

## The European Union's Approach to Artificial Intelligence from a Territorial Perspective: The Case of DIHs and EDIHs Programmes

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### Abstract

**Aim:** The aim of the paper was twofold. Firstly, to identify and define the European Union's approach to Artificial Intelligence from the territorial perspective. The main aim was achieved through a detailed analysis of the EU strategic documents evoking regional and urban aspects of AI. Secondly, the significance of Digital Innovation Hubs as a key AI European policy instrument was assessed. In this paper, the author tried to answer the following research question: to what extent are the Digital Innovation Hubs a key policy instrument of the European Union's approach to AI from a territorial perspective?

**Methodology:** Literature review, desk research and text analysis (for EU strategic documents related to AI from the period 2018-onwards) are used as research methods in this paper.

**Results:** The results show that the territorial dimension of AI, especially in the context of the EU strategic documents, has only been discussed to a limited extent. However, there are indeed some EU initiatives with a focus on AI, or to a large degree – their digital aspects. It is the case of Digital Innovation Hubs being an instrument to strengthen SMEs' competitive position and boost their digital transformation combining a regional dimension.

**Implications and recommendations:** The paper builds upon the growing importance of AI in different socio-economic contexts. However, in the EU strategic documents related to AI, this issue has been discussed only to a small extent. DIHs and EDIHs are indicated as a main tool of the EU policy to deploy digital services (and AI-related services specifically) to companies in a regional dimension. The paper suggests to continue assessing the importance of DIHs and especially EDIHs in this context. The

challenge of digital transformation is huge for companies in the EU (according to the Digital Decade targets set for 2030 the AI take-up is 11% of enterprises in 2023 against 75% of enterprises targeted for 2030 (European Commission, 2023), and EDIHs are expected to be a main actor boosting this process in the EU context.

**Originality/value:** The paper builds upon the territorial dimension of the EU's approach to AI based on the EU strategic documents which is new in the literature. Moreover, it gives an extended overview of the DIHs and EDIHs programme in the context of AI, also suggesting fields for further research.

**Keywords:** digital transformation, Digital Innovation Hub, European Digital Innovation Hub, artificial intelligence (AI), EU

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## 1. Introduction

The question of whether machines can think has fascinated the human imagination for centuries, but only since 2011 the breakthroughs in machine learning and neural networks have significantly changed the Artificial Intelligence (AI) environment. The availability of enormous datasets and technological advances in Big Data, the Internet of Things, and fast connectivity make the unprecedented development of AI systems and services possible. AI is being implemented in numerous socio-economic contexts. At EU level there are diverse EU-funded AI initiatives, but only a subset of them has a territorial dimension; this is the case of Digital Innovation Hubs that target digital transformation of companies with a territorial approach. They bring together actors in the regional economy in order to join forces and boost SMEs' digital transformation building an ecosystem and cooperating with other entities across Europe. The vast majority of DIHs offer services related to AI. However, as the notion of AI is huge, the level of technological advancement of these services also vary across the EU.

The aim of the paper was twofold. Firstly, to identify and define the European Union's approach to AI from the territorial perspective (at subnational level, i.e. at regional or urban level). The main aim was achieved through a detailed analysis of the EU strategic documents evoking regional and urban aspects of AI. Secondly, the significance of Digital Innovation Hubs as a key AI European policy instrument concept was assessed, depicted as a main tool of this European approach to AI. In this paper, the author tried to answer the following question: to what extent are the Digital Innovation Hubs a key policy instrument of the European Union's approach to AI from a territorial perspective?

A literature review (on AI and Digital Innovation Hubs), desk research and text analysis (for EU strategic documents related to AI from the period 2018 onwards) were combined as research methods in this paper. These descriptive and analytical tools were employed to answer the research question.

The paper proceeds as follows. Section 2 addresses the AI definition, the technological nature, threats and benefits of its use. Section 3 depicts the EU approach to artificial intelligence from the territorial perspective. Section 4 identifies the key features of Digital Innovation Hubs in the context of the AI development in the EU. Section 5 concludes.

## 2. Artificial Intelligence – Definition, Benefits and Threats of Its Use

Artificial Intelligence (AI) is a notion used to describe machines performing human-like cognitive functions (e.g. understanding, learning, problem-solving, reasoning, or interacting). It encompasses different forms of cognition and meaning understanding (natural language processing, speech recognition) and human interaction (e.g. smart control, signal sensing, simulators). According to the OECD's definition: "An AI system is a machine-based system that is capable of influencing the

environment by producing an output (predictions, recommendations or decisions) for a given set of objectives. It uses machine and/or human-based data and inputs to (i) perceive real and/or virtual environments; (ii) abstract these perceptions into models through analysis in an automated manner (e.g. with machine learning), or manually; and (iii) use model inference to formulate options for outcomes. AI systems are designed to operate with varying levels of autonomy" (OECD, 2019). In the White Paper on Artificial Intelligence issued by the European Commission (2020, p. 2). AI is defined as "a collection of technologies that combine data, algorithms and computing power". Russell and Norvig (2016) indicated that AI definitions can be grouped into four categories: thinking humanly, thinking rationally, acting humanly, and acting rationally. As a result, approaches toward AI can also differ.

Scholars have been discussing the technological nature of AI. For Teece (2018), AI is considered to be an enabling technology with the potential to become a general purpose technology (GPT). For Vannuccini and Prytkova (2021) it is premature to consider AI as a GPT; in the future this technology will evolve hugely. Researchers investigated how AI can dramatically change the economy by transforming a wide range of sectors (Agrawal et al., 2019; OECD, 2023; Xiao and Boschma, 2023). Based on the processes that already happen nowadays it is assumed that AI is going to lead to unprecedented social and economic changes. Mankind is not able to predict the extent of these transformations (Cattaneo et al., 2020; Harari, 2018; Przegalińska and Oksanowicz, 2020; Śledziwska and Włoch, 2020). In which significant areas can AI be applicable at present? Here are some examples of use cases. Firstly, AI can improve healthcare services through the better prevention of diseases, and more precise and quicker diagnoses that can help or replace doctors' diagnoses. AI applications entered the health field in the early 1970s but now they are revolutionizing the industry being used in various spheres of medicine, such as diagnostics, personalized medicine, and the pharmaceutical industry to mention just a few (Mahajan et al., 2019). This is the case not only in countries that are digital transformation leaders, but increasingly in developing countries in which citizens have very limited access to healthcare services (Sarkar and Mateus, 2022; Sukums et al., 2023). Secondly, AI is gradually being introduced in the business sector to improve the efficiency and cost reduction of production systems (through predictive maintenance), to improve the efficiency of the agricultural sector, and to contribute to climate change mitigation.

Moreover, the territorial dimension of AI can be examined from several perspectives. Urban and regional authorities can either use AI-based tools, applications, algorithms to data collection, interpretation and analysis in support of town planning, real estate management, traffic management, public transport management, waste or street light management, environment, education, healthcare services to name only some examples<sup>1</sup>, or they can support the use of AI by other regional stakeholders such as SMEs, large companies, universities, and start-ups. This second approach can be implemented through diverse regional, national or European policies (regional policy, public health policy, entrepreneurial policy, environmental policy etc.). These are only selected AI usages, and soon will be more numerous as new solutions based on AI are discovered and implemented systematically in different spheres of human life.

The transformative role of AI is largely discussed from different viewpoints, however the analyses taking a territorial perspective are still rather scarce. In this context, one should mention that the significance of AI for regional development was explained in the literature not directly, but from a larger perspective taking into consideration different ICT technologies (e.g. a variety of applications, devices, networks, and services that enable people to interact with each other in their daily lives) and only recently studies investigating the importance of AI at the regional level are being published (i.e. Xiao and Boschma, 2023; Cicerone et al., 2023; Lazeretti et al., 2023).

When discussing the widespread benefits of artificial intelligence, one cannot ignore the diverse threats it brings. As AI becomes more sophisticated, the voices warning against the potential dangers of AI grow louder. Data scientists are still not able to fully explain how AI works (the decision-making process of a machine-learning model is often referred to as a black box). As a consequence, when decisions are made by AI, it is difficult for the end user to understand the reasoning behind them which can make the use of AI limited and generate fears. Job losses due to AI automation are another danger

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<sup>1</sup> For more details see: (*Comment les collectivités...*, pp. 20-27).

connected to AI development, often quoted by its opponents. The starting point in this context is the fact that digital technologies can automate in particular routine tasks (mid-skill routine jobs are most at risk from AI – according to diverse estimations 34% of European jobs are at risk) (Autor, 2022). Among other dangers of Artificial Intelligence, one can mention: social manipulation through AI algorithms, social surveillance via AI technology (with the much discussed case of facial recognition technologies widely used in China) limiting privacy, and different biases due to AI, widening the socio-economic disparities as a consequence of AI (Thomas, 2022).

### **3. The EU's Approach to AI – a Territorial Perspective Based on EU Strategic Documents**

AI has been attracting attention among scholars and regional authorities due to its disruptive nature and enormous growth potential. Despite numerous discussions related to the advantages and barriers of AI development, there is relatively less debate about the territorial dimension of AI use, especially at EU level. The European Union only in 2018 started to implement explicit policies, agendas, and strategies to face the economic, social and technological challenges linked to AI. Before this date, AI issues were investigated in the context of the overall EU digital policy (Digital Single Market, Digital Agenda for Europe). These digital strategies – having a holistic approach – have impacted to a large extent the development of diverse AI enablers such as infrastructures, skills, technological standards and business investments (European Commission, 2020).

The growing attention of the EU to AI can be explained by the increased competition from China and the US regarding AI, as well as by numerous calls for action from different stakeholders (e.g. policy-makers, industry, academia representatives). These factors pushed the EU to formulate a framework for AI legislation and investments. In 2018 the European Commission published the “Artificial Intelligence in Europe” communication formulated around three main pillars: boosting the EU’s technological and industrial capacity of AI, preparing for socio-economic challenges brought about by AI, thus ensuring an adequate ethical and legal framework corresponding to EU values. The EU’s vision of AI is centred around the concept of ethical AI, which can be considered a distinctive feature when compared to the Chinese and US approaches (Pellegrin et al., 2021, pp. 42-43). At the same time, the European Commission cooperates with the Member States in order to coordinate and implement AI-related actions, in particular national AI plans in different EU Member States. Moreover, in 2018 a multi-stakeholder partnership on AI was launched – the European AI Alliance – to assist policy development. This is an open policy dialogue on AI, engaging approximately 6000 stakeholders through public consultations, regular events and online exchange forums, which are all shaping the European ecosystem of excellence and trust in AI and robotics (European Commission, n.d.a). In April 2019, the High-Level Expert Group on AI presented Ethics Guidelines for Trustworthy Artificial Intelligence (a set of seven key requirements that AI systems should meet in order to be deemed trustworthy). In February 2020 the European Commission issued “White Paper on AI: a European approach to excellence and trust”. In July this year, the High-Level Expert Group on Artificial Intelligence (AI HLEG) presented their final Assessment List for Trustworthy Artificial Intelligence. In April 2021 the European Commission published a proposal for a Regulation laying down harmonised rules on AI (the Artificial Intelligence Act – AI Act). This event can be considered the culmination of the EU’s efforts so far to build the first ever legal framework of AI addressing the risks of AI (categorising them into four different risk levels: unacceptable, high, limited, and minimal), provides a definition of AI, introduces specific requirements for high-risk systems and operators, bans AI applications contradictory to the EU values, and puts Europe as a leader in legal rules on AI. This regulation proposal is also key to build an AI ecosystem in the EU Member States. It reaffirms the willingness of the European Union to balance the risks and opportunities brought about by AI, to mobilise public sources of funding and to guarantee ongoing coordination between Member States on this matter (Pellegrin et al., 2021, p. 44). The European Commission aims to address the risks provoked by specific uses of AI through a set of

complementary, flexible rules. The proposed framework gives AI developers, deployers and users the clarity they need by intervening only in situations that the existing national or EU rules do not cover. This proposal needs to follow an ordinary legislative procedure, hence its conclusions could even take some years. So far, several EU institutions have expressed their opinions on this piece of legislation: the European Economic and Social Committee in November 2021; the European Central Bank and the Committee of the Regions in December 2021. The French Presidency Compromise text on the AI Act was published in July 2022 (European Commission, A European approach to artificial intelligence). Moreover, a heated debate around the AI Act has started worldwide, engaging different stakeholders from academia, business and other interested parties. Their representatives express diverse viewpoints as regards the necessity to regulate the functioning of AI at economic and social levels. In many cases they suggest not to regulate this sphere with complex legal acts in order for the European companies not to lose competitive advantage over Chinese and US companies. The EU AI Act will thus continue to be subject to debate until the end of the legislation process.

The EU strategic approach towards AI focuses on regulation, coordination and funding with a view to developing AI in a way that is in line with EU values and principles. That is why an emphasis on ethical aspects and risks is a distinctive feature of the European approach to AI compared to China and the USA. However, the key EU documents related to AI do not dedicate wide attention to territorial issues such as the differences in impact on cities and regions across the EU, territorial inequalities, the role of regional and local authorities in AI implementation across the EU, etc. According to Pellegrin et al. (2021, pp. 48-49), the following terms: city/cities, urban/rural, territory/territorial appear only ten times in all the documents related to AI published by the following institutions: the European Parliament, the European Commission, The EU Council, the Committee of the Regions, the European Economic and Social Committee in the 2018-2021 period. In this study, in order to check the reference of AI-related EU strategic documents to regional or urban aspects, the author implemented the same framework of analysis, but used a new set of keywords: city/cities, urban, region/regional (Table 2) and updated the set of analysed documents (from 2018 onwards). The results show that the reference to regional/urban issues in the EU strategic documents related to AI was much larger than in the study by Pellegrin et al. Nevertheless, a high number of occurrences of urban/regional-related words appeared only in the case of 3 out of the 21 studied documents (with 21, 41, 43 occurrences of urban/regional-related words respectively). In the vast majority of the analysed documents this territorial dimension was very limited or non-existent (in 9 out of the 21 documents there was no reference to any urban/regional-related words). One can have the impression that these aspects were overlooked.

Table 1. Reference to regional or urban aspects in the main EU strategic documents dedicated to AI

Name of the EU institution	Title of the EU document	Number of occurrences of urban/regional-related words
European Commission	2018 Commission Communication on Artificial Intelligence for Europe	4 (2 regions, 2 regional)
	2019 Commission Communication on Building Trust in Human-Centric Artificial Intelligence	0
	2020 White Paper on Artificial Intelligence – A European Approach to excellence and trust	2 (1 region, 1 regional)
	2021 Commission Communication on Fostering a European Approach to Artificial Intelligence. Coordinated Plan on Artificial Intelligence 2021 Review	41 (6 urban, 10 cities, 7 region, 18 regional)
	2021 European Commission: Proposal for a regulation laying down harmonised rules on AI <sup>2</sup>	1 (regional)

<sup>2</sup> Legislation proposal.

European Parliament	2020 Parliamentary Resolution on the Framework of Ethical aspects of Artificial Intelligence, Robotics and Related Technologies	2 (region)
	2022 Proposal for a Directive on adapting non contractual civil liability rules to artificial intelligence	0
	2020 Parliamentary Resolution on a Civil-Liability Regime for Artificial Intelligence	0
	2020 Parliamentary Resolution on Intellectual Property Rights for the Development of AI Technologies	0
	2021 Parliamentary Resolution on AI in Civil and Military uses	0
	2021 European Parliament OPINION of the Committee on the Environment, Public Health and Food Safety on the Artificial Intelligence Act	2 (regional)
	2022 European Parliament OPINION of the Committee on Industry, Research and Energy on the Artificial Intelligence Act	3 (2 region, 1 regional)
	2022 European Parliament OPINION of the Committee on Transport and Tourism on the Artificial Intelligence Act	6 (2 region, 4 regional)
	2023 Amendments adopted by the European Parliament on 14 June 2023 on the proposal for a regulation of the European Parliament and of the Council on laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain Union legislative acts <sup>3</sup>	7 (region/regional)
Council of the European Union	2019 Council Conclusions on the Coordinated Plan on the Development and Use of AI Made in Europe	1 (regional)
	2020 Council Conclusions on the Charter of Fundamental Rights – Focus on AI and Digital Change	0
European Economic and Social Committee	2018 EESC Opinion on the Commission Communication on Artificial Intelligence for Europe	0
	2021 EESC Opinion on the Coordinated Plan for Artificial Intelligence	3 (1 cities, 2 regional)
	2021 EESC Opinion on the Regulation of Artificial Intelligence	0
Committee of the Regions	2019 COR Opinion on Artificial Intelligence for Europe	21 (1 urban, 2 cities, 7 region, 11 regional)
	2021 COR Opinion on the White Paper on Artificial Intelligence	43 (in the majority of cases a reference to regional authorities)
European Central Bank	2021 European Central Bank: Opinion on the AI Act	0

Source: own elaboration.

Note: Urban or regional-related words are the following: city/cities, urban, region/regional.

However, there are some explicit references to regional and urban level in selected AI strategic documents issued by the EU (see Table 1). In this respect, one can cite the Coordinated Plan on Artificial Intelligence 2021 Review which pushes for the development of AI within the public sector in different EU Member States, including local administrations (e.g. through the development of AI algorithm registries to increase citizen trust, the use of catalogues of AI-enabled applications for administrations to increase the take-up of AI by the public sector, public procurement for AI, etc.). The importance of Digital Innovation Hubs as an instrument to spread digital transformation of companies at regional level was emphasized in the Communication of the European Commission from 2021 (this topic is further developed in Section 4). Overall, the urban and regional dimension of AI is not explicitly addressed in the EU strategic documents related to AI (with one exception regarding Digital Innovation Hubs). This limited attention to AI in policy documents contrasts with the fact that AI-based services and applications are already impacting regional and urban development. They are thus developed through multiple programmes and instruments related to ICT development or digital transformation in the EU in general (e.g. smart specialisations, diverse ERDF-funded initiatives, Smart Cities Marketplace). The absence of territorial references to AI in the EU strategic documents is thus similar to China and the USA which do not pay a great attention to these issues in their AI policy documents.

<sup>3</sup> Legislation proposal.

#### 4. Digital Innovation Hubs as a Policy Instrument to Use AI by European SMEs<sup>4</sup>

The limited interest towards territorial aspects related to AI in the EU strategic documents does not mean the absence of EU-funded instruments or initiatives dedicated to AI. There are indeed some EU initiatives with a focus on AI or to a large extent, digital aspect, yet only a subset of these initiatives can be presented as related to AI in the strict sense. Moreover, in many cases these initiatives are not presented as those contributing to territorial cohesion, but rather as targeting specific areas (e.g. digital transformation of companies, public transport) with a territorial approach. This observation is of key importance as one attempts to indicate the main EU measures devoted to AI deployment at subnational level. In this context, Digital Innovation Hubs are key examples of such an instrument combining the digital transformation of SMEs through the development of ICT, including the AI and regional dimension. This regional dimension can be thus understood differently. Initially, the intention of the European Commission was to provide every NUTS 2 region in the EU with at least one DIH (in order for any business in Europe to have access to a DIH at “a working distance”) (European Commission, 2017). In practice, the term *region* referred to different types of regions as regards the geographical coverage of a DIH activity: NUTS 2 or groupings of NUTS 2 regions.

What are the origins of this programme? The European Commission launched on 19 April 2016 the first industry-related initiative of the Digital Single Market package. The Commission intended to trigger further investments in the digitisation of industry and support the creation of better framework conditions for the digital industrial revolution. One of the most important pillars of this programme is the activity to develop a network of Digital Innovation Hubs (DIHs), one-stop-shops with a not-for-profit objective that help companies (in particular SMEs) to become more competitive with regard to their business/production processes, products or services using ICTs. They are based upon technology infrastructure (a network of competence centres that existed before the launch of this programme) and provide access to the latest knowledge, expertise and technology to support their customers with piloting, testing and experimenting with digital innovations. Companies across the EU (especially SMEs) interested in diverse digital services can contact a DIH in order to be provided with a digital service. These services are focused on four areas: 1. networking, 2. skills, 3. ‘test before invest’, 4. access to finance. From these four categories of services provided by DIHs, the third one is of key importance as the other three categories of services can be easily provided also by other intermediaries such as science and technology parks, business incubators, ERDF-funded or Horizon projects etc. The provision of services using the ‘test before invest’ opportunity is thus a distinctive feature of a digital innovation hub that gives an opportunity for SMEs to test a technology before acquiring it.

Digital Innovation Hubs were financed under the Horizon 2020 programme for the 2014-2020 period (EUR 500 million) with the support of DG CONNECT. DIHs mobilised different stakeholders (companies, public services, universities, government and research centres – the form of an entity engaged in the programme depended also on a regional setting) around digital projects in a regional context (Pellegrin et al., 2021, pp. 48-51).

According to the DIH catalogue<sup>5</sup>, as of August 2023, there were 655 fully operational or in preparation DIHs across all the EU member states. Of these DIHs, 456 were related to AI (offered services based on

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<sup>4</sup> The empirical data about DIHs and EDIHs in the EU come from the desk research on DIH catalogue available on the Smart Specialisation Platform of the European Commission up till August 2023, EDIH catalogue of the EC, selected DIHs and EDIHs websites as well as from the direct participation in the EDIH Summit that took place from May 31<sup>st</sup> to June 1<sup>st</sup> 2023 in Brussels.

<sup>5</sup> The Digital Innovation Hubs Catalogue (yellow pages) hosted under the JRC Smart Specialisation Platform was created in 2018 to provide a geographical mapping of DIHs in the EU across diverse competences, selected digital technologies offered, market sectors, type of services offered to SMEs etc. The information provided in the DIH catalogue was based on self-declaration of a DIH and before a DIH appeared in the catalogue, its profile was verified for compliance with the following criteria: 1. Being part of a regional, national or European policy initiative to digitise industry; 2. Being a non-profit organisation; 3. Having a physical presence in the region and present an updated website explaining the DIHs' activities and services to boost digital transformation of SMEs or mid-caps; 4. Providing at least three examples of how

AI). However, taking into account the validity of data provided by the DIH catalogue, it is extremely hard to assess to which extent these data are correct. The level of technological advancement of these services also differed: in the majority of cases, DIHs offered general information about the potential uses of AI to SMEs. There were also selected DIHs that offered dedicated services in robotics based on AI solutions. This was especially the case of DIHs grouped in AI-related networks in robotics such as: RIMA Network, DIH<sup>2</sup>, DIH-HERO, Trinity.

For the period 2021-2027, renewed European Digital Innovation Hubs have been proposed as a digital policy instrument. European Digital Innovation Hubs (EDIHs) support SMEs, mid-caps and public sector organisations (a new actor compared to the DIH programme) to improve business or production processes, products, or services using digital technologies and to become more competitive. They provide access to technical expertise and testing, as well as the possibility to 'test before invest'. EDIHs combine the benefits of a regional presence with the benefits generated by a pan-European network. Numerous EDIHs are based on existing clusters, other intermediaries or include organisations that are part of Enterprise Europe Network (EEN) consortia. They also act as the nearest point of entry to all the different EU-funded AI activities in Europe, such as the Testing and Experimentation Facilities (TEFs).

EDIHs were selected through a two-step process. Firstly, EU Members and Associated States preselected their candidate entities. National and regional authorities played a key role in the identification process of suitable candidates for EDIHs. Secondly, the preselected entities participated in a European call. With the adoption of the Digital Europe Programme work programme (DIGITAL), the first call for EDIHs has already been completed with 136 grants. According to the EDIH catalogue of the EC, there are in total 228 EDIHs: funded under the Digital Europe Programme or Seals of Excellence (positively evaluated in a European call but not funded by regional or national resources). Out of 228, there are 169 EDIHs offering AI and decision making services to companies or public sector organisations (accessed: 20.10.2023). As EDIHs are only starting their operations (it is expected that the financial agreements between EDIHs and the Member States authorities started to be operational up to the end of 2023), it is for instance impossible to assess the extent to which AI-related services will be offered by the EDIHs in future. However, one can expect that solutions based on AI will be sought by European SMEs and mid-caps in order to face the digital transformation challenges.

## 5. Conclusions

Artificial Intelligence is a fast evolving family of technologies that can bring a wide array of economic and societal benefits. By optimising operations and resource allocation, improving prediction, and personalising service delivery, the use of AI can provide key competitive advantages to companies and support socially and environmentally beneficial outcomes, for example in healthcare, farming, education and training, infrastructure management, energy, transport and logistics, public services, security, justice, resource and energy efficiency, and climate change mitigation and adaptation. However, the same elements that build the socio-economic benefits of AI can also bring about new risks or negative consequences for individual citizens or society as a whole.

As mentioned in the paper, the EU strategic approach towards AI focuses on regulation, coordination and funding in line with EU values and principles. Despite numerous debates on AI, its territorial dimension, especially in the context of the EU, has been discussed so far to a limited extent. The

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a DIH has assisted a company in digital transformation [<https://s3platform.jrc.ec.europa.eu/dihs-national-analysis>]. These official criteria of appearing in the DIH catalogue were fulfilled once a DIH decided to be part of this catalogue, but unfortunately in the meantime the data provided by the DIHs were not updated regularly. As a consequence, this catalogue was out of date in many cases. It was removed in August 2023 and at present one can have access only to a new catalogue of European Digital Innovation Hubs comprising 405 entities in total: <https://european-digital-innovation-hubs.ec.europa.eu/edih-catalogue> (accessed: 20.10.2023).



analysis of the EU strategic documents related to AI has shown rather limited attention to these issues. Nonetheless, there are indeed some EU initiatives with a focus on AI, or to a large extent – on the digital aspects. The paper discussed the concept of Digital Innovation Hubs as an instrument to strengthen SMEs' competitive position and boost their digital transformation. The programme has been implemented from 2016 onwards (with renewed European Digital Innovation Hubs as digital policy tools for the period 2021-2027). The vast majority of DIHs and EDIHs are linked to AI. DIHs and EDIHs are presented as a key instrument of the EU digital policy to support companies and public sector organisations (in the case of EDIHs) at regional level in terms of going digital and deploying the use of digital technologies. The deployment of AI-related services by EU companies is one of the aims of this programme. Thus DIHs and EDIHs follow a territorialised logic, by providing services around ICT (and in some regions around AI in particular) for a given region, and they can also contribute to the development of regionalised Smart Specialisation Strategies (Pellegrin et al., 2021, pp. 50-51).

Referring to the research question formulated in this paper, DIHs and EDIHs are thus suggested to be the key European AI policy instruments in the EU strategic documents with a territorial dimension. Assessing the impact of DIHs and EDIHs on the process of digital transformation of companies needs further research as this evaluation has only commenced, and it is also difficult from the perspective of the availability of relevant data. As the EDIH programme was formally launched in the second part of 2023, one needs at least one year to observe the first tangible results of this programme (services provided to SMEs, mid-caps or public authorities in the area of AI or digital transformation in general; Key Performance Indicators reported to the European Commission through a dedicated tool on the EDIH Network portal; familiarisation of the companies with the EDIHs services portfolio etc.). In this way, EDIHs' performance will be possible to assess and their impact on the digital transformation of companies will be evaluated as well. One can expect that they will show to be a significant tool to boost these processes at regional level. Taking into account the growing importance of AI for cities and regions, studies in this field have shed light on AI features, and paved the way to make a better use of AI potential for regional and urban stakeholders. Hence, further research in the field should focus on the assessment of the performance of the EDIH programme, and linked with other programmes launched and financed by the European Union in terms of digital transformation and AI deployment (i.e. the European Chips Act that entered into force on 21 September 2023, European Data Strategy, Testing and Experimentation facilities). It is also of importance to examine other actors of the AI ecosystem being built in Europe in order to face the competition from China and the USA, and can be done e.g. in the context of territorial innovation models (Moulaert & Sekia, 2003; Doloreux et al., 2019; Pires et al., 2019).

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## Europejskie podejście do sztucznej inteligencji z perspektywy terytorialnej na przykładzie programów DIH i EDIH

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### Streszczenie

**Cel:** Cel artykułu jest dwójaki. Po pierwsze, jest nim identyfikacja i charakterystyka podejścia Unii Europejskiej do sztucznej inteligencji z perspektywy terytorialnej. Osiągnięcie tego celu odbywa się poprzez szczegółową analizę dokumentów strategicznych UE odwołujących się do regionalnych i miejskich aspektów AI. Po drugie, oceniane jest znaczenie hubów innowacji cyfrowych jako kluczowego instrumentu polityki UE w zakresie sztucznej inteligencji. W artykule autor stara się odpowiedzieć na następujące pytanie badawcze: w jakim stopniu huby innowacji cyfrowych są kluczowym instrumentem polityki Unii Europejskiej do sztucznej inteligencji z perspektywy terytorialnej?

**Metodyka:** W artykule jako metody badawcze wykorzystano przegląd literatury, *desk research* i analizę tekstów (w przypadku dokumentów strategicznych UE dotyczących sztucznej inteligencji od 2018 r.).

**Wyniki:** Wyniki pokazują, że wymiar terytorialny AI, zwłaszcza w kontekście dokumentów strategicznych UE, był dotychczas omawiany w niewielkim stopniu. Rzeczywiście jednak istnieją pewne inicjatywy UE skupiające się na sztucznej inteligencji lub w dużej mierze – aspektach cyfrowych. Tak jest w przypadku hubów innowacji cyfrowych jako instrumentu wzmacniającego pozycję konkurencyjną MŚP i pobudzającego ich transformację cyfrową, łącząc przy tym wymiar regionalny.

**Implikacje i rekomendacje:** W artykule omówiono rosnące znaczenie sztucznej inteligencji w różnych uwarunkowaniach społeczno-gospodarczych. W dokumentach strategicznych UE związanych z AI kwestia ta jest jednak poruszana w niewielkim stopniu. DIH i EDIH są wskazywane jako główne narzędzia polityki UE mające na celu wdrażanie usług cyfrowych (w szczególności usług związanych ze sztuczną inteligencją) dla przedsiębiorstw w wymiarze regionalnym. W artykule sugeruje się dalszą ocenę znaczenia DIH, a zwłaszcza EDIH w tym kontekście. Wyzwania transformacji cyfrowej są ogromne dla przedsiębiorstw w UE (według celów dekady cyfrowej wyznaczonych na rok 2030 w 2023 roku 11% przedsiębiorstw wykorzystywało sztuczną inteligencję w porównaniu do 75% przedsiębiorstw, które powinny wykorzystywać AI w 2030 r. (Komisja Europejska, 2023), a oczekuje się, że EDIH będą głównymi podmiotami stymulującymi ten proces w kontekście UE.

**Oryginalność/wartość:** W artykule odwoływano się do terytorialnego wymiaru podejścia UE do sztucznej inteligencji, opierając się na dokumentach strategicznych UE, co jest nowością w literaturze. Ponadto naszkicowano rozszerzony przegląd programu DIH i EDIH w kontekście sztucznej inteligencji, sugerując także pola do dalszych badań.

**Słowa kluczowe:** transformacja cyfrowa, hub innowacji cyfrowych, europejski hub innowacji cyfrowych, sztuczna inteligencja, UE

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