Employing AI in Regional Development: The Need for a Strategic Approach

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Abstract
Navigating the age of AI is challenging not only because of its novelty, but also because of its rapid progress and unpredictable impact. AI is substantially influencing the labor market, industrial services, agricultural processes, value chains and also the organization of workplaces. Thus, a better understanding of the potential of AI and its pitfalls becomes crucial when developing national strategies. The main focus of this article is to investigate if AI is fit for an overall balanced regional development. The process of setting up a policy framework for AI technologies is very complex and it is useful to learn from the experiences and achievements of other regions or countries that have successfully implemented or adopted AI in regional development. Therefore, to draw some lessons for Romania in designing the national AI strategy and related policies, we needed to explore the landscape of AI policymaking at the international level. In Romania, AI was born and advanced mainly in academia and the private sector, through research and innovative programs. The bottom-up approach in mainstreaming AI together with its cross-sectorial impacts raise important challenges for our policymakers because, as through the national strategy and related policies, they need to find a proper equilibrium, by creating environments that enable AI development and growth, while, simultaneously mitigating the risks posed by AI. In addition, equal distribution of the benefits of AI represents a key social concern. By analyzing the current and future opportunities and trends of AI in regional development and discussing the challenges and risks associated, along with exploring some examples and case studies from different regions or sectors that have successfully implemented or adopted AI, we consider that this article will be helpful for decision making and governance processes at different levels, to enable even faster scale development of AI for regional development.
The conclusion section briefly presents some recommendations and suggestions for Romania to improve its AI readiness and capacity for regional development and provides some suggestions for future research or action on AI in regional development.

Keywords: cross-cutting policies, partnership-driven approach, balanced regional development.

1. Introduction
In the age of artificial intelligence, countries and regions around the world are establishing strategies and initiatives to ensure that new technologies improve the lives of their citizens. Since 2017, when Canada published the world's first national AI strategy, the development of national policies and strategies focusing specifically on AI evolved, and according to OECD AI Policy Observatory, there are over 620 national AI policies from over 60 countries and the European Union [1]

Even if AI is considered to be a relatively new phenomenon, its progress and impact on society and the economy, ranks it among the most powerful technologists of our time, the technological progress being revolutionary. AI can contribute to regional development by improving efficiency, productivity, innovation, sustainability, inclusion, etc., in various sectors and activities, such as health care, education, transportation, manufacturing, etc..

In this context, national governments and regional and intergovernmental organizations have raced to put in place AI-targeted policies to maximize the opportunities AI presents in critical areas, like climate, agriculture, energy, public health, education, and cybersecurity [2] .

But, the opportunities that AI presents for socio-economic development should be taken into accont in correlation with the its risks, especially in critical areas such as cybersecurity, biosecurity, or safety. AI can be a key element in regional development, improving the economic, social and environmental aspects of different regions, but in the whole process of designing, developing, using and evaluating AI products, services and systems, the "different actors" involved should consider and mitigate associated risks that arise, such as ethical, social, legal, technical, etc..

The purpose of this article is to explore the opportunities and trends of AI in regional development, and to draw some lessons for Romania, which is a country with a low level of AI readiness and capacity compared to other European countries, but also has a high potential for AI development and adoption. Therefore, the main focus of this article will be to investigate the following 3 research questions:

- What are the current and future opportunities and trends of AI in regional development?;
- What are the challenges and risks of using AI in regional development?;
- What are the best practices and lessons learned from other regions or countries that have successfully implemented or adopted AI in regional development?.

By analyzing the current and future opportunities and trends of AI in regional development and discussing the challenges and risks associated, along with providing some examples and case studies from different regions or sectors that have successfully implemented or adopted AI, we consider that this article will be helpful for decision making and governance processes at different levels, to enable even faster scale development of AI for regional development.

The conclusion section briefly presents some recommendations and suggestions for Romania to improve its AI readiness and capacity for regional development and provides some suggestions for future research or action on AI in regional development.

2. AI in regional development

Artificial intelligence (AI) has been in development since the 1950s and is expected to be one of the biggest disruptors of the 21st century, with the impact affecting the economy, the built environment, society and most professions, including the planning profession [3].

In the field of regional science, AI is still an emerging topic, the main themes identified in study performed by Lazzeretti et al. in 2023 being: Industry 4.0, smart cities, big data, AI and related technologies (robotization, IoT, augmented and virtual reality) [4].

The literature on the role and impact of AI in regional development can be divided into two main streams, which are not mutually exclusive, but rather complementary, as they offer different insights and perspectives on how AI affects regional development:

- the micro-level effects of AI on individual sectors or activities in a region, such as healthcare, education, transportation, manufacturing, etc [5] [6] [7]
- the macro-level effects of AI on the overall economic, social, and environmental conditions of a region, such as growth, employment, innovation, sustainability, inclusion, etc..

Moreover, the systematic literature review on AI & economic development topic, performed by Qin et al. and published in the collection of studies "AI in the Knowledge Economy and Society: Implications for Theory, Policy and Practice" in 2023, identified five main research themes on the opportunities offered by AI in different areas [6]:

- AI supports intelligent decision-making;
- AI empowers social governance;
- AI enhances labor and capital;
- AI accelerates Industry 4.0;
- AI fuels innovation.

But these opportunities that accelerate regional economic development, embodied in improving efficiency, productivity, innovation, sustainability, inclusion, etc., come along with some challenges, in terms of ethical, social, legal, technical aspects.

Furthermore, due to each region's readiness and ability to absorb AI opportunities, interregional disparities may increase. Therefore, there is a need of a strategic aproach on how to use AI as a key driver of regional development, taking into account the potential inequalities it can generate. A wide range of sectors or individual activities at the regional level can benefit or be affected by AI, so the main focus of decision makers should be to ensure that AI is used in a responsible, inclusive and sustainable manner.

2.1. Opportunities and trends

The application of AI in regional development has the potential to address various challenges across different sectors, improve efficiency and sustainability, enhance quality of life, and stimulate economic growth in underdeveloped regions.

The automation of tasks and processes in various business sectors such as healthcare and biotechnology, education, transportation, manufacturing, logistics and agriculture will enhance productivity by streamlining operations, reducing costs and increasing efficiency. The advancements of various industries' outcomes will attract investments and talented and skilled workforce to the specific regions.

In addition, AI can enable the development of smart cities, providing a better quality of life for residents in specific regions by optimizing resource allocation and waste management; improving transportation systems to optimize traffic flow, reduce congestion and carbon emissions; and improving public services, including public safety through intelligent surveillance systems.

Also, regional development planning and management can be foster by AI powered algorithms in order to identify areas that need improvement, prioritize infrastructure development projects, and allocate resources more efficiently.

Furthermore, AI powered systems can be used to optimize the energy management, by analyzing the energy usage patterns, predicting peak demands, and recommending energy-saving strategies and integrating more effectively renewable energy sources such as solar and wind into the regional energy grid.

Withal, AI-based algorithms can be used to mitigate the effects of climate change by developing early warning systems for natural disasters and assisting authorities in their emergency response efforts.

In summary, AI has the potential to significantly impact regional development, but it is important to note that fostering innovation in AI applications specific to regional needs requires a high level of AI literacy. Therefore, it is critical that policymakers and stakeholders prioritize AI education and skills development programs in order to equip their workforce with the skills needed to participate in the AI economy. In this context, close collaboration between academia, industry and government is needed to facilitate knowledge sharing and promote innovation in AI applications specific to regional needs.

2.2. Challenges and risks

Beyond the opportunities that AI brings for regional development (overcoming the infrastructure gaps; increasing productivity in various industries by optimizing service operations, marketing and sales, product and service development, strategy and corporate finance and supply chain management; creating innovative digital solutions for urban and regional planning; enhancing creativity and culture, supporting learning and innovation; addressing climate change and green transition), it also raises ethical concerns such as data privacy, bias and the digital divide; job displacement due to automation and also, cybersecurity risks.

A major challenge relates to ethical issues, and it can be difficult to ensure that AI systems respect human rights, values and norms. By collecting personal and sensitive data, AI systems can expose individuals and regions to potential data breaches, cyber attacks or data misuse. It is therefore necessary to establish clear guidelines and regulations to address issues such as privacy, data protection and algorithmic transparency. Additionally, AI models rely heavily on the availability of high-quality data to provide solutions for decision makers. If, in some regions, the availability of relevant data is limited or outdated, fragmented or biased, the solution provided by AI algorithms will be suboptimal, with significant negative consequences. Furthermore, if the data used to develop AI models is biased or lacks diversity, it can lead to inequitable outcomes and perpetuate or even exacerbate existing inequalities.

Regions with better access to various resources such as infrastructure (including research centers, innovation centers and incubators that can stimulate entrepreneurship, attract investment and promote the growth of high-tech industries), financing and financial incentives (including public and private investments, grants, loans and venture capital), skilled and educated workforce (with an adequate level of AI knowledge and who can provide technical expertise and training programs to drive growth in specific regions) are more likely to benefit from AI adoption. But this can lead to a potential digital divide between regions, with some areas experiencing faster growth and development compared to others, affecting the goal of cohesion policies, which aim to reduce disparities and promote balanced development across regions and countries.

The adoption of AI technologies might lead to workforce displacement, with certain job roles being replaced by AI systems. The changing job market will potentially cause unemployment and social disruptions. At the same time the skill gap between the demand and availability of AI talent can be significant. Therefore, it is necessary to invest in retraining and upskilling programs to help individuals adapt to the new reality of labor market.

Lastly, cybersecurity risks are a significant concern as AI systems can be vulnerable to attacks and, if compromised, can have severe consequences for critical infrastructure and public safety. Misuse or unauthorized access to sensitive data collected by AI systems can have serious consequences for individuals and organizations, eroding public trust and hindering the adoption of AI technologies for regional development.

To address these challenges and risks, it is important to have a comprehensive approach that includes collaboration between governments, businesses, communities and AI experts to develop strategies that maximize the benefits of AI while reducing the associated risks. To ensure public trust, inclusiveness and sustainability, and a responsible deployment of AI in regional development, policy makers should develop ethical frameworks, regulations and norms, based on best practices on how to leverage AI for regional development.

3. Lessons for Romania

The process of setting up a policy framework for AI technologies is very complex and it is useful to learn from the experiences and best practices of other regions or countries that have successfully implemented or adopted AI in regional development. Therefore, to draw some lessons for Romania in designing the national AI strategy and related policies, we need to explore the landscape of AI policymaking at the international level.

According to OECD AI Policy Observatory, AI strategy is defined as "a policy document that communicates the objective of supporting the development of AI while also maximizing the benefits of AI for society." [8].

The Artificial Intelligence Index Report 2021 highlights the state of the art of different countries in setting national and regional AI strategies, which are policy initiatives that aim to guide the development and use of AI in different fields and sectors. These documents were classified in 3 main cathegotries [1]:

- published strategies:
    a) 2017: Canada, China, Japonia, Finland, United Arab Emirates.
    b) 2018: European Union (Coordinated Plan on Artificial Intelligence), France, Germany, India, Mexico, United Kingdom, Sweden, Taiwan.
    c) 2019: Estonia, Russia, Singapore, United States, South Korea, Colombia, Czech Republic, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Qatar.
    d) 2020: Indonesia, Saudi Arabi, Hungary, Norway, Serbia, Spain.
- strategies in public consultation: Brazil, Italy, Cyprus, Ireland, Poland, Uruguay.
- strategies announced: Argentina, Australia, Turkey, Bulgaria, Chile, Israel, Kenya, Latvia, Malaysia, New Zealand, Sri Lanka, Switzerland, Tunisia, Ukraine, Vietnam.

Even if, most of them share a similar format, that includes: goals, principles, priorities, actions, and indicators to measure, they differ in terms of scope, focus, funding, and implementation. Among similarities, we can list the following topics:

- promoting research and innovation in AI;
- developing human capital and skills for AI;
- fostering trust and ethical use of AI;
- ensuring inclusive and sustainable development of AI;
- enhancing international and multi-stakeholder cooperation on AI.

The Report offers active links to some of national and regional AI strategies, which are very useful for further investigations.

At the European Union level, there is a Coordinated Plan on Artificial Intelligence, first published in 2018 and revised in 2021, which sets out a joint approach to boost Europe's competitiveness and ensure trust in AI [9].

Furthermore, the European Commission's Joint Research Centre (JRC), the European Commission's science and knowledge service and the Organisation for Economic Co-operation and Development (OECD) published in 2021 a joined document "National strategies on Artificial Intelligence – A European perspective", which reviews the national AI strategies and identifies five key policy areas to apply AI for social and economic benefit [8].

- human capital;
- from the lab to the market;
- networking.
- regulation;
- infrastructure.

National approaches to AI and supporting policies differ in terms of strategic priorities, budget allocations, implementation timeframe, level of detail of proposed actions and sectoral focus [10].

Some examples of national and regional AI strategies are provided in the Communication from the European Commission, "Fostering a European approach to Artificial Intelligence", with the aim to learn from each other and to bring good practices to the European level [9]. Hence, it becomes important to monitor and examine national AI strategies in order to build synergies that shape the EU vision on AI.

Statistical information regarding Romania's progress in absorbing AI is presented in the AI-Watch platform of the European Commission [11] which monitors the development, uptake and impact of Artificial Intelligence for Europe.

According to available information on Romania's progress in improving its AI readiness and capacity, in 2020 our country launched an EU-funded project on the creation of a national framework in the field of AI for the period 2021-2027, but the deadline for publishing this strategy by at the end of 2022 was exceeded.

It is obvious that Romania is struggling with the development and implementation of the national policy framework in the field of AI. There is no universally valid formula, but some lessons in designing a national AI strategy can be drawn from the experience of other states.

First, it is important to establish a vision and mission statement that articulates the Romania's aspirations and values for AI development and use. The vision and the mission should comply with the European approach on AI.

Second, it is necessary to define a set of strategic objectives and priorities in line with the country's vision and mission, in order to address the key AI opportunities and challenges.

Addressing the ethical, legal and societal implications of AI involves close engagement and collaboration between experts from the public and private sector, government expertise, academia and the business sector, supported by technology and legal consultancy services. Therefore, an important step is to create a governance framework that defines the roles and responsibilities of various stakeholders, such as government agencies, industry, academia, civil society and even international partners.

For example, at the national level, policy initiatives on AI governance can be approached in two different ways:

- establishing ministries or regulatory bodies to take direct responsibility for AI;
- embedding of AI responsibilities into existing ministries.

In both scenarios, we strongly recommend AI training for Romanian government officials.

Another suggestion is to establish strategic frameworks or priorities for industry, academia and other government initiatives with a view to achieve a coordinated and comprehensive approach by integrating AI policies into operational plans.

The next step is to design the roadmap and action plan that outlines the specific initiatives, programs and policies that will be implemented to achieve the strategic objectives and priorities.

Last but not least is the establishment of a monitoring and evaluation mechanism that tracks the progress and impact of the national AI strategy and allows for feedback and adaptation.

To speed up AI advances, Romania must invest in education, research, and infrastructure. In this context, our recommendation is that Romania's national AI strategy should respond to the EU vision and be interconnected with other national policies, in order to promote the responsible and inclusive AI research, development and deployment.

In addition, we recommend the use of data and new data analysis methods to improve decision-making and planning processes. Romania's decision-makers should also focus on identifying new innovative financing mechanisms and adopting cross-sector and multi-stakeholder approaches in the planning and governance process of AI-targeted policies.

4. Conclusion and policy recommendations

Navigating the age of AI is challenging not only because of its novelty, but also because of its rapid progress and unpredictable impact.

AI is substantially influencing the labor market, industrial services, agricultural processes, value chains and also the organization of workplaces. Thus, a better understanding of the potential of AI and its pitfalls becomes crucial when developing national strategies.

In Romania, AI was born and advanced mainly in academia and the private sector, through research and innovative programs. The bottom-up approach in mainstreaming AI together with its cross-sectorial impacts raise important challenges for our policymakers because, as through the national strategy and related policies, they need to find a proper equilibrium, by creating environments that enable AI development and growth, while, simultaneously mitigating the risks posed by AI. In addition, equal distribution of the benefits of AI represents a key social concern.

In this context, Romanian policymakers, in their mission to pave the way for this AI-driven future and get maximum value from AI, should investigate the AI journeys of other countries and look at best practices that helped executing AI successfully. Networking, partnerships and the diffusion of good practice can be the path to a comprehensive and integrative national strategy for AI.

Last but not least, strengthening the knowledge base about AI and stimulating the awareness of decision makers about the enormous potential of using AI, but also the concrete risks, play a major role to enable the development of strategic and programming documents for regional development.

Our governors' mission is to focus significant and targeted investment in infrastructure, human capital, ethical design and value-based implementation of AI. Next, a diverse range of perspectives is needed to define problems and formulate policy objectives. Thus, expert consultations together with public consultation will help to assess the effectiveness of policies by ensuring the representativeness and diverse input of a wide range of stakeholders.

Summarizing the main findings of this research paper, there is a strong need for coordination across our government authorities, to improve Romania's regional development readiness and capacity in the field of AI and to ensure coherence within national policies, but also with the EU legislative framework regarding AI-targeted policies.

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