INNOVATION–SANDBOX
for Artificial Intelligence

Play & Learn

How to strengthen an AI hub with a sandbox

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This report presents the findings of the «Innovation Sandbox for Artificial Intelligence (AI)». Launched in 2021, the programme brings together various stakeholders from public administration, the private sector and the research community, with the aim of establishing the Zurich Metropolitan Area as a leading hub for AI. Key objectives include developing regulatory expertise, promoting AI innovation, strengthening the transfer of knowledge and generating inputs for future AI regulation. The sandbox serves as an innovative environment for testing and developing AI technologies. Between 2022 and 2024, the project team successfully implemented five projects in the areas of smart parking, autonomous systems, automated infrastructure maintenance, machine translation and AI in education. During this time, the sandbox has had a positive impact on the AI ecosystem. A cornerstone of the programme is the interdisciplinary collaboration between partners from administration, industry, academia and politics. All stakeholders in the AI hub can leverage the insights gained from the program to enhance their own AI initiatives. Building on the positive results and experiences so far, new sandbox projects will be carried out during a second implementation phase from 2024 to 2026.

Table of contents

01.
Challenges faced as an AI hub

Artificial intelligence (AI)* **is a transformative technology that is reshaping industries across the board and holds immense significance for the Zurich Metropolitan Area as both a business hub and a centre for innovation. AI encompasses the capability of machines and computer systems to perform tasks traditionally requiring human intelligence, such as learning from data, recognising patterns, solving problems and making decisions. The collaboration between humans and AI systems has the potential to significantly enhance productivity, as evidenced by examples such as the automation of administrative processes, the improvement of medical diagnoses, and the optimisation of traffic management. Despite this great potential, there are numerous challenges to be overcome, especially from the perspective of a business hub and centre for innovation.**

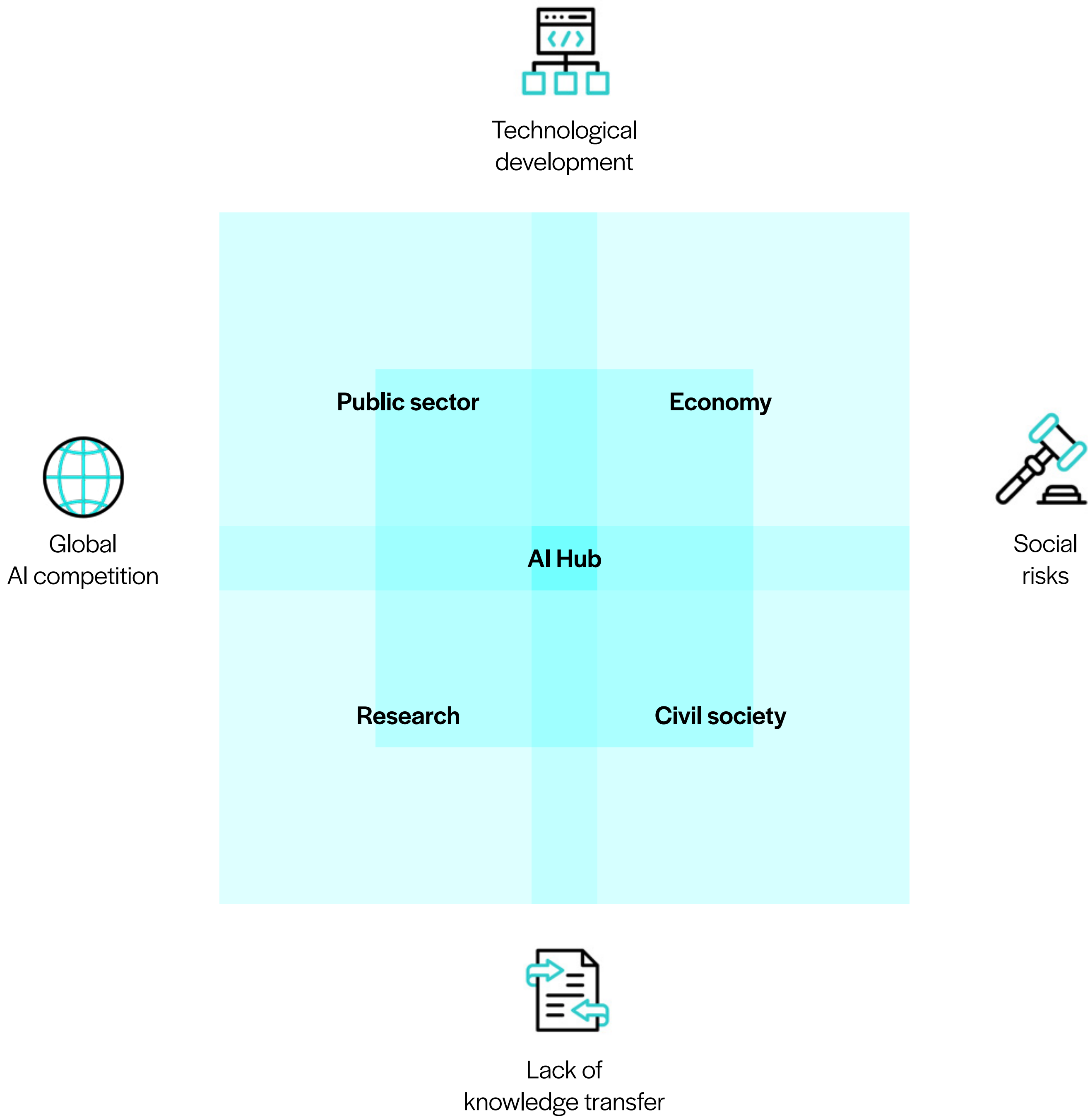
Rapid technological development
The speed at which technology providers are developing new and more powerful AI models represents a significant challenge. Companies and research institutions have no choice but to make sizeable investments if they are to keep pace with these advances. Examples of such progress include the development of Large Language Models like GPT-4 and Mistral, which are increasingly able to understand and generate natural language, as well as the improvements seen in image recognition, which plays a decisive role in applications such as autonomous vehicles and medical image analysis. Continuous adjustments are essential to utilise the latest technologies efficiently. Technological advancements are also presenting major difficulties for legislators. The review and adaptation of the legal framework for AI technologies is currently unable to keep pace with the speed at which innovation is advancing.

Global AI competition
Global AI competition is intense. The United States dominates the market, with major technology companies such as Google, Meta, Amazon and Microsoft leading the way. These firms distinguish themselves through their innovative capabilities, vast financial resources and access to top talent, positioning them at the forefront of AI development and implementation. In contrast, Europe hosts relatively few globally active technology companies. The European Union is primarily focused on regulating AI and establishing a legal framework, exemplified by the ***AI Act***. Meanwhile, China is pursuing a long-term, strategic industrial policy, characterised by substantial investments in research and development and the promotion of state-sponsored programmes. Even if this represents a somewhat simplified picture and the respective regions are each pursuing a combination of AI approaches, it reflects the respective priorities and strategies. Amidst this global competition, it is challenging for smaller innovation centres, such as Switzerland, to keep pace with the leading nations and to ensure that they reap the benefits of the value created.

Lack of knowledge transfer
A further issue is the lack of knowledge transfer, particularly at the intersection of regulatory

* The terms marked in blue are explained on page 28 in the glossary

01. Challenges faced as an AI hub



requirements and the development of innovative AI applications. Numerous AI projects are conducted in parallel, often without incentives to share results and best practices. Legal clarifications are frequently complex, as AI introduces a multitude of legal challenges, particularly in areas such as data protection and copyright. This situation leads to the fragmentation of knowledge, hindering the widespread application of valuable findings and innovative approaches. To address this, stronger collaboration and the exchange of knowledge and experiences among the various stakeholders within the AI ecosystem are essential.

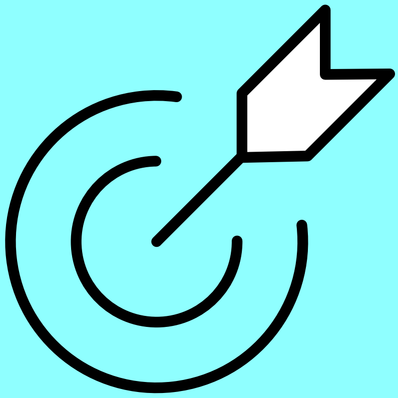
Social risks

AI also presents social risks. A key concern is discrimination, as algorithms can perpetuate existing biases, thereby disadvantaging certain demographics. Another significant issue is the so-called «black box» problem, which refers to the difficulty in understanding the decision-making processes of complex AI models—an especially pressing concern in sensitive areas such as criminal justice, human resources, and financial services. Additionally, job losses are a major worry, as automation is likely to substantially alter specific job roles. Ethical concerns and a lack of transparency in how AI systems operate could foster mistrust in the technology. Hence, for an AI hub to thrive, it is crucial to have a well-informed population and broad social acceptance. Striking a careful balance between innovation and regulation is essential to maximise the benefits of AI while minimising the risks it entails.

A sandbox as a test environment

The rapid development of AI technologies presents both risks and opportunities for innovative AI providers and state actors who have the common good in mind. To meet the challenges, public institutions have established so-called ***«sandboxes»*** as test environments for AI innovation. The aim is to promote the development of technologies while at the same time ensuring safety. There is a focus on adherence to legal regulations and responsible innovation. However, different countries and regions are implementing their sandbox programmes in a wide variety of manners. The following sections provide a summary of the objectives, approaches and findings of the «Innovation Sandbox for AI» (hereinafter referred to as the «sandbox») that has been in operation in theZurich Metropolitan Area since 2021.

02.
Definition of the sandbox objectives



In 2021, various institutions from the realm of public administration, the private sector and the research community came together to form a working group with the aim of developing new measures to foster AI in the Canton of Zurich. At that time, AI was not yet dominating discussions in the media, at companies and within educational institutions as would later be the case following the launch of *ChatGPT* 3.5 in November 2022. Nevertheless, it was foreseeable that AI will have a considerable impact on various sectors. The working group developed specific measures aimed at promoting the local AI hub. A key element here was interdisciplinary teams working across organisational boundaries. The working group devised specific measures to promote Zurich as an AI centre, with a key focus on the formation of interdisciplinary teams that operated across organisational boundaries. The working group also emphasised that the intersection of innovation and regulation presents a unique opportunity. All stakeholders involved recognised the substantial added value provided by a test environment for AI. They developed the vision of a sandbox for AI innovation, inspired by both the technical and regulatory interpretations of the term.

What is a sandbox?

The term «sandbox» carries various meanings and evokes different associations depending on the target audience. For many AI developers, it primarily refers to a technical infrastructure for testing code. In contrast, regulatory experts often understand it as the time-limited testing of technologies outside the legal framework, overseen by an authority. The AI Act, introduced in 2024, provides the first formal definition of an *«AI regulatory sandbox»* situated at the intersection of AI innovation and regulation. The Zurich working group, which came together almost three years before the introduction of this definition, did not yet have any concrete idea about what the practical organisation of a sandbox might look like. As soon as their vision of an AI test environment was established, the Office for Economy of the Canton of Zurich assumed a leading role by providing human resources for the development of a concept and the running of the programme. In its role as a cooperation partner, the Zurich Metropolitan Area Association provided financial resources for the programme's implementation. Due to the various interpretations of the sandbox concept, the first challenge was to define the initiative's strategic objectives.

Regulatory learning

One of the primary objectives of the sandbox is to promote regulatory learning. The sandbox team clarifies regulatory issues and works to identify new topics arising from the technological advancements made in AI. In doing so, it is moving from a purely compliance-oriented mindset towards a forward-looking approach that anticipates new AI topics and addresses them constructively. This forward-looking approach is beneficial not only for the regulatory authorities, but also for those organisations participating in the sandbox. Public administration gains insights into emerging technologies, allowing it to

02. Definition of the sandbox objectives

better understand and predict future trends. The participating organisations gain legal expertise that helps them to better navigate the regulatory landscape. Despite the lack of AI regulation in Switzerland, the development and commercialisation of AI is not taking place in a legal vacuum. In most cases, a wide range of legal frameworks apply, including those relating to data protection, copyright and sector-specific regulations.

Promoting innovation

A further objective is to promote innovation. The sandbox offers the participating organisations a unique opportunity to test, develop and validate AI technologies, services and products. Especially start-ups, small and medium-sized enterprises (SMEs) and research institutions gain access to resources such as regulatory know-how and data sources. By lowering the barriers to entry and providing a supportive environment, the sandbox provides a basis for stakeholders to test and scale AI innovations together. The introduction of AI technologies in public administration is a key component of the sandbox approach. Specific examples of how the sandbox promotes the spread of AI innovations include the testing and implementation of smart parking solutions through image recognition, drone inspections for infrastructure maintenance and machine translation for administrative staff. The insights gained from these projects facilitate the broader dissemination of new technologies beyond the scope of the sandbox programme itself.

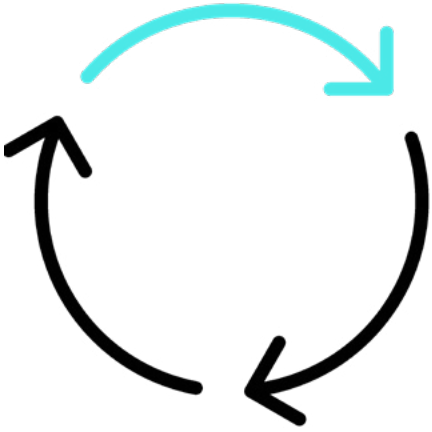
Knowledge transfer

A further critical goal of the sandbox approach is to promote knowledge transfer. The sandbox environment prevents redundant efforts by allowing for collaboration and the exchange of specialist knowledge across the areas of public administration, business and research. The collective sharing of knowledge enables the project team to effectively disseminate solutions to common problems, contributing to a more integrated and efficient ecosystem. The sandbox draws on the knowledge and experiences of various stakeholders, thus accelerating the spread of best practices and innovative approaches. A concrete example of the promotion of knowledge transfer is the publication of reports that summarise findings from specific use cases. Additionally, the sandbox team regularly organises workshops with stakeholders, including AI companies and public authorities to share the knowledge gained.

Suggestions for future regulation

The sandbox also acts as an important source for the development of regulations. By drawing on real-world experiences and specific use cases, the project team identifies gaps in the regulatory framework and areas requiring attention, thereby helping to ensure that regulations evolve in step with technological advancements. This bottom-up approach supplements top-down measures such as the overview of regulatory approaches to AI commissioned by the Federal Council. While a sandbox cannot comprehensively cover all relevant AI use cases, it promotes sustainable development by harmonising AI innovations with safety aspects and ethical considerations.

03.
Development of an AI test environment



The development of the sandbox concept was a collaborative and dynamic process, guided by an interdisciplinary steering committee composed of representatives from the eight institutions that initiated the sandbox.

Interdisciplinary steering committee
The Office for Economy of the Canton of Zurich oversees the sandbox, with the primary objective of enhancing Zurich's status as a global hub for AI. Although not a regulator of AI technologies, the Office for Economy acts as a coordinator for the test environment. It brings various interest groups together to ensure a holistic approach to testing AI applications. The sandbox steering committee was made up of representatives from the Office for Economy, the Office for Statistics and the Department for Digital Administration of the Canton of Zurich as well as from the Office for Economy of the Canton of Schwyz, the Zurich Metropolitan Area Association, the ETH AI Center, the Center for Information, Technology, Society, and Law of the University of Zurich and the ZHAW entrepreneurship initiative.

Intercantonal cooperation
A key aspect of the project is the interregional cooperation with the Zurich Metropolitan Area Association, which has facilitated the sandbox through financial support and the integration of eight different cantons. This collaborative approach is logical, as the regulatory challenges across the regions are similar, and pooling resources helps to overcome fragmentation. Consequently, the sandbox is well-positioned to undertake intercantonal AI projects. Examples include the Smart Parking Project in the City of Frauenfeld and the machine translation application in the Canton of Schwyz. Knowledge transfer efforts are also intercantonal. Accordingly, events have already been held in the cantons of Aargau, Schaffhausen, Schwyz, Thurgau, and Zurich.

Identifying and utilising legal instruments
An important realisation was the absence of specific legal instruments for an AI sandbox, such as *experimentation clauses* or *no-action letters*. Rather than creating new legislation, which could have delayed the programme, the steering committee decided to operate within the existing legal framework. The sandbox leverages already established economic development measures, as seen in sectors such as finance or healthcare. A key aspect of the project is its focus on AI as a cross-cutting technology that is transforming multiple industries simultaneously. All sandbox activities are required to comply fully with current legal requirements (e.g. in the areas of data protection and public law). This pragmatic approach enabled a swift launch and the rapid accumulation of practical experience. Remarkably, it lasted only five months from the formal programme launch to the first call for projects.

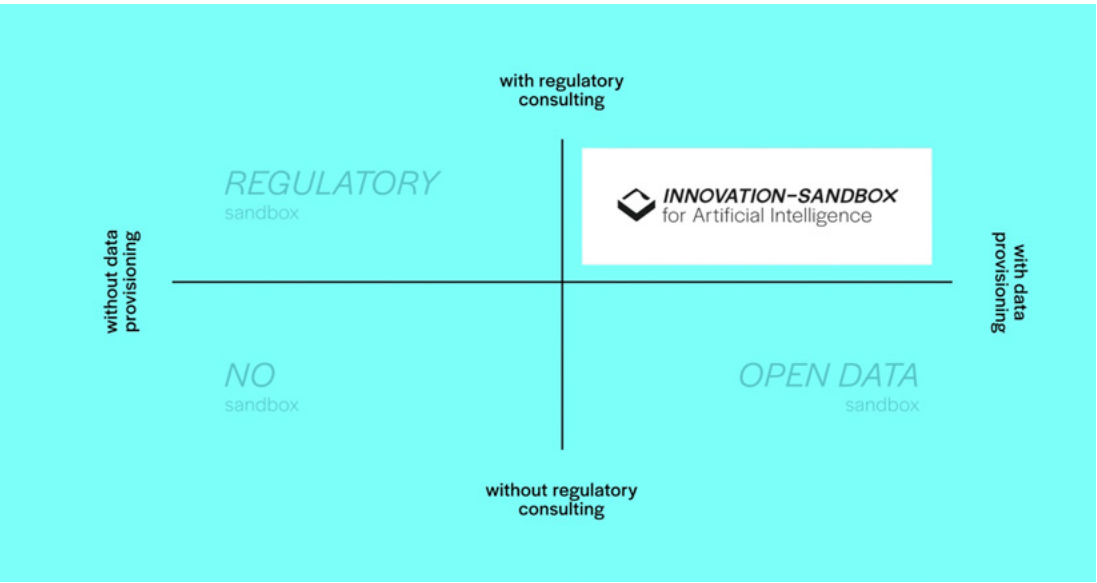
Learning from international experience
As there was no established template for sandbox approaches in Switzerland, the team conducted extensive interviews with other countries such as the United Kingdom and France as well as with

03. Development of an AI test environment

potentially participating organisations, including AI start-ups and administrative units. These talks provided valuable insights and helped in developing a pragmatic and adaptable sandbox model tailored specifically to the unique context of the Zurich Metropolitan Area. For instance, foreign sandbox teams highlighted that they had imposed overly stringent requirements on project applications, resulting in high barriers to entry for potential participants. The project team avoided this issue by requesting only a brief project outline via an online form for potential sandbox case studies.

Differentiation through practical implementation
A special feature of the sandbox is its focus on the provision of data and the practical implementation of AI projects. In contrast to the sandbox approaches of other countries, which primarily carry out legal assessments, this model incorporates practical testing and the use of AI technologies in the real world. This approach allows for the identification of practical challenges and regulatory issues that would not come to light with a theoretical approach. Practical implementation relies on collaboration with partners who provide data. The goal is to find suitable partners within the public administration network (e.g. cities, cantonal offices, educational institutions, and military organisations) who can support sandbox projects as data owners. Data and technical services are provided on a project-specific basis, meaning there is no centralised technical infrastructure available to all participating organisations. The practical implementation is supported by a regulatory review that addresses legal issues across various areas, including data protection, copyright, and sector-specific regulations, such as those related to AI in education. It became clear that for certain projects, depending on the specific use case, one of the two sandbox services would form the focus. This flexibility was intentionally designed to accommodate a variety of project types.

Sector-independent approach
A key aspect of the sandbox is its sector-indepen-



dent approach, which is deliberately designed to respond to different market needs in a flexible and adaptable manner. This inclusivity promotes the broad participation of start-ups, SMEs and research institutions from a variety of sectors and facilitates the transfer of knowledge across application areas. The use cases (45 in total) submitted during the two completed calls for projects in 2022 and 2024 came from many sectors, including autonomous systems, sustainability, health, public administration and education. This confirmed that adopting a sector-independent approach was the right decision. Most of the project proposals came from start-ups. To date, only a few major corporations have put forward proposals. One possible explanation for this is that large organisations already have access to regulatory know-how and useful data sources that are made available through the sandbox programme. Another unexpected outcome was that only one of the 45 submitted proposals originated from the traditionally strong financial services sector in the Canton of Zurich. A potential reason for this could be that many fintech firms already have substantial regulatory expertise and robust data foundations.

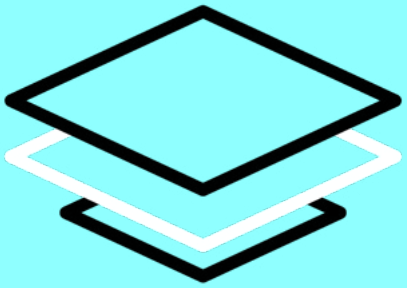
Putting together the right team

The success of a sandbox also hinges on assembling a team with a diverse skill set. From the very beginning, the team has included a programme manager as a generalist, a legal expert, a data scientist and a communications expert. This combination ensures that the project team effectively addresses all aspects of the sandbox, from legal compliance and technical implementation to stakeholder communication.

Communication as a success factor

The steering committee identified effective communication as a critical success factor. Clear and consistent communication with stakeholders, including participating organisations and regulatory authorities, is essential for building trust and ensuring transparency. A key element in successful communication is the unified support of communication efforts by all institutions represented on the steering committee. By utilising the communication channels of the eight different organisations from public administration, the private sector and the research community, the sandbox can effectively reach relevant target groups with calls for projects or announcements of new reports.

04. *Selection of use cases*



The selection of the sandbox use cases starts with a public call for projects that lasts two to three months. There are several requirements that have to be met in order to participate in the sandbox.

Five key requirements for applications

- ***Own AI competencies***
  The participating organisations must provide their own AI technologies and possess the necessary technological expertise.
- ***No financial remuneration***
  Participation in the sandbox does not involve any financial remuneration and the organisations must provide their own human resources.
- ***A willingness to share knowledge***
  The participating organisations must agree to publish their results and contribute to best practices except for IP-related information (e.g. code).
- ***Presence in Switzerland***
  The participating organisations must be based in Switzerland.
- ***Submission of a single project***
  Each organisation can only submit one AI project.

Application process

The process for the submission of project proposals has been designed to be easily accessible. The contact persons of the participating organisations complete a simple online form by providing information about their organisation, its general activities in the area of AI and a rough description of its proposed sandbox use case. The aim is to avoid overly detailed and bureaucratic requirements that could deter organisations from participating. As sandbox projects have to be developed iteratively, the process is flexible and adaptable in each case. It is almost impossible to predict and describe a sandbox project in all its details during the application phase.

Selection criteria and process

The selection criteria have been put together in such away that they ensure a balanced and effective project portfolio. It is important to communicate the criteria in advance so that interested organisations can take them into account in their application. The ten criteria also reflect the diverse perspectives of the steering committee.

- ***Readiness for testing***
  The AI project's level of maturity with respect to concrete implementation
- ***Regulation***
  Potential to build regulatory know-how
- ***Data use***
  Potential for the utilisation of data sources from the administration ecosystem

04. Selection of use cases

- ***Social added value***
  Potential to provide AI-based services in the public interest
- ***Centre for innovation***
  Potential to strengthen the innovation centre through cooperation between business, research and administration
- ***Transferability***
  Potential to transfer the results to other AI application areas or industries
- ***Relevance for administrative bodies***
  Relevance of the results for cantons, cities and municipalities in the Zurich Metropolitan Area
- ***Necessity***
  Need for participation in the sandbox for the implementation of the project
- ***Technical feasibility***
  Feasibility based on technical requirements (infrastructure, hardware, models, etc.)
- ***Non-technical feasibility***
  Feasibility based on non-technical requirements (e.g. data access, political sensitivity)

Interviews and evaluation
A 30-minute interview with each participating organisation helps to better assess their motivation and expertise. The steering committee evaluates each application based on the selection criteria. It weights all the criteria equally and assigns them one of five ratings ranging from «very low» to «very high». Together with the project team, it creates a short list of the most promising use cases. This is then followed by an in-depth discussion of the topics to be addressed as part of a sandbox project. The project team informs the organisations that are not selected for participation. In doing so, it endeavours to propose alternative areas of support outside the scope of the sandbox (e.g. linking the organisation to relevant authorities or complementary technology providers). Where similar projects exist (e.g. two different projects on machine translation in public administrations), these can be consolidated to address overarching issues. During the first call for projects between March and June 2022, start-ups, SMEs and research institutions, submitted a total of 21 project proposals from various sectors. The five selected projects were:

- *Smart Parking*
- *Autonomous Systems*
- *Automated Infrastructure Maintenance*
- *Machine Translation*
- *AI in Education*

04. Selection of use cases

Autonomous systems
Self driving tractor
Autonomous mower

Education & work
Correction app for schools
Optimisation of catering
Analysis of salary data

Mobility
Parking management
3D-models of cities
Airstrip inspections
Traffic analysis

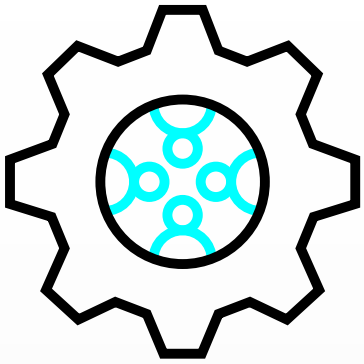
Public administration
Machine translation (2x)
Kowledge management bot
Semantic search
Tax statement tools

Health
Biomechanical analysis
Personalised therapies

Sustainability
CO2-emission-forecasts

Further
AI ethics process
AI governance platform
Conflict analysis
Public AI monitoring

05. *Implementation of sandbox projects*



The iterative implementation of sandbox use cases requires continuous coordination and planning. The iterative approach is primarily based on two factors. Firstly, the sandbox's low threshold to entry means that the project proposals are kept very general. The sandbox team must further specify the projects in cooperation with the participating organisations. Secondly, the provision of data sources by implementation partners (e.g. public bodies or military organisations) requires the project team to involve suitable organisations after the sandbox project proposal has been accepted.

Planning at a portfolio and project level
The implementation phase begins with planning at both a portfolio and project level. The complexity of the projects varies widely, ranging from practical implementation processes requiring the procurement and installation of hardware to projects that mainly focus on legal assessments. The planning at a portfolio level ensures that each project is appropriately resourced and managed. An important success factor is the phased implementation of the sandbox projects to optimise the use of resources.

Finding partners and specialists
A critical factor for implementation is identifying and recruiting the right partners and experts for the project. For example, implementation partners such as data owners are essential for testing AI applications. It is important that the partners recognise the benefits of participating in a sandbox project. After all, project implementation is heavily dependent on the willingness of data owners to take part. Furthermore, it may be necessary to involve third-party providers or regulatory experts to handle specific technical or legal challenges (e.g. in areas such as automated driving or EU regulation of AI). A network of qualified partners and experts is therefore crucial.

Continuous budgeting as a challenge
The participating organisations do not receive any financial remuneration. The main reason is that the focus of the collaboration should be placed on the generation of knowledge. Financial remuneration could give rise to false incentives for participation. However, the sandbox budget does cover additional expenses (e.g. for hardware, legal expertise and third-party technology providers). This means that the implementation partners are not required to contribute any or only limited financial resources of their own. One of the practical challenges of sandbox projects is the need for continuous budgeting. Considering the iterative nature of project implementation, financing needs evolve over time. It is important that flexible and continuous financial support is available to cover any unforeseen costs or requirements.

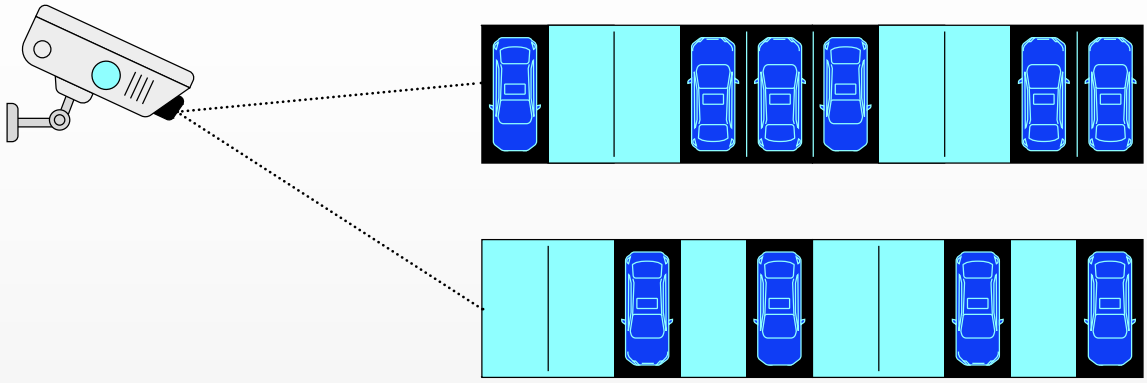
Regulatory compliance in various legal areas
AI use cases frequently require compliance with regulations in several legal areas as well as coordination with different regulatory authorities. It is crucial to involve various regulatory authorities (e.g. data protection officers or federal offices) at an early

05. Implementation of sandbox projects

stage and to maintain continuous communication to ensure compliance. Implementation must also adhere to all existing political and administrative processes. In the case of the sandbox, there were no shortcuts and no legal requirements were relaxed, meaning that all processes had to be legally and politically fulfilled (e.g. based on city council resolutions). This meant that some sandbox projects lasted for the entire implementation phase of one-and-a-half years.

Use cases in the first implementation phase
The five successfully realised projects following the initial call for projects were as follows: Smart Parking, Autonomous Systems, Automated Infrastructure Maintenance, Machine Translation and AI in Education.

05. Implementation of sandbox projects

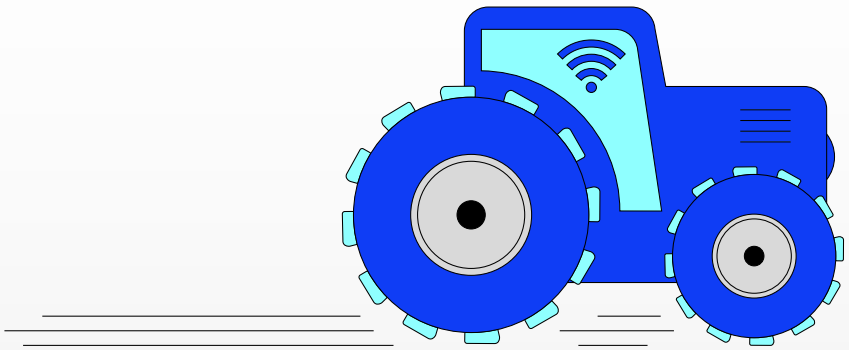


1) Smart Parking

Urban areas often suffer from inefficient car park management systems in public spaces, leading to congestion, lost time and unnecessary emissions. This sandbox project tested a smart parking solution based on image recognition technology developed by the ETH spin-off Parquery. This has succeeded in optimising the use of parking spaces in the City of Frauenfeld. The technology makes it easier for vehicles to find locations with free parking spaces. One focus of the cooperation lay in ensuring data protection during image processing in public spaces through the application of privacy-by-design measures. The sandbox project led to best practices for other Swiss cities and municipalities. An important aspect here was the project's relevance for everyday life. The smart system has been in operation as part of a pilot project since November 2023 and provides residents of the Frauenfeld region with access to an AI-based service. Car park management is a topic of great public interest, which increases the importance of non-legal issues such as transparent communication with the public. The procurement and installation of camera systems in public spaces proved complex. The operational requirements for covering more than 500 public car parks (24-hour access to power grids, coordination with property owners, etc.) were time-consuming and complex. Most challenges were therefore not AI-related, but rather linked to the basic technical infrastructure.

Smart Parking – Best Practices for Image Recognition

05. Implementation of sandbox projects



2) Autonomous Systems

The regulation and standardisation of autonomous systems are lagging technological developments, creating an unclear legal framework for manufacturers. This sandbox project tested autonomous ground vehicles with two start-ups, including an autonomous tractor for the agricultural sector from Lonomy and a self-driving lawnmower from Ronovatec for professional greenkeeping. It clarified legal issues for manufacturers in various legal areas, including product safety, autonomous driving on public roads and data protection. By bundling two similar use cases, the sandbox team ensured that it clarified regulatory issues that are also relevant for other manufacturers (e.g. autonomous cleaning robots). The outcome was a set of regulatory guidelines that will help manufacturers to meet both current and future regulatory requirements. The guidelines serve as an entry point and offer a general overview before manufacturers undertake specific legal clarifications. This is important, as in many cases there is no end-to-end consideration of legal issues for specific use cases. One challenge lay in the fact that Ronovatec went bankrupt during the collaboration. Although the reasons for this had nothing to do with the sandbox, this required adaptability. The sandbox team was, however, able to finalise the regulatory guidelines without the remaining contribution of the company in question.

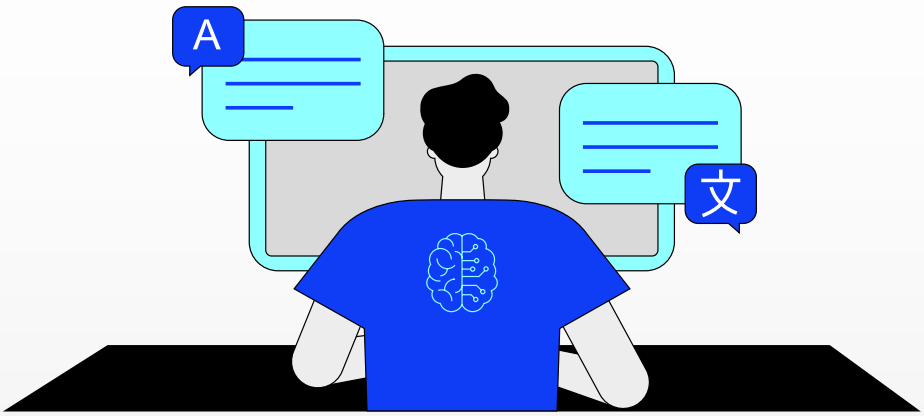
Autonomous Systems – Guidelines for Regulatory Questions

3) Automated Infrastructure Maintenance

Infrastructure managers largely perform visual inspections of roads, bridges and dams on a manual basis, which is both a time-consuming and dangerous process. This AI project used AI algorithms from IBM Research for the automated detection of cracks and damage to a runway located at the military airfield in Dübendorf. pixmap created high-resolution image material for this purpose. The sandbox collaboration resulted in a high-quality data set that other companies can now also use to test and validate visual inspection algorithms. The sandbox published a best practice report on the technical and operational findings of this AI application. One opportunity provided by this project was the chance to involve a specific third-party drone flight provider with the aim of capturing high-quality runway data. To find the right partner, the sandbox team compared several drone providers in terms of their capabilities. This underlined the importance of a strong partner network, as the drone recordings were very demanding owing to the high level of resolution required. Following the successful completion of the sandbox project, the operational challenges of integrating drone inspections into day-to-day maintenance activities came to light: the use of drone and AI-based image recognition is also changing existing runaway maintenance procedures, which will require employee training and extensive process adjustments that were not part of the sandbox project.

Automated Infrastructure Maintenance – Drone Inspections with Computer Vision

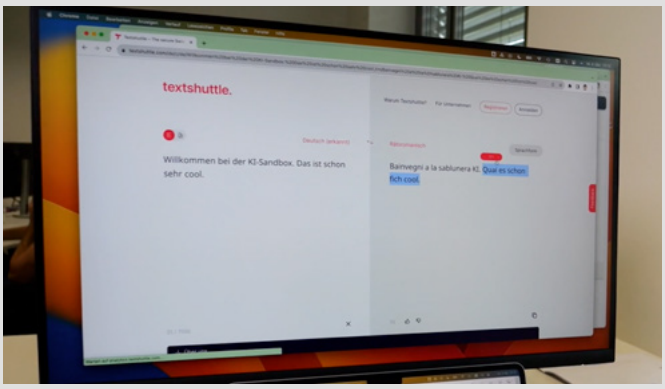
05. Implementation of sandbox projects



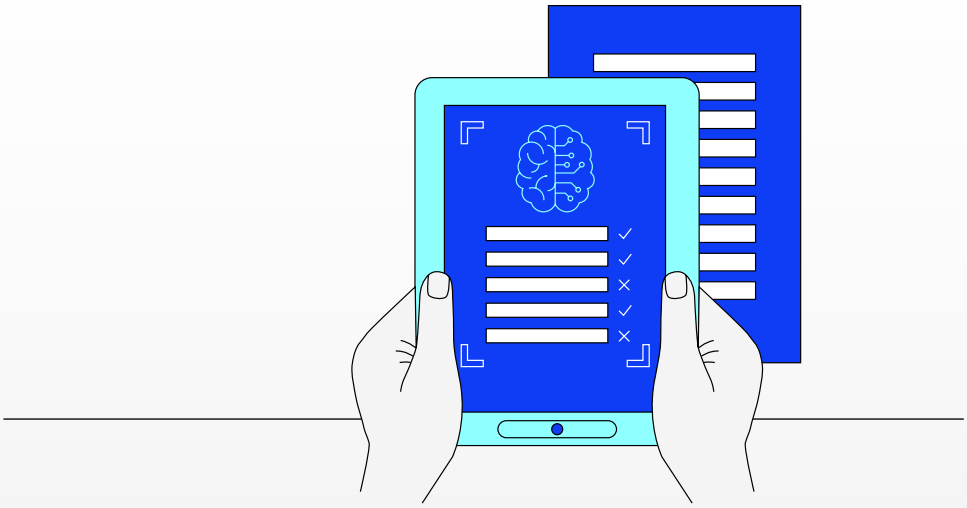
4) Machine Translation

Language barriers often exist in communication between those working in public administration and the foreign-speaking population. This sandbox project carried out two different projects with the translation firms Neur.on and Textshuttle: one with the Commercial Register of the Canton of Schwyz and one with the Integration Office of the Canton of Zurich. The project report includes guidelines for legal questions relating to the use of AI translations in public administration. The team also developed a best practice approach with the objective of testing various AI translation services and better aligning them with the specific needs of public institutions (e.g. specific administrative vocabulary). By combining the two projects, the project team had the opportunity to analyse various approaches to adjusting machine learning in the context of public administration. The team tested the so-called *fine-tuning* based on 20,000 commercial register extracts, the optimisation of translations based on human expert feedback and the manual definition of translation preferences of administrative staff. The issue of machine translation attracted great interest from various public administrations. It helped to compare specific AI tools tailored to local requirements with generic online services. One challenge lay in the testing of the various AI translation services. Blind tests conducted in various languages were based on feedback provided by certified professional translators who compared the machine translations of several tools with human output. This process proved to be very complex and time-consuming. Due to the resource and time limitations within the sandbox, the benchmarking is not representative. It does, however, provide a template for how public administrations can proceed when comparing different AI translation tools.

Machine Translation – Recommendations for Public Administration



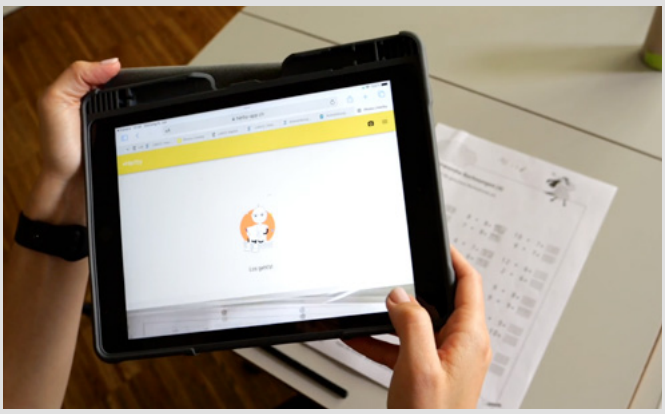
05. Implementation of sandbox projects



5) AI in Education

Teachers are increasingly using AI tools in performing their work. Examples include automated corrections, personalised learning and the preparation of examination tasks. However, there is often a sense of uncertainty among school authorities, teachers and parents when it comes to the legal requirements relating to the safe use of AI tools. This project tested an AI image recognition solution of Herby Vision that allows school pupils to automatically correct their handwritten maths and spelling exercises using a smartphone scan. The project led to a set of legal best practice guidelines that will help *edtech* providers to overcome the challenges they face in the areas of data protection and copyright. One success of the sandbox project was that the provision of legal expertise contributed to the strategic focus of the participating company, with the start-up subsequently increasingly turning its attention to its core competencies in automated corrections. It reduced the degree of regulatory complexity by pushing functions that use personal data and are not required for automated corrections into the background. One major difficulty was finding implementation partners for the project, in this case primary schools in the Zurich Metropolitan Area. The project team and the partner network had no direct access to primary school classes. Only after several months was the sandbox team able to enter a collaboration with the Swiss EdTech Collider, making testing with primary schools possible. Furthermore, the report, which summaries the findings of AI in education, is aimed at edtech providers and not at school representatives. The strong interest from teachers clearly indicated that a separate guide for this target group would be helpful.

Artificial Intelligence in Education – Legal Best Practices



05. Implementation of sandbox projects

Other projects without implementation

The project team initiated two additional projects that, however, did not reach the implementation stage: one focused on modelling CO2 emissions, and the other on semantic search in legal documents. In both cases, it was not possible to secure a binding commitment from an implementation partner. For the CO2 modelling project, a global technology firm was expected to share data from a mobility service, but this failed to materialise due to a lack of human resources. In the case of the semantic search project, an administrative unit initially confirmed its participation but later withdrew. These examples highlight the inherent uncertainty in planning for a sandbox focused on practical implementation. The success of AI projects is often dependent on the cooperation of third parties, making planning security elusive. Therefore, a degree of openness regarding outcomes and flexibility in planning is essential.

06.
Ensuring the transfer of knowledge

The overarching objective of the sandbox is to generate knowledge that can be generalised beyond the scope of individual projects. Throughout the AI projects, the project team focuses on documenting relevant findings that can serve as templates or recommendations to other stakeholders.

Two main target groups
The main target groups for these generalisable findings are AI solution providers (e.g. market participants such as technology firms) and users of AI applications (e.g. public administrative units). Identifying the relevant issues for these two target groups represents an important task of the sandbox team. The five projects revealed that many technology providers are so focussed on product development that they fail to treat regulatory issues as a priority. Even the clarification of basic regulatory concepts can therefore offer added value for the participating organisations. To ensure that it can effectively communicate the findings of the five projects to the various target groups following their completion, the sandbox team prepared a variety of communication materials throughout the entire implementation phase: videos, interviews and detailed reports that capture and communicate the findings from each use case. Documenting the process and presenting the results in multiple formats ensures that the knowledge gained is accessible to various interest groups. The graphic design of the reports with illustrations of the AI applications and a professional layout are also important factors in communicating the innovative character of the sandbox as a test environment.

Knowledge transfer at various levels
The sandbox team publishes all findings online in the form of best practice reports made available in German and English. The translation of the findings is crucial, as the AI sector in Switzerland is very international. To reach various target groups, the sandbox not only uses reports for knowledge transfer, but also other formats. These include blog posts, workshops, keynotes, scientific papers and direct dialogue with relevant stakeholders such as companies and administrative units. It is important to maintain an open approach, encouraging interested parties to engage with the project team without encountering significant barriers. By tailoring the knowledge transfer process to the specific needs of each target group, the sandbox ensures that knowledge is disseminated effectively.

Input for future regulation
The transfer of knowledge within the sandbox is not solely focused on making the findings from AI implementations accessible; it also aims to improve the framework conditions for AI innovation. Active participation in shaping the future legal framework is crucial. This proactive approach ensures that the results of sandbox projects provide valuable input on two levels:

On the one hand, the findings from specific projects serve as an information basis for revisions to sector-

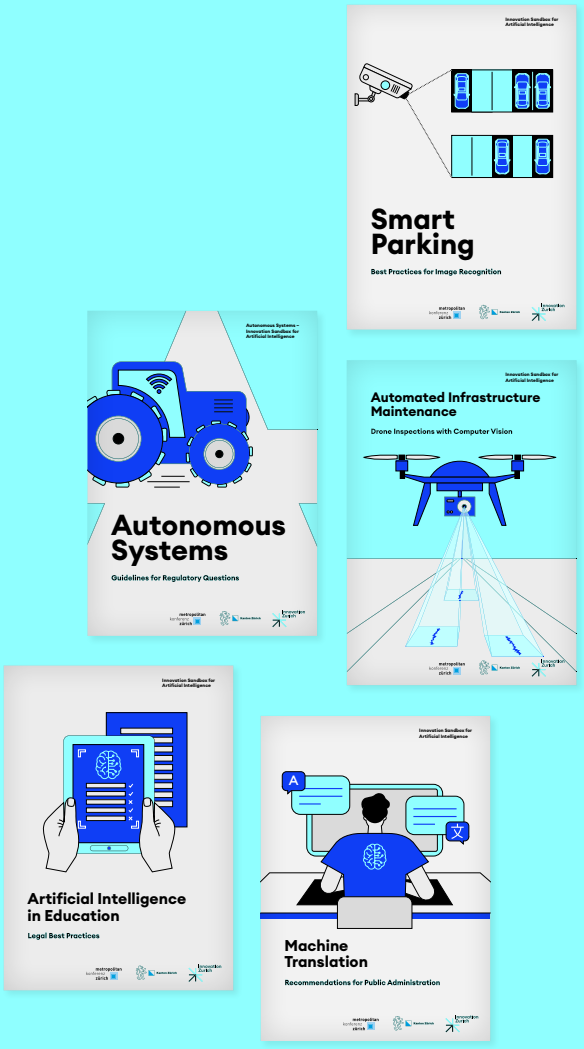
06. Ensuring the transfer of knowledge

specific legislation. One example of this was found in the context of autonomous ground vehicles. The sandbox team tested an autonomous tractor for the agricultural sector and a self-driving lawnmower for professional greenkeeping. Both vehicles were primarily designed for operation on private property and therefore only occasionally had to cross public roads. By conducting a detailed review, the team established that the vehicles are subject to the same regulatory requirements as conventional vehicles, such as cars, lorries and buses. It therefore provided the input that both the operational and technological differences between these systems have to be better accounted for in future regulations governing the area of automated driving. In the shape of the smart parking project, the sandbox was also able to provide a concrete use case for the mobility data infrastructure (MODI).

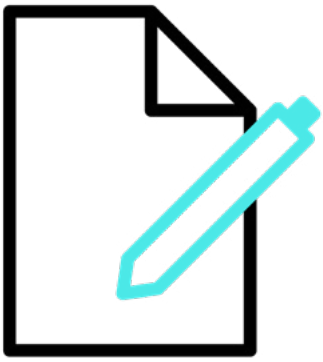
On the other hand, the sandbox highlights the need for administrative and political measures. It thus provides input for policymakers to create new support measures and test environments for AI innovation in Switzerland. One example of this was the national policy that drew on the AI sandbox programme of the Zurich Metropolitan Area as a model for submitting a postulate for an «innovative environment for AI testing and promotion». This has already been adopted by the Council of States.

Cross-border knowledge transfer

Cross-border knowledge transfer is also important. One example here is the AI Sandbox Summit, which took place in Zurich in January 2024 with seven European sandbox operators. This event provided a platform for the cross-border transfer of knowledge and facilitated the exchange of findings and best practices between different regions and countries. This opened access to a broad range of experiences gained from sandbox programmes with varying degrees of maturity, while the perspectives of various approaches were also integrated. One specific outcome under consideration is the development of an international database of sandbox projects, enabling teams working on similar use cases to benefit from each other's experiences.



07.
Conclusion on the sandbox design



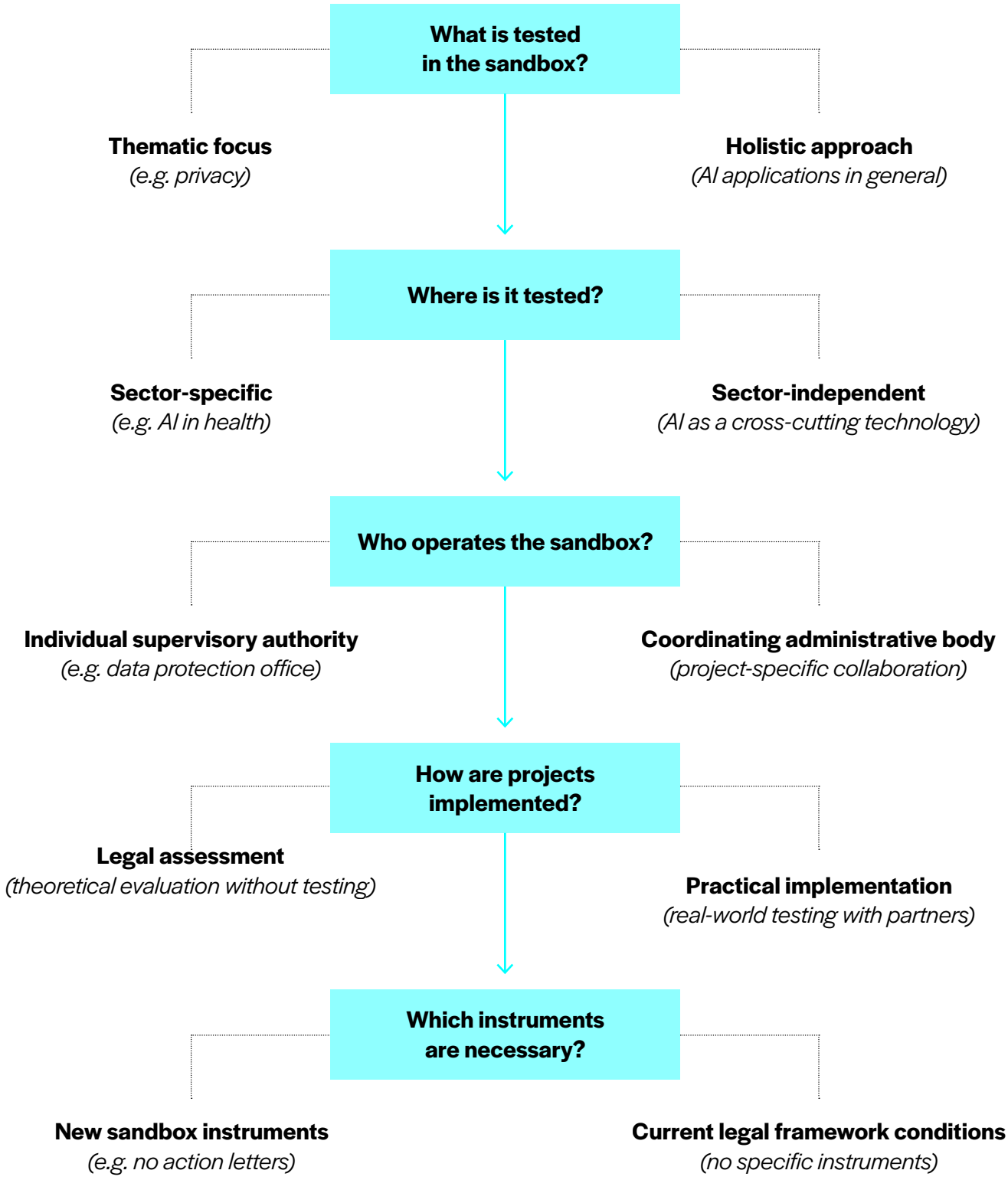
The previous sections outlined the experiences and findings from the sandbox in the Zurich Metropolitan Area. The design of an AI sandbox necessitates the consideration of various strategies, which each come with advantages and disadvantages. The following considerations influence the effectiveness and suitability of the sandbox for the respective context.

Thematic focus vs holistic approach
A thematic focus involves concentrating on a specific AI topic, such as data protection, allowing for in-depth analysis and specialised guidance for participating organisations. This approach can yield detailed findings in the chosen area. However, in the Zurich Metropolitan Area, a holistic approach was selected, addressing multiple aspects of AI solutions, including their legal, technical, and communicative dimensions. The goal is to provide a comprehensive understanding of the wide-ranging challenges posed by AI. While this approach is less focused and requires the deployment of human resources with diverse skill sets, it ensures that all relevant topics are considered. Consequently, it offers a more comprehensive and practically relevant framework for the development of AI solutions.

Sector-specific vs sector-independent
A sector-specific approach targets a particular industry, such as healthcare or mobility, and ensures that the sandbox addresses the unique challenges and regulations pertinent to that industry. This can result in highly relevant outcomes for the targeted sector. However, the steering committee of the sandbox opted for a sector-independent approach, which offers greater flexibility and variety. While this approach produces more general sandbox results, it encourages a broader range of innovations and applications that align with the cross-sectoral market needs of the AI community. If the demands of specific industries are particularly high, sector-specific and sector-independent programmes can be linked to complement each other.

Individual supervisory authority vs coordinating administrative body
A competent body within its specific area of activity, such as a data protection authority, can provide clear and authoritative answers and thus offer unambiguous guidance. While this can be advantageous in the case of specific regulatory issues, it overly limits extensive AI projects whose results are intended to be transferable. In Zurich, a coordinating administrative body, namely the Office for Economy, assumed responsibility for the sandbox. This office is not a traditional AI supervisory authority. However, as almost all AI applications are subject to several legal requirements, a coordinating role can prove advantageous. A coordinator that acts across various legal areas (e.g. data protection, product safety, sector-specific requirements) and levels (municipal, cantonal, national, supranational) can ensure broader oversight and integrate various regulatory perspectives. This allows for a more comprehensive regulatory focus and makes the sandbox results more broadly applicable. Howe-

07. Conclusion on the sandbox design



07. Conclusion on the sandbox design

ver, it should be noted that the sandbox results do not constitute definitive decisions by a competent authority within its specific area of activity.

Legal review vs practical implementation
The focus on legal reviews can clarify legal requirements and compliance issues and provide clear guidelines for AI development. However, this approach lacks practical insights from real AI implementations. The steering committee of the sandbox prioritised the practical implementation of AI applications, including data provision, hardware installation, and public communication. This approach offers valuable practical insights and highlights real challenges and opportunities. While this may require more resources and greater coordination, the developed solutions are not only theoretically sound, but can also be implemented in practice. The primary challenge in the practical implementation of sandbox use cases, which require close collaboration across institutional boundaries, is finding the right partners.

New sandbox instruments vs current legal framework conditions
Legal instruments such as experimentation clauses and no-action letters are valuable when implementing an AI sandbox. However, such instruments are not available in all legal areas, and their introduction can be a time-consuming and complex undertaking. The Zurich Metropolitan Area also lacks such instruments in the relevant legal areas, leading to the decision to operate within existing legal options. While this may perhaps not provide the specific support that some sandbox projects require, it allows for immediate application and flexibility. This pragmatic approach harmonises the promotion of innovation with the practical realities of existing legal structures. An alternative approach could have been to combine the two options: launching the sandbox within the current legal framework while simultaneously developing new sandbox-specific instruments.

Conclusion and outlook
Designing an AI sandbox requires striking a balance between strategic considerations and practical approaches to create a test environment that supports both AI innovation and regulatory learning. It is crucial for the sandbox to evolve iteratively based on practical experiences and to be continuously optimised in response to changing requirements. Adapting the sandbox to national culture and regional circumstances ensures its relevance and effectiveness within its local context. By carefully considering the aforementioned factors, a sandbox can create a framework that fosters AI innovation while addressing regulatory learning processes and practical challenges. Based on the positive experiences of the Zurich sandbox and its impact on the AI ecosystem, the project team will initiate new AI projects during a second implementation phase between 2024 and 2026. In doing so, the sandbox will continue to contribute to establishing the Zurich Metropolitan Area as an innovative, efficient, and robust AI hub.

Glossary

AI Regulatory Sandbox
A special form of sandbox defined in Article 3 (55) of the EU AI Act. Companies and authorities can test AI applications under supervision and in compliance with regulatory requirements to clarify legal uncertainties and promote innovation.

Chat-GPT
An AI model from OpenAI that specialises in natural language processing. It allows for the creation of human-like texts and conversations and has significantly influenced the discussion about AI at a global scale.

Edtech
The abbreviation for educational technology. Edtech refers to the use of digital technologies to improve teaching and learning processes.

Experimentation clause
A legal provision that makes it possible to temporarily suspend or adapt certain regulations to test innovative technologies under real conditions.

Fine-tuning
The process of adapting a pre-trained AI model in line with a specific task or data set to optimise its performance in an area of application.

AI Act
A legal framework of the European Union that aims to regulate the use of AI technologies with the objective of ensuring ethical standards, safety and data protection.

Artificial intelligence (AI)
There are various definitions of AI. In this report, AI is understood to mean the ability of machines to execute tasks that require human intelligence (e.g. recognising patterns, learning from data and taking decisions). In the sandbox, the term is very broadly defined to cover many technologies and applications.

No-action letter
A letter from a regulatory authority informing a company that it does not have to fear being subjected to any regulatory measures if it conducts a certain project. This provides companies with legal certainty when testing new technologies.

Sandbox
A controlled environment in which new technologies or methods can be safely tested and further developed. It allows for innovations to be tried out without taking major risks for the real environment. The term is used for both technical test environments and regulatory frameworks in which new approaches are tested under supervision.

Further links

- ***AI sandboxes for Switzerland?***
  (in German) by Stephanie Volz
- ***Review mandate for regulatory sandboxes***
  by Dr. Yves Schneider, Patrick Zenhäusern and Guido Saurer
- ***International exchange on test environments***
  (in German) by the Office for Economy
- ***Artificial intelligence: Canton of Zurich strengthens its position as a centre for innovation***
  (in German) by the Office for Economy
- ***Innovative environment for AI testing and promotion***
  (in German) by Matthias Michel

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