

# **Exploring an Innovation Policy for Public AI – Rationales, Examples and Learning**

Policy brief of the project “Public AI”

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Place: Karlsruhe

Date: December 2024

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**Recommended citation**

Schwäbe, C.; Hummler, A.; Blind, K. (2024): Exploring an Innovation Policy for Public AI – Rationales, Examples and Learnings. Karlsruhe: Fraunhofer ISI.

**Published**

December 2024

**Doi**

10.24406/publica-3989

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## Executive Summary

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Since the launch of ChatGPT in 2022, AI applications have become even more widespread across personal, business, and public domains. However, AI applications have the potential to extend beyond text generation to improve governance, support decision-makers, and engage in participatory processes. With its broad impact, AI is now seen as a general-purpose technology (Crafts 2021) crucial for societies and democratic processes.

Public AI emphasizes collective involvement in AI's governance and infrastructure. Key inputs – data, computational resources (compute), algorithms, and human labor – are necessary for meaningful public engagement. Public AI is further defined by three dimensions: trustworthiness (ensuring privacy, fairness, transparency), social innovation (focusing on societal challenges rather than profit), and AI as a common (creating accessible resources and participation). Examples include Estonia's "bürokratt," an AI for public services, EU's GAIA-X, which provides secure cloud services as an alternative to private giants like Amazon, or the non-governmental axolotl AI, which provides an open-source tool for a finetune training of the usability of AI models.

A coherent policy mix is essential to support Public AI, where market and system failures exist and can be resolved by an involvement of the public. Moreover, the use of AI needs an alignment to societal challenges such as sustainability transformations or national technological sovereignty. Governments can offer funding, regulatory frameworks, and educational resources, aligning AI development with societal values and fostering technological sovereignty. Supported by the Mozilla Foundation, Fraunhofer ISI researchers are inviting input from AI practitioners and policy experts to advance a Public AI concept lowering access and use barriers of and fostering investments towards trustworthy and innovative AI applications addressing societal challenges.

*Dear ChatGPT, what do you think in one sentence regarding the following question: How far do we need publicly financed and/or participatory organized artificial intelligence infrastructures?*

*ChatGPT: Publicly financed and participatory organized AI infrastructures are crucial to ensure equitable access, transparency, and accountability in AI development and deployment, fostering innovation while safeguarding public interests.*

*Does this mean - from your perspective - that private AI companies need to be more intensively regulated and better embedded to public activities?*

*ChatGPT: Yes, it implies that private AI companies should be more intensively regulated and better integrated with public initiatives to ensure their operations align with societal values, transparency, and accountability, while also contributing to the broader public good.<sup>1</sup>*

## Introduction

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Artificial intelligence (AI) has already achieved a broad variety of business applications. AI applications do not only support text writing, generate pictures and videos or provide a more intelligent alternative to search engines, they are also capable to improve communication in the form of intelligent chat bots or as conversation partners representing the role of psychologists, priests or friends. Moreover, AI is seen as a tool with the potential to improve the governance of firms, public organizations and of democratic processes. As a monitoring and advice tool it can support decision makers and as an intelligent interviewer, it can talk with stakeholders or the public to improve participatory processes. This broad range of applications in the private, business and public space underlines the character of AI as a general-purpose technology (Crafts 2021) – like the role of social platforms since the 2000s.

As a general-purpose technology, AI is of crucial importance for industries, societies, politics, including democracy, and will have a significant impact on inequality and global wealth distribution. While some current occupations are increasingly becoming irrelevant, new tasks revolving around AI training and application will become more important than ever. As a result, the disruptive potential of AI poses the question how to deal with such potential social inequalities. Apart from the impact of AI applications themselves, the access to AI infrastructures raises additional questions regarding social coherence as equal access to AI becomes a central factor allowing firms and people to profit from AI in a fair competition. This is especially true for those AI infrastructures representing a prerequisite for successful societal (demographic) or ecological transformations. AI has the potential to allow aging societies to cope with demographic losses in the workforce (Tiku 2023), to provide the basis for a sustainable circular economy by allowing an intelligent use of resources in production, consumption and recycling (Piétron et al. 2023), and may represent the key to create smart

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<sup>1</sup> Answers of ChatGPT on the described prompts generated on September 28<sup>th</sup> 2024.

electric grids capable to deal with volatile renewable energy feed-ins and power demand dynamics (e.g., Ayub Khan et al. 2023).

As AI will have potentially severe geopolitical implications, a public perspective on AI is also required in the context of international competitiveness. If countries depend on foreign AI infrastructures and knowledge, the general-purpose technology character of AI implies that these governments may have an increasing impact on national value chains. Technological sovereignty, therefore, requires sufficient nationally sourced AI capacities or needs to be open and trustworthy for all everywhere, which justifies a stronger role of the state in providing and regulating AI infrastructures.

However, acknowledging the economic, social and political importance of AI does not answer the strategic and operational questions of how the public sector needs to be part in the provision and application of AI infrastructures. The design and implementation of useful public AI infrastructures represent a research topic, for which experiences already exist, but which has not yet been discussed structurally. By raising the importance of public AI, a team of researchers from Fraunhofer Institute for Systems and Innovation Research (ISI), funded by the Mozilla Foundation, aims at initiating the required research and debate on an innovation policy mix for Public AI. We aim to answer the following research questions:

- What are the definitions, delineations, and rationales for Public AI?
- What kinds of Public AI exist already?
- What is the impact of Public AI on research and innovation?
- How can policy-making support Public AI?

This policy paper aims at raising attention to our research case and the necessity to discuss the rationales and opportunities for an innovation policy for Public AI. Interested experts, practitioners, and stakeholders are invited to discuss their conceptual considerations and empirical experiences. In the following, we share our initial thoughts on the what, the why, the who, the where, and the how of Public AI.

## What is Public AI?

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Public AI, in general, emphasizes the role of the public and of collective action on the provision and governance of AI. Public AI can be organized for an entire AI infrastructure or for specific AI inputs. The input types, on which AI is based, are **(1) sufficient computational capacities (compute)**, **(2) learning, self-modifying algorithms and neural nets**, **(3) the required training data** and **(4) human resources** such as programmers as well as other AI experts. These four input types need to be considered, when discussing how the public or the state could take a role in providing, financing, regulating, or participating in AI.

However, the input types need to be understood in their entire breadth to identify relevant activities for the provision of AI. **Compute (1)**, for instance, encompasses a development and a deployment perspective leading to different compute capacity requirements. One of the most common barriers for AI developers are capacities of chips or storage. The hosting of AI, on the contrary, depends on an ecosystem, in which an AI model is stored in a cloud service, for which a user needs a model hosting tool to apply the AI. Centralized private

ecosystems might suffer from problems of data security or value chain vulnerability. The **algorithms and neural nets of AI (2)** exist in different forms regarding their function in the provision of AI. AI models for the general purpose or specified applications represent only the basis of AI. Practice-oriented modifiers are required for the fine tuning for specific use cases with minimal compute. Concrete AI applications are based on models and modifiers but are developed for specific use cases, such as content generation or automated processes, tuned to specific contexts and user groups. Additional tools enable the AI application to deal, for example, with a variety of languages and cultures or to ensure the trustworthiness of the AI (see below). **Data (3)** includes all kinds of qualitative and quantitative data sources. Sufficient access to the necessary quality and quantity of data often challenges AI developers. **Human resources (4)** are needed to be trained for different tasks around the provision and deployment of AI. Developers, trainers or AI managers bring AI applications to the market. However, users, as well, need to be made able to use AI. Moreover, experts are needed to guarantee the trustworthiness and the quality of AI generated content or services (Marda et al. 2024: 28-31).

It is the challenge to conceptualize of Public AI in a way, which includes the various definitions of AI, their delineations, and their inputs. Therefore, we focus on three different dimensions to define Public AI, which seem necessary to make sure that AI is fulfilling a positive societal function (Mikalef et al. 2022):

First, a Public AI is a **Trustworthy AI**, which considers the following values as central:<sup>2</sup>

- *Privacy* regarding the collection, storage and sharing of data
- *Fairness* by avoiding the abuse of power via biases implemented in the computational models or the training data of AI and via the exploitation of AI-related workers
- *Trust* of the users and stakeholders into the control of their data, the algorithms and the avoidance of dangerous content from AI generated output
- *Safety* against exploitation and attacks, but also against a misuse causing inconveniences in other areas such as an excess power demand coming from an inappropriate use of AI for applications, which could be managed with simpler solutions.
- *Transparency* on how AI generates recommendations and how it came to its decisions or its discussion of recommended options.

Second, Public AI should be regarded as a **social innovation**, where profit maximization is not the primary motivation (Wittmayer et al. 2024; Wittmayer et al. 2020).<sup>3</sup> Although profits can be relevant for this type of Social AI, its primary focus is on addressing societal challenges and political missions for socio-technical transformations. For example, this could involve mitigating climate change, supporting the diffusion of renewable energy, combating loneliness, or improving education systems.

Third, Public AI necessitates the treatment of AI-inputs or specific applications of **AI as public or common goods**. The nature of the underlying inputs of AI allows for different interpretations of this. While data and algorithms can be provided as a public good (Bessen

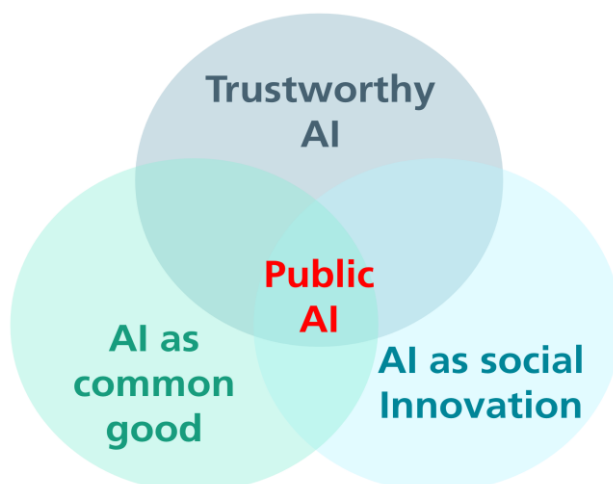
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<sup>2</sup> See e.g. the concept of Trustworthy AI by the Mozilla Foundation: <https://foundation.mozilla.org/en/internet-health/trustworthy-artificial-intelligence/> (29/10/2024).

<sup>3</sup> Social innovations primarily aim at promoting a social good or the resolution of a societal challenge. Though this can make commercialization necessary, profits have a lower priority.

2006; Johnson 2002; Sá et al. 2016), where the focus is mostly on the initial provision of the good itself, compute and to an extent the underlying human resources are subject to the “tragedy of the commons” (Hardin 1968) and therefore require ongoing specific political decision-making on access as well as their structural and financial basis (Coeckelbergh 2024; Ostrom 1990; Samuel 2023). Similarly, AI applications themselves, will need capacity restrictions and regulations regarding usage, if they are made accessible to a large or prolific user base. Therefore, Public AI postulates that at least some aspects of AI or its inputs must be provided either as public or common goods, instead of the current commercial approach focusing on private, license-, patent- or subscription-based access. The overall goal is to provide access to AI and AI-inputs to ensure fair competition and equal access beyond pure profit-orientation or the interest of big tech companies. While the creation of AI as such a common good might be possible purely through private actors, the need for a role of the state can focus on guaranteeing a long-term supply of AI inputs or public governance modes.

**Figure 1: Venn diagram to operationalize the definition of Public AI**



Source: Own elaboration

These three dimensions constitute the basic definition of Public AI for this research project. They are used as a filter to identify examples of Public AI infrastructures or applications and to clarify how innovation policy instruments can provide incentives, funds and directionality to the creation of Public AI. Additionally, the usage of different combinations of these dimensions allows for the categorization of conceivable variations of Public AI. While each dimension can characterize different versions of AI applications and usage on its own, Public AI is indeed found only where aspects of all three are present.

**Hence, we define Public AI as forms of AI which are trustworthy, meaning they fulfill the conditions of privacy, fairness, trust, safety, and transparency, aim to create additional value to society as a whole – that is, they are not primarily driven by profit-maximizing motives – and whose inputs (compute, algorithms, data, human resources) and access are at least partially governed, regulated, or supplied as public or common goods.**



## Why do we need to discuss Public AI?

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The economic and societal significance of AI alone necessitates the discussion on how and to what extent the state should be involved in the development, provision, and application of AI. However, this significance does not automatically justify the supply or governance of AI as a public or common good.

Rather, the additional characteristics of AI as a digital innovation and general-purpose technology justify the involvement of the state in the supply of Public AI. As a digital innovation, the market for AI applications and services follows the general characteristics of the platform economy and the market for digital services in general. These market structures are dominated by a few large players like Google, Amazon, Microsoft, Apple, Meta (Facebook and Instagram), or ByteDance (TikTok). The nature of these markets tends to concentrate market power in a way that hinders operators and developers of societally oriented applications and social innovations, since the oligopolistic actors of these markets are focused mainly on profit maximization (Staab 2024). The developing market for AI and AI applications shares these characteristics:

- **Economies of scale:** Shrinking costs per unit with a higher number of produced units or users are a phenomenon that is supercharged by the virtual non-scarcity of digital goods. While the overall operating cost of AI infrastructures increases with the number of users and queries, the overall cost structures and cumulative efficiency of bigger AI platforms per query and user make them inherently more competitive than smaller platforms. The global scope of the digital economy further restricts the possibility of new entries to create similar economies of scale in separate, isolated markets. As a result of the global markets for AI and the benefit of economies of scale, the AI market begins to show a similar concentration on a few powerful actors as already present in other markets for digital goods (Nuccio et al. 2019: 8).
- **Network effects:** Similar to other services in the platform economy, AI improves its service quality with a rising number of users. Meanwhile, users become ever more reluctant to change AI services since the quality is superior to the competing providers and their networks and usage patterns have become adapted to the specific platform architecture. This lock-in makes service hopping costly. As a result, the competitive advantages caused by the network effect will further enhance the concentration on the AI market (Nuccio et al. 2019: 3-4).
- **Learning by doing effects:** Digital services and social platforms learn from each user interaction. More users mean increased data and user interactions with AI models, which train their effectiveness. If this data is not made available to competitors or R&D, the competitive advantage of large AI platforms increases exponentially (Nuccio et al. 2019: 3-4).

Public AI represents an alternative to this tendency to concentrate the market for AI services in a societally problematic manner. This does not mean that Public AI is necessary in every case of market concentration; rather it presents an option in those cases where market concentration tends to lead to developments with negative effects on public welfare.

Furthermore, while AI models have become ever more reliable, users often do not, and in many cases cannot, understand why they work in the first place, and even the developers are often hard-pressed to explain how specific results are obtained. To improve this knowledge, transparency on AI algorithms and structures is important to understand how AI works and how many different ethical questions on the explicit and implicit value assumptions of AI can be resolved.

Public AI can offer a transparent foundation that allows for insights that can be shared across the public without being hindered by the restraints to maintain business secrets for a competitive edge.

## Who profits from Public AI?

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Public AI lowers access barriers for potential developers and users of AI, which would not or cannot use private AI. Moreover, Public AI can provide an open access to data and software code, infrastructures or important knowledge, access which private providers of AI usually restrict to increase their competitive advantage.

Public AI addresses potential AI applications in various fields and allows for additional activities, including research, education, business model development, and diffusion processes. AI training data can be organized as an innovation common representing "repositories of freely accessible, open source innovation-related information" (Potts et al. 2021: 2). Such innovation commons can be an important resource for businesses inventing or absorbing innovations. By transferring data from private to public and generally accessible ownership, innovation commons reduce the costs of collecting data and information required for innovation (Potts et al. 2021). This concept of an innovation common is understood as a privately organized common without further involvement of state authorities.

Ostrom (1990) introduced the concept of "Governing the Commons" which, while focusing on local self-governing capabilities, also included (mainly local) state authorities in her analysis of principles for a functioning governance of common pool resources such as fish stocks or fresh water. Apart from data, other discussions focus on treating entire AI infrastructures as commons requiring collective governance mechanisms to redirect AI towards the social good (Coeckelbergh 2024; Samuel 2023). Regulating and providing access to compute helps to overcome the increasing divide between smaller and large actors in the development and use of AI. Moreover, the direct regulation of such common AI inputs allows public authorities to detect and avoid harmful AI applications and to invest sufficiently in the security of AI (Mazzucato et al. 2022).

Furthermore, the relevance of AI to solve societal challenges in the context of the digital and ecological transition leads to the discussion of how the public needs to be involved in the governance of AI. Not only developers and users, but societies as a whole may profit from AI systems and applications introduced to resolve societal challenges (Mazzucato et al. 2022). Considering the ecological transition, AI has the potential to significantly improve the use of data to shape the governance of the circular economy or the integration of volatile wind and solar power in the electricity system. However, the development and use of AI are

also the cause for significant increases in electricity consumption, necessitating a discussion on which kinds of AI applications need to be widely diffused and which tasks might instead be achieved by simpler algorithms with a much lower need for computing power. With the goal of providing directionality for the use of AI, Public AI can strengthen specific application fields or be used as a platform for experimentation where different applications can be evaluated (Coeckelbergh 2024).

Considering the geopolitical dimension of AI, Public AI may also be tasked with identifying critical inputs and competitive advantages which are to be strengthened so as to increase technological sovereignty and protect societal values (Beckert 2021; Edler et al. 2023; Mazzucato et al. 2022: 15). The race for AI capabilities between the US, China and belatedly the EU is already underway and affects many different areas. Specifically, the US and the EU need to discuss the potential for a shared vision of AI and identify possible fields of cooperation, e.g., in the form of shared approaches to Public AI, to provide AI applications following shared visions and values. Moreover, facing the international importance as well as the potential dangers of problematic AI applications, a discussion needs to take place in how far AI needs to be regulated as implemented in the EU AI Act. Even agreements like those on nuclear non-proliferation are discussed.<sup>4</sup>

## Where can we already find Public AI?

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Public AI is not a theoretical idea but is already being implemented in various ways. In many diverse areas of application and for different AI inputs, private AI firms are starting to be complemented by public alternatives (Marda et al. 2024: 16), for example:

- Similar to large language model-based applications like ChatGPT, but with a smaller field of application, is **bürokratt**<sup>5</sup>, an AI provided by the Estonian government. bürokratt allows users to communicate with the state around the clock. It can be used for the application for child benefits right after birth or the notification of affected households in case of military exercise. bürokratt is provided through a public-private partnership. Thus, it can be seen as a public good. Due to its nature and the underlying mode of open development while achieving societal goals, bürokratt fulfills all three dimensions of Public AI.
- Amazon Web Services (AWS) is well known as one of the major suppliers of cloud computing solutions. It provides the server capacities to enable access to large amounts of web services easily from all over the world and is one of the major providers of compute allowing the development of AI in the first place. However, especially in Europe, concerns on the security of important and secret data of private businesses on AWS and similar services have become more prevalent recently. In reaction, Germany and France together with other European partners founded the project **GAIA-X**<sup>6</sup>. Though its

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<sup>4</sup> See e.g. the United Nations Report on Governing AI for Humanity, September 2024: [https://www.un.org/sites/un2.un.org/files/governing\\_ai\\_for\\_humanity\\_final\\_report\\_en.pdf](https://www.un.org/sites/un2.un.org/files/governing_ai_for_humanity_final_report_en.pdf) (29/10/2024).

<sup>5</sup> See <https://www.ria.ee/en/state-information-system/personal-services/burokratt> (29/10/2024).

<sup>6</sup> See <https://gaia-x.eu/> (29/10/2024).

scope cannot be compared with AWS, GAIA-X represents a step towards the provision of a public alternative guaranteeing the highest data safety and a trustworthy structure of cloud computing capacities, both of which are crucial inputs for AI.

- Private firms such as Scale AI or Surge AI offer large data sets for the training of AI. The **Common Voice**<sup>7</sup> project by Mozilla is an open data set to train AI that can generate speech like human beings in many different languages. The project is financed by donations and public sector contributions, thereby constituting a variation of privately organized Public AI, fulfilling all three criteria of a trustworthy AI as a social innovation based on data collected as a common.
- **Intelcomp**<sup>8</sup> represents a project funded by the EU Horizon 2020 research and innovation program. It consists of an EU-wide consortium of private and public partners researching and developing digital tools including AI for public administration and governance applications. The project offers living labs for Artificial Intelligence, Climate Change, and Health applications.

## How can Public AI be implemented?

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While AI researchers and developers, companies, civil society, and the public are all equally necessary to guide AI towards the public interest (Marda et al. 2024: 26-27), our research project specifically focuses on the role of the state in relation to Public AI. Even if not supplied by the state, AI and the effects of its application are necessarily political issues. However, with regards to Public AI, the state is much more involved by having to create the conditions to add sufficient Public AI activities and actors to the AI ecosystem. In creating these conditions, the state can use different levers for supporting Public AI (Coeckelbergh 2024; Marda et al. 2024: 21-22; Mazzucato et al. 2022):

- **Directionality for AI applications and the role of Public AI:** Governments need to be able to identify what kind of AI inputs or applications are to be developed for a healthy AI-ecosystem, while at the same time trying to predict which problematic AI applications need to be prevented. Moreover, governments need to send clear signals on how Public AI will be involved in strategic priority setting and whether the required financial resources and regulations will be provided. Such clarity is necessary to send clear signals to the other actors of the AI ecosystem.
- **Funding of R&D on, infrastructures, or specific inputs of Public AI:** Depending on the capabilities of the AI ecosystem, the state can fund Public AI activities in different ways. GAIA-X is an example of a state-funded AI input, whereas bürokratt represents a direct form of Public AI application provided by the state. If the state mainly focuses on funding Public-AI, it needs to emphasize its control on the implementation of open and trustworthy principles. Additionally, existing or new R&D programs on AI need to be reconsidered in view of the chances and challenges of Public AI.

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<sup>7</sup> See <https://commonvoice.mozilla.org/en> (29/10/2024).

<sup>8</sup> See the website of the project: <https://intelcomp.eu/about> (29/10/2024).

- **Preferential treatment for Public AI in government procurement:** Apart from direct provision, the government can use public procurement criteria to foster the development of Public AI. This creates incentives for private AI actors to implement the Public AI dimensions in their development. Moreover, innovative public procurement can represent a stable funding structure for Public AI. The US federal government, for example, published a strategy for public agencies on how to realize AI acquisitions.
- **Regulation towards a level playing field for Public AI in the AI ecosystem:** Regulations, like for example the EU's Digital Market, Service, or AI-Acts need to start taking the role of Public AI into account. On the one hand, they need to create a level playing field for Public AI services, on the other, they need to start to promote Public AI as means to increase competition in the AI markets and a tool to develop consumer-friendly alternatives which can deal with the different dangers of AI applications.
- **Qualification, working conditions, and payment of human resources:** AI requires human developers and human interaction. These jobs need to be well paid and organized. Currently, AI training is often conducted by the exploitation of precarious labor conditions; however, the job of training AI is essential for integrating societal values, and this must be reflected in how the AI workforce is treated. Furthermore, the diffusion of AI applications will change many job profiles, regardless of the use of private or Public AI. Therefore, Public AI needs to address working conditions under AI in many diverse fields.
- **Exchange of knowledge and experience on AI via Public AI:** How to integrate AI in jobs, firms, or personal applications represents a challenge for AI users. Public AI also means providing the necessary knowledge and experience exchange resulting in positive spillovers.

These diverse roles of the state demonstrate that a broad range of instruments needs to be part of an innovation policy mix (Flanagan et al. 2011) for Public AI. At the same time, this policy mix needs to be able to be orchestrated in a manner that maintains the directionality a government wants to achieve for AI. Financial instruments are important for supplying Public AI directly or to support research, innovation, and further activities towards Public AI. Regulation is needed to create space for Public AI in markets and to avoid harmful AI applications. Information instruments are important for communicating strategies, but also to diffuse required knowledge on the use of (Public) AI.<sup>9</sup>

The worldwide activities on Public AI and the regulatory activity regarding AI in general show that some experience with innovation policy mixes for Public AI already exists. However, to explore the effect of existing policies and to identify additionally required policies, further research is required. Existing instruments need to be analyzed for their explicit and implicit relations to the concept of Public AI. Additionally, new policy instruments need to be discussed to complete a coherent innovation policy mix on Public AI. This includes the question of how AI is related to other missions and directionalities of innovation policy, specifically in respect to the digital and ecological twin transition (Laranjeira de Pereira 2024).

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<sup>9</sup> For an overview on this typology of innovation policy instruments, see Borrás et al. (2013).

## Outlook

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This policy brief highlights the potential role of Public AI and the required scientific and public debate on an innovation policy mix for Public AI. This necessary discussion will be supported by a research project of the Fraunhofer Institute for Innovation and Systems Research, funded by the Mozilla Foundation. The project represents an invitation to researchers, AI practitioners, and policymakers to discuss their interpretations of Public AI.

Public AI centers within three dimensions: Trustworthy AI, AI as a Social Innovation, and AI as a Common. Rationales for Public AI can be found based on the increasing concentration of market power for private AI applications, a concentration that does not necessarily benefit consumer and public welfare. Additionally, Public AI offers alternative use and application options for those who cannot pay the prices for AI data and infrastructures or accept the current data security conditions offered by private AI. Public AI is no theoretical debate, as examples for Public AI exist in the form of specific inputs made public (data, algorithms or neural networks, data, human resources) or the provision of entire AI infrastructures by governments or non-government collective organizations.

Our research project uses a structured review of publications, documents, and interviews to follow an explorative research strategy on Public AI and options for a supporting innovation policy mix. Therefore, we are delighted to receive any related feedback, information, or the willingness of AI or policy experts to talk with us in an interview. In that way, we attempt to detect possible directionalities of Public AI, conflicting goals, and suitable policy options, which need to be discussed.

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