moderates), the short-term trends seem to suggest that resources should be more clearly allocated towards supporting small and medium enterprises and regions less prepared for AI adoption.

Considering an analysis on company size for year 2024, the companies with over 250 employees adopt AI technologies much more than other categories (41,17%) as compared with companies with lower number of employees (under 21%).

Study Limitations

The literature review has focused on WoS and SCOPUS databases, leaving other potentially important research from other sources still unexplored. The analysis of the AI national strategies has been performed under a limited number of criteria. The statistical analysis has been performed on limited data- from 2023 and 2024 - which may limit the opportunities for advanced statistical analysis.

Future Research Directions

Future studies may use more powerful statistical analyses in order explore the complex link between national AI strategies and the AI usage across EU companies, such as spatial autocorrelation to see how the AI in the EU countries is influenced by their neighbors. For a more robust analysis of AI national strategies, additional comparison criteria such as AI governance, ethical considerations, and sectoral AI deployment can be included in order to achieve a more comprehensive comparative study. Furthermore, a future research direction will include the impact of the AI Act on National AI strategies of EU countries. Investigating the impact of AI Act on AI national strategies will remain a central theme for future research.

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