Generative Guide

A creative design project tackling the impact of Generative AI on the climate in the public sector.

This creative design project, developed within the early research programme Sustainable ICT, offers one possible solution: a toolkit to support meaningful dialogue among public sector stakeholders. It's not a definitive answer, but a starting point to guide exploration and inspire action.

This document is targeted to public sector innovators that are curious what to do with the growing impact of Generative AI.

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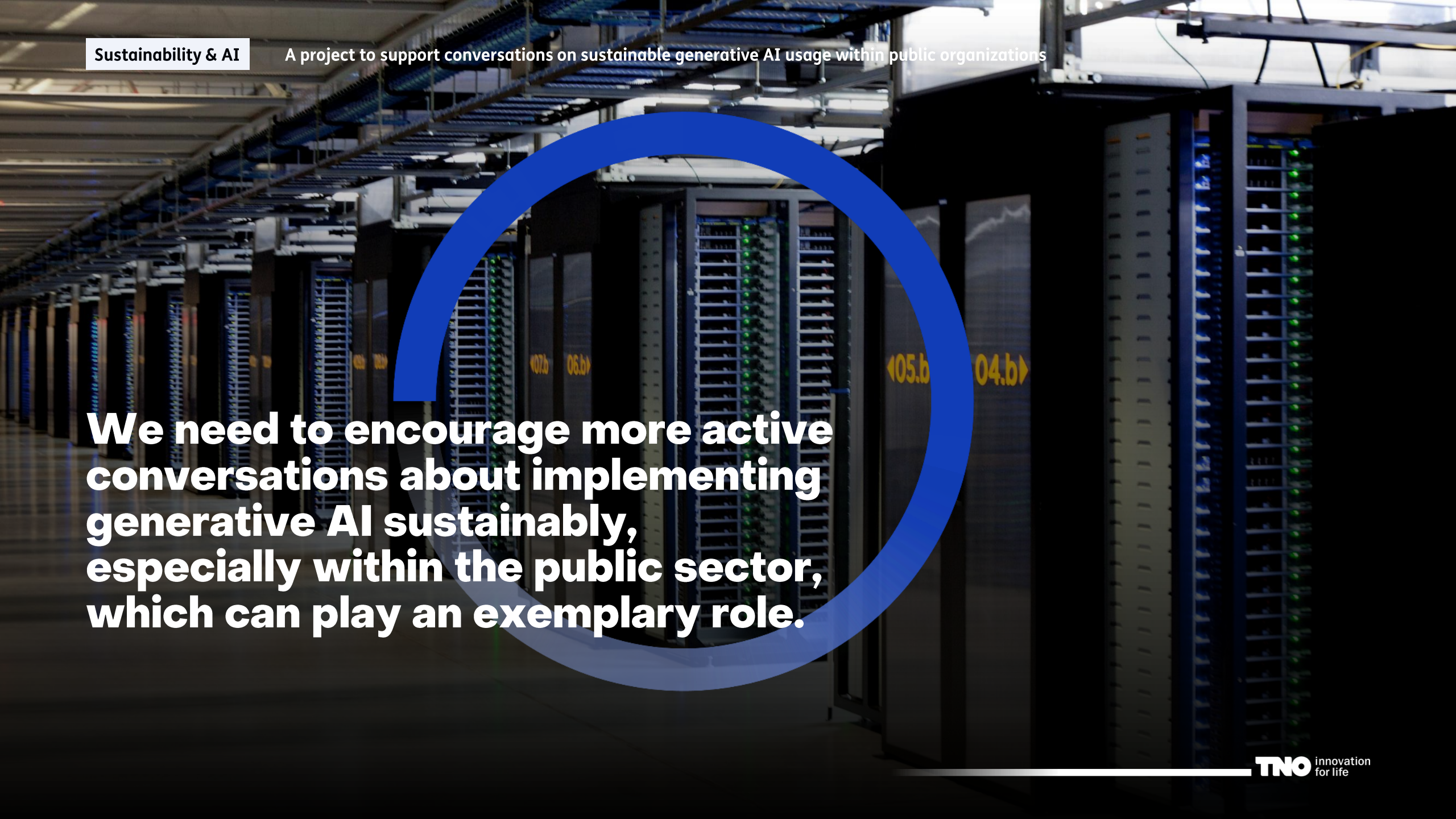


We need to encourage more active conversations about implementing generative AI sustainably, especially within the public sector, which can play an exemplary role.

Agenda

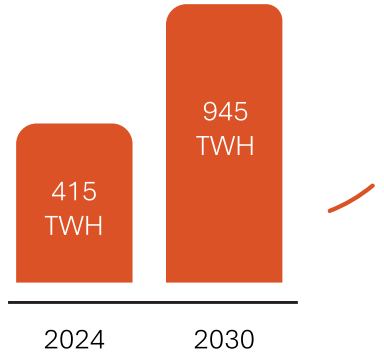
Generative AI is having a growing impact on the climat

Recent studies show that generative AI has a big impact on our climate (Kudina et al., n.d.). Generative AI models use a lot of energy. Due to this, the **International Energy Agency (2025) predicts that data centers' energy use will double by 2030 compared to 2024**. This year already, AI could use as much power as countries like Switzerland and Austria (de Vries-Gao, 2025).

Data centers also use a lot of water for cooling and energy production. For example, GPT-3 can use up to **500ml of water for 10-15 responses** (Li et al., 2023). This varies depending on the data center's location and energy source.

Generative AI also creates a lot of **physical waste**, potentially 1.2 to 5.0 million tons between 2020 and 2030 (Wang et al., 2024). Building data centers increases the demand for scarce materials (Bolte et al., 2022; Ligozat, 2022; Robbins & van Wynsberghe, 2022). Materials like **steel used in construction** also add to the environmental impact (Microsoft, 2025).

All of this shows that the climate impact of generative AI is continuing to grow



Total data center energy usage is expected to account for 3% of the world's total by 2030.

(International Energy Agency, 2025)

Big tech also recognizes the problem

"As we further integrate AI into our products, reducing emissions may be challenging" – Google (2024)

"The infrastructure and electricity needed for these technologies create new challenges for meeting sustainability commitments across the tech sector" – Microsoft (2024)

The use of Generative AI in the public sector

Increased use of Generative AI in the Public sector

Generative AI is becoming **more popular among Dutch government organizations,** as shown by research from De Algemene Rekenkamer (2024) and Hoekstra et al. (2024). Research by Software One (2025) found that about **20% of public government workers use AI tools often, and around 50% use them sometimes** (Meijer et al., 2025).

This leads to an increase in energy usage:

Public sector AI energy usage:

27,2 GWh
Middle scenario

53,3 GWh
High scenario

128 GWh
Current total public sector data center energy usage

Toward sustainable Generative AI

The European AI Act provides legal obligations to tackle the problem, (European Union, 2024). It states that by law organizations that work with AI should have **AI literacy**, **knowing what AI is and how it works when you work with AI**. On top of this it also briefly mentions the sustainability of AI models as a possible guideline to take into account.

The Dutch government also addresses the issue of the sustainability of generative AI, in guidelines released this year (Ministerie van Binnenlanse Zaken en Koninskrijkrelaties, 2025) including a brief section on sustainability, emphasizing the choice of **more sustainable models** and **promoting alternative solutions to address the same challenges.**

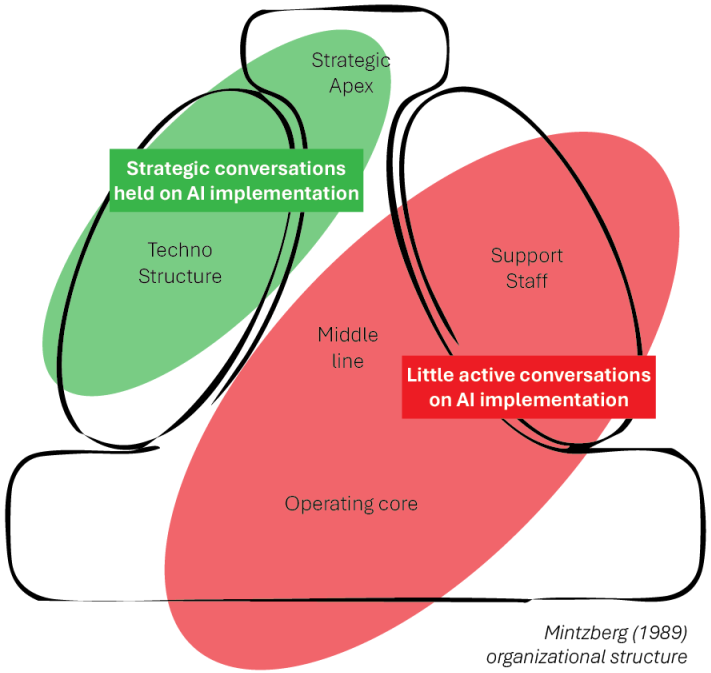
Supporting conversations

Our research revealed that conversations about adopting generative AI tools sustainably are currently lacking, particularly among employees who are potential adopters. This project aims to bridge that gap by connecting employees across various organizational layers and facilitating meaningful discussions among them.

Through these conversations, participants should become more aware of generative AI and understand its impact on our climate.

The goal is to promote more sustainable use of AI tools by individual employees and to potentially influence organizational policies on AI adoption.

A public organization



Mintzberg (1989) organizational structure

Design Question:

How can **conversations** about the importance of **sustainability in generative AI adoption** be facilitated amongst **employees across different organizational layers** within public organizations?

Creatively getting to a solution

The project followed the Double Diamond Design process (Design Council, n.d.). Throughout three iterative stages, insights were continuously transferred and critically reflected upon, from which ideas were created and worked out.

Within the iterations a hand-on and creative mindset was held, brainstorming sessions were conducted, sketches were made and prototypes created. Such a hands-on methodology provided the opportunity to discover different forms and shapes of prototypes, both physical and digital.

Iteration 1:
Discovering the scope

Iteration 2:
Researching the problems in place and finding preliminary concept directions

Iteration 3:
Gathering input from users & stakeholders and creating a final concept

Research through interviews, workshop & survey

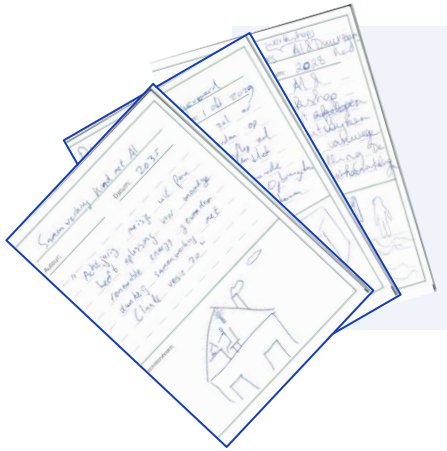
Within the research input from users, experts and stakeholders was gathered at numerous moments.

A future-thinking workshop was held at The Rijks ICT Gilde, providing inspiration and input on the context

A survey was distributed among public sector employees, providing a wider view of the topic within different organizations.

These insights were then mapped onto design success criteria, from which creative concepts were iteratively developed.

Future thinking workshop



In the workshop participants created possible futures when it comes to AI & sustainability

"AI literacy needs to be increased"
(Future Perspectives Workshop)

"More awareness is needed on the topic"
(Future Perspectives Workshop)

"We need to take this problem seriously, due to the impact of AI on our climate but also due to the rising costs that come with the high energy usage"
(Public Organizations Survey)

Research findings

Through the different research moments, we discovered key factors to include in a concept:

1

Actively raise awareness on the topic engaging a wide range of employees

"There is little attention about the topic sustainability & AI" (Future Perspectives Workshop)

2

Focus on supporting sustainable usage of generative AI

"I want to know the solution on how it can be done sustainable" (Public organizations survey)

3

Teach people more about generative AI and its impact on our climate

"There is too low level of knowledge in this area. That needs to be developed" (Public organizations survey

4

Support conversations that include employees across different organizational layers and a wide range of perspectives

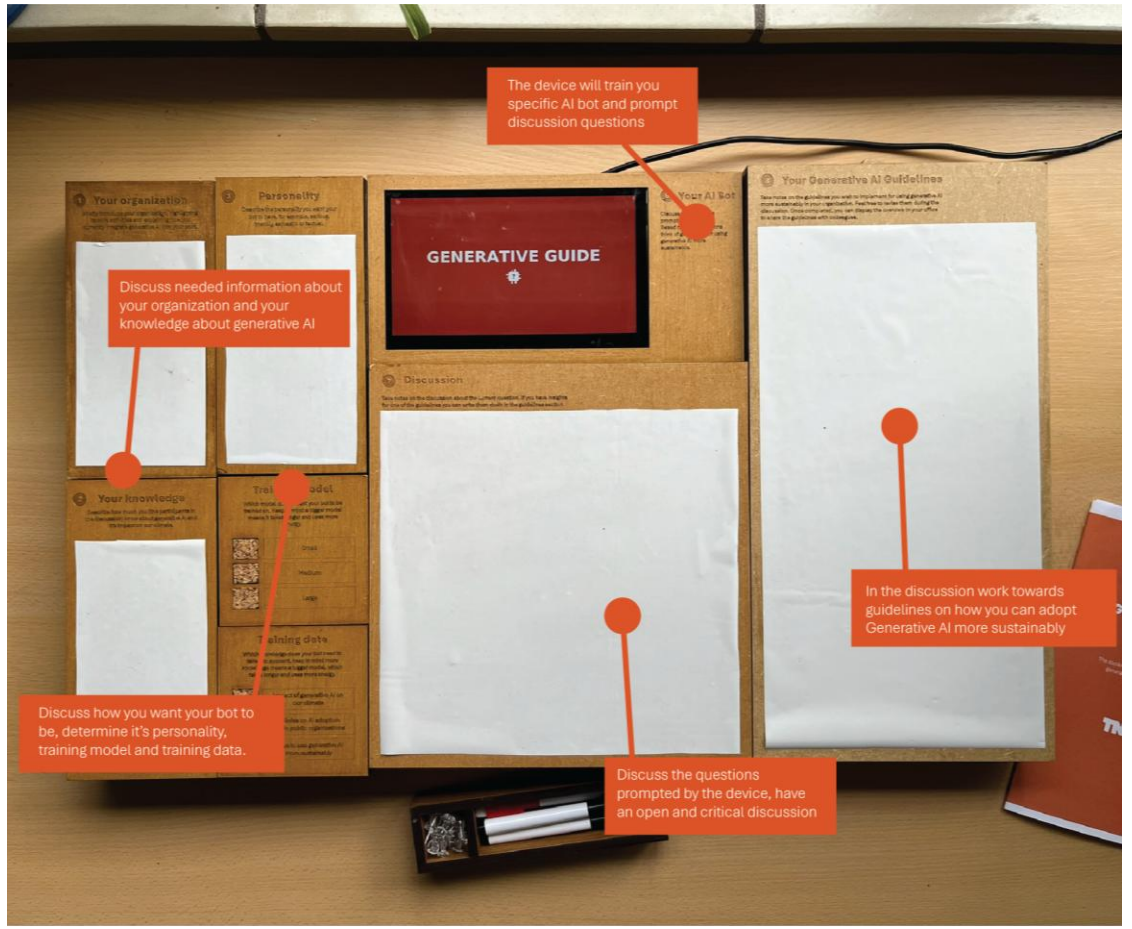
"As the public sector, we are supposed to go along with the public expectations. The diversity of perspectives needs to be included" (Public organizations survey)

Result: Generative Guide

Generative Guide is a toolkit for public organizations that want to implement generative AI in a more sustainable way!

With the help of the toolkit relevant stakeholders are supported in having a conversation on using generative AI more sustainably. By building their own AI bot, they learn what inputs go into an AI model and what the impact of these decisions is. This bot then prompts discussion questions about using AI more sustainably altered for their organization. From the discussion on these questions participants build towards guidelines. These guidelines are the outcome of the discussion which can be shared with colleagues afterwards to make more people aware of how to use generative AI effectively and sustainably, while also sparking organization-wide conversations about potential policy changes for more sustainable generative AI adoption.

Through this collaborative discussion participants will learn how AI works, the impact of it on our climate and co-create guidelines to implement AI in a more sustainable way.



Evaluation & future perspective

From the research we saw that the first step of making our sustainable generative AI behavior is creating a conversation about it. The Generative Guide toolkit facilitates such discussions in a low-effort and engaging way.

Validating the results

The toolkit was validated with a group of interested employees and pitched towards a public sector employee. The evaluation showed the value the conversation with such a toolkit can have.

The future of the topic

It is beneficial to further explore concepts that support these conversations. Allowing users to build their own generative AI model is particularly valuable, as this model can serve as both a moderator and an expert, providing valuable input and keeping track of discussions.

It teaches people more about generative AI:

"by using Generative AI within the concept, I now understand oh hey, this is what it can do, and this is what it can't do" (User test)

It provokes conversations on proper implementation:

"I think that's the most interesting thing. That people kind of get into a discussion about the good use and so the benefits versus the drawbacks of Generative AI" (Validation pitch)

It engages people on the topic:

"That's an interesting discovery we had in the beginning of using the toolkit, we discussed if we have anything in place already to tackle this problem. From this, I do feel a bit more responsible to do something with the topic now" (User test)

Want to know more? Get into contact!

Want to get more details on the research and the process behind it or want to have a chat on the sustainability of AI and what can be done, don't feel afraid to reach out.

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Or want to know more about what is happening within TNO on the topic of the sustainability of AI, reach out to one of the people guiding this project from TNO to learn more.

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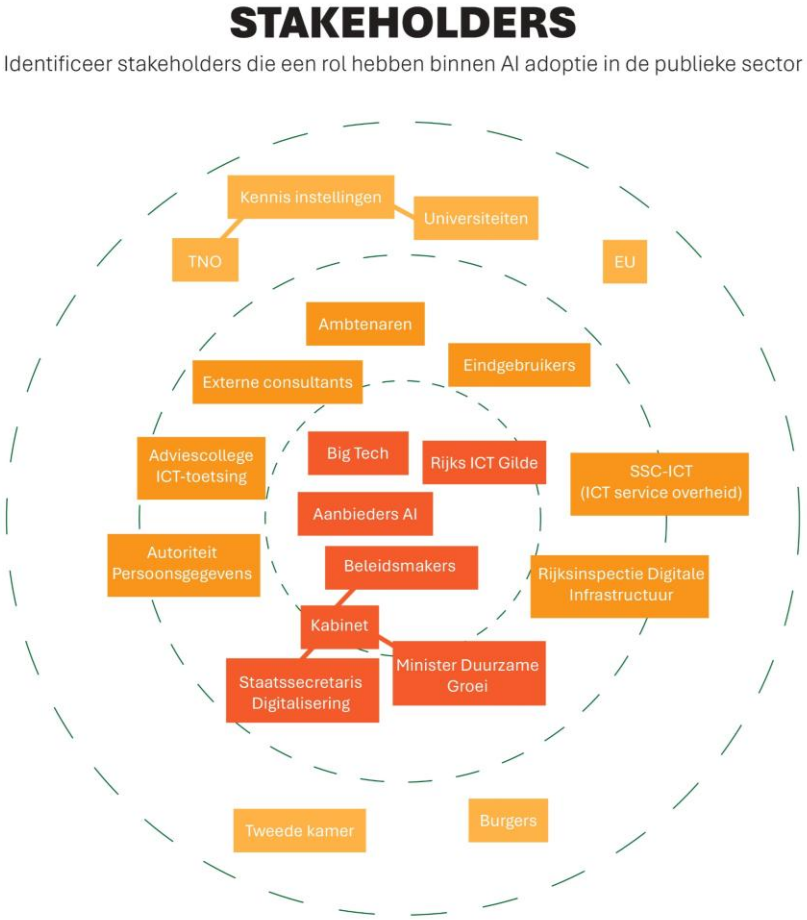
Appendix 1: Future Thinking Brainstorm Rijks ICT Gilde

As part of the project a workshop was held on future scenarios related to AI and sustainability in the public sector.

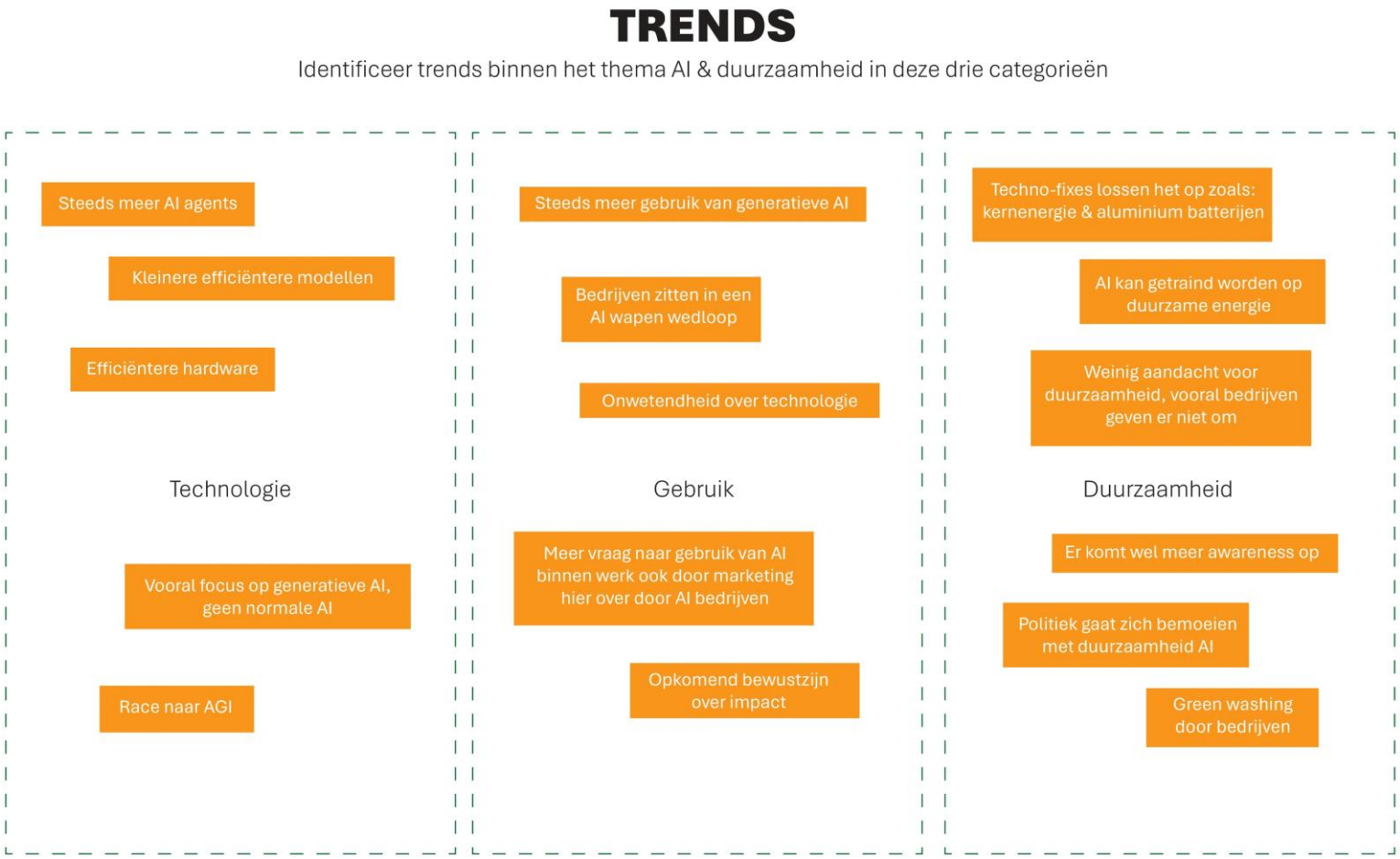
This took place during the "Vakwerkdag" (Craftsmanship Day) of the Rijks ICT Gilde on Thursday, March 27. The workshop consisted of multiple phases: we began with an analysis of the current situation, then outlined possible future visions, and finally determined actions to realize these future scenarios.

The workshop was conducted in four groups of three participants, during which we shared insights in plenary sessions multiple times. This overview presents the combined insights from the workshop.

Within the public sector, the main stakeholders are primarily policymakers, big tech/technology providers, and experts such as the Rijks ICT Gilde.



Appendix 1: Future Thinking Brainstorm Rijks ICT Gilde



- Due to the rapid rise of generative AI systems (especially LLMs) and their significant emissions, the question of AI's sustainability has become very important.
- At the moment, there is little attention being paid to the sustainability aspect, especially among companies. However, discussions are slowly starting to emerge.

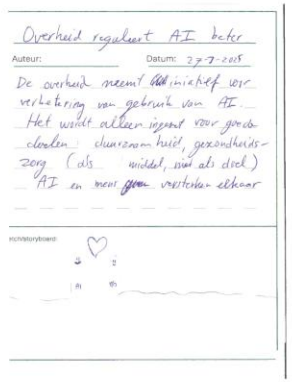
Appendix 1: Future Thinking Brainstorm Rijks ICT Gilde

MOGELIJKE ACTIES

Denk na over wat voor mogelijke acties er zijn om bij de gewenste toekomst te komen

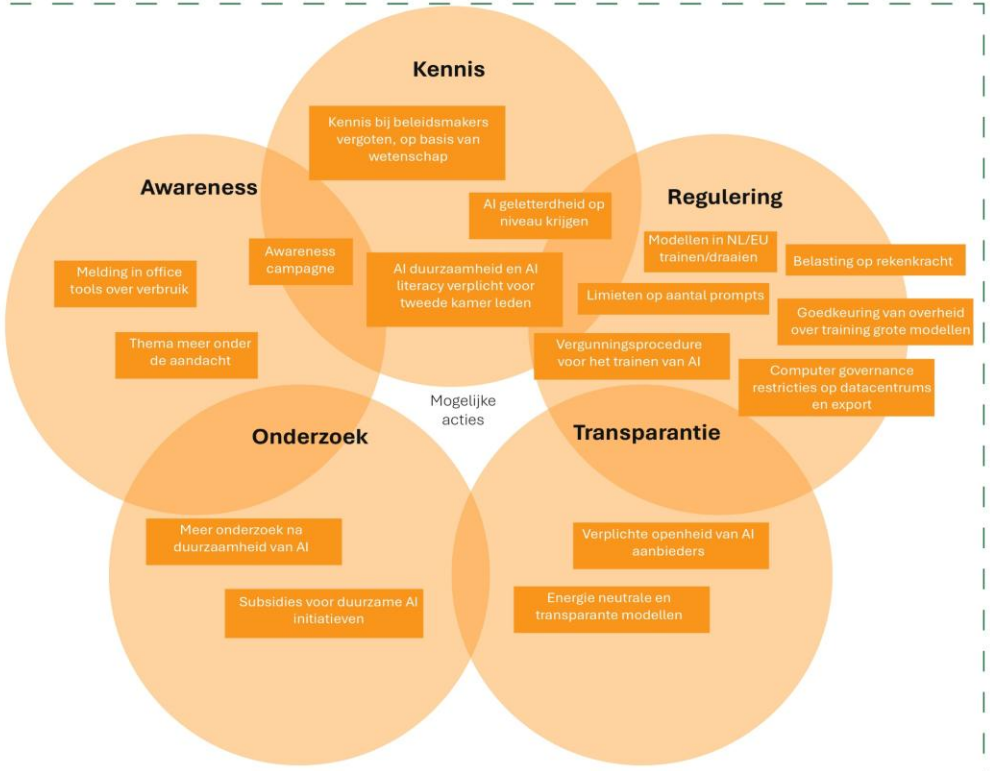
Gewenste toekomst

Toekomst gebaseerd op:



Belangrijks aspecten:

- Meer bewustwording over het thema
- Meer regulering
- Meer lokaal, in Nederland of EU
- Focus op innovatie, slimmere meer gefocuste AI modellen bijvoorbeeld

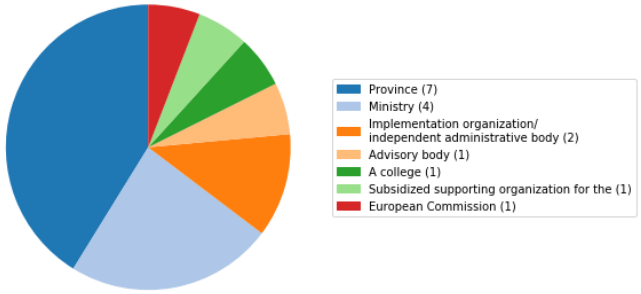


- To achieve desirable futures, various types of actions are needed. For example, workshops, pop-ups, or limits on the number of prompts.
- It is especially important to continue having conversations like the ones in this workshop. Taking a structured approach using multiple canvases and outlining future visions proves to be effective.

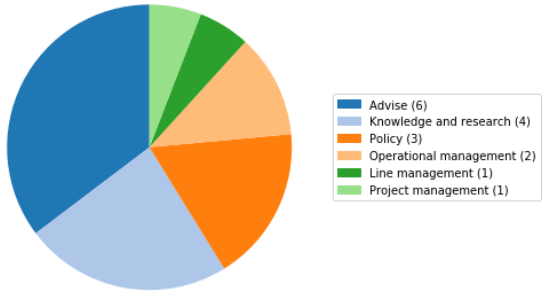
Appendix 2: Public Organizations Survey results

Participants

What type of public organization do you work for?



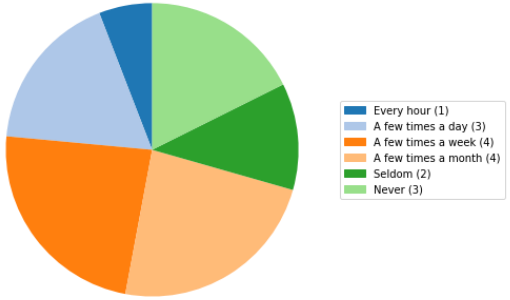
What type of role are you active in? (choose the one that fits best)



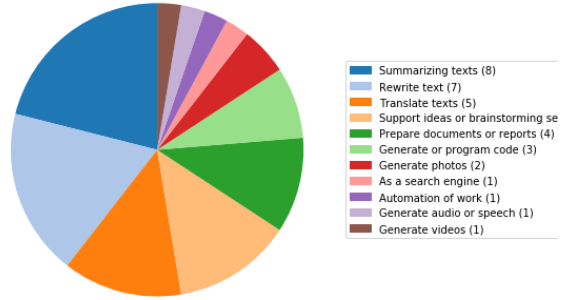
The survey was filled in by participants in different public organizations, ranging from national to provincial level. Most participants had an advice, knowledge or policy related function

Usage of Generative AI

How often do you use generative AI in your work?



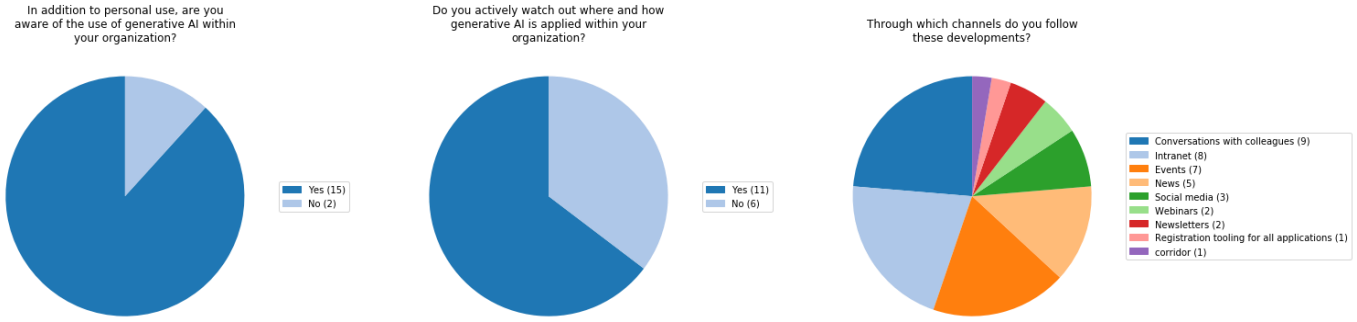
What do you use generative AI for in your work?



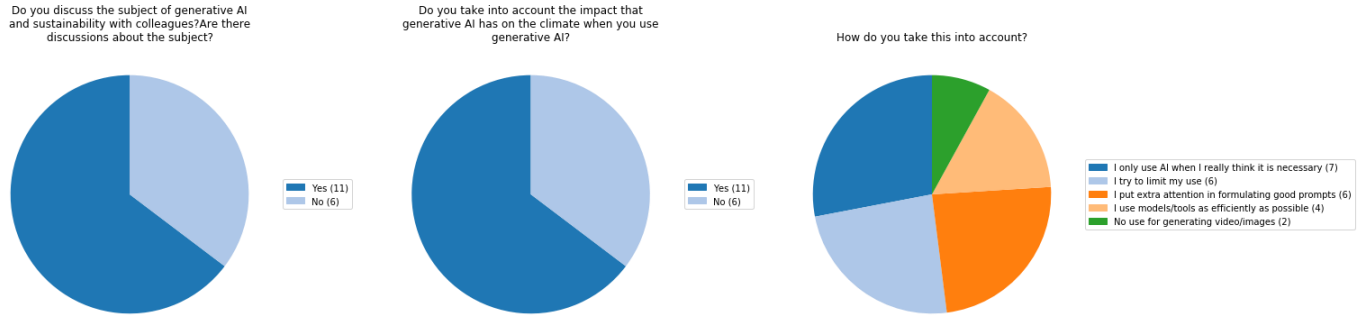
Over half of participants use AI less than once a week (once a month, hardly or never). Most usage is in Large Language models, mainly generating text for summaries, rewriting or translations. Within the participants almost all are actively aware (15/17) and following (11/17) generative AI adoption within there organizations. What is good to note is that there is a potential bias within participants that filled it in. It is likely that employees interested in AI adoption are more likely to fill in a questionnaire on the topic

Appendix 2: Public Organizations Survey results

Keeping track of generative AI developments



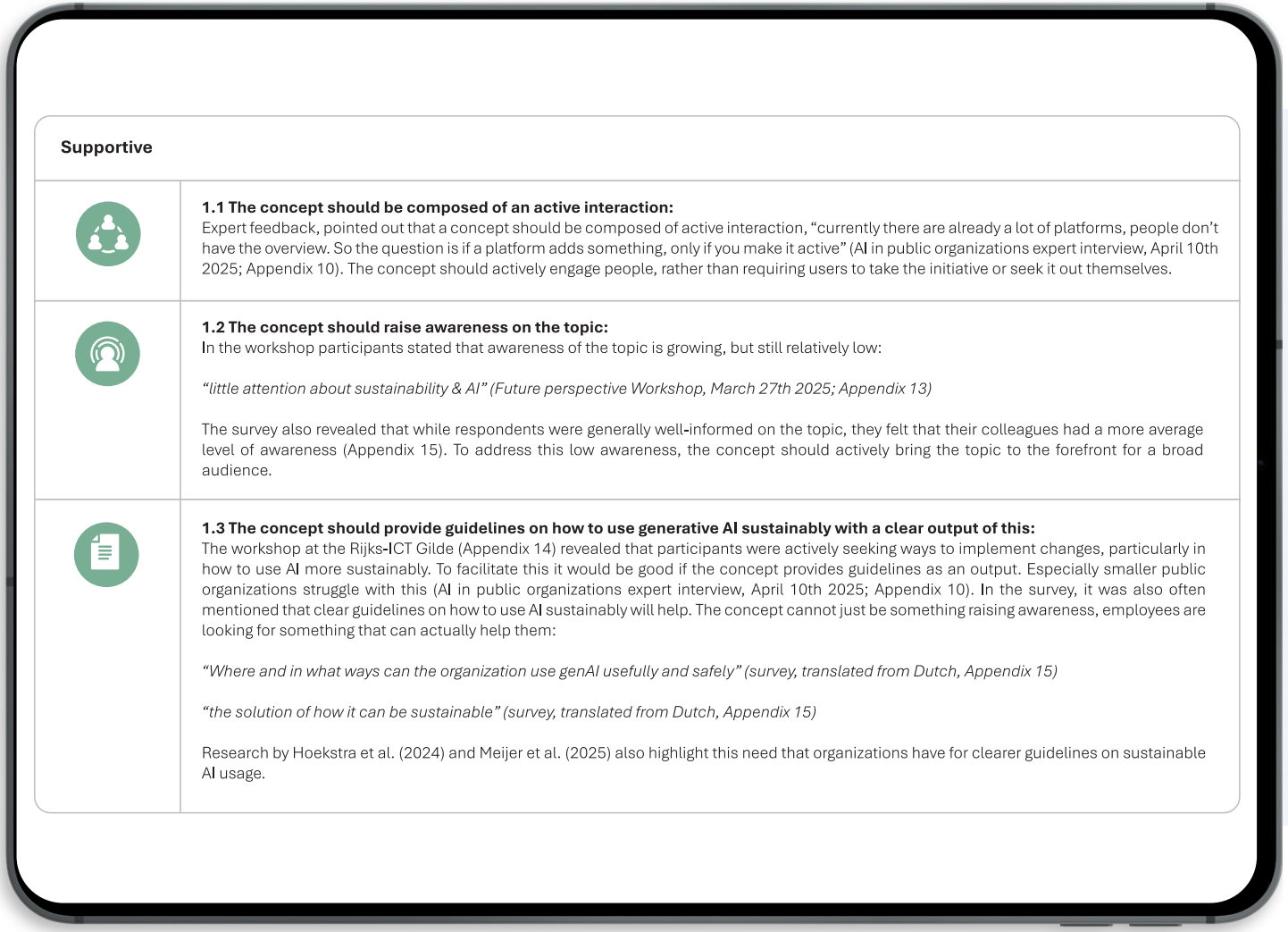
Does sustainability currently play a role



Participants were asked to describe what they know about the impact of generative AI on the climate. Here 12/17 participants notify the big energy usage of generative AI systems, only two also highlight the big water usage, as well as four people the physical material usage.

In the survey it shows that around 2/3 of participants take climate change into account when using generative AI. Both the options “I only use AI when really necessary” and “I try to limit my AI usage” are popular, highlighting decision making when and when not to use generative AI.

Appendix 3: Design Criteria



Supportive

1.1 The concept should be composed of an active interaction:
Expert feedback, pointed out that a concept should be composed of active interaction, "currently there are already a lot of platforms, people don't have the overview. So the question is if a platform adds something, only if you make it active" (AI in public organizations expert interview, April 10th 2025; Appendix 10). The concept should actively engage people, rather than requiring users to take the initiative or seek it out themselves.

1.2 The concept should raise awareness on the topic:
In the workshop participants stated that awareness of the topic is growing, but still relatively low:

"little attention about sustainability & AI" (Future perspective Workshop, March 27th 2025; Appendix 13)

The survey also revealed that while respondents were generally well-informed on the topic, they felt that their colleagues had a more average level of awareness (Appendix 15). To address this low awareness, the concept should actively bring the topic to the forefront for a broad audience.

1.3 The concept should provide guidelines on how to use generative AI sustainably with a clear output of this:
The workshop at the Rijks-ICT Gilde (Appendix 14) revealed that participants were actively seeking ways to implement changes, particularly in how to use AI more sustainably. To facilitate this it would be good if the concept provides guidelines as an output. Especially smaller public organizations struggle with this (AI in public organizations expert interview, April 10th 2025; Appendix 10). In the survey, it was also often mentioned that clear guidelines on how to use AI sustainably will help. The concept cannot just be something raising awareness, employees are looking for something that can actually help them:

"Where and in what ways can the organization use genAI usefully and safely" (survey, translated from Dutch, Appendix 15)

"the solution of how it can be sustainable" (survey, translated from Dutch, Appendix 15)

Research by Hoekstra et al. (2024) and Meijer et al. (2025) also highlight this need that organizations have for clearer guidelines on sustainable AI usage.

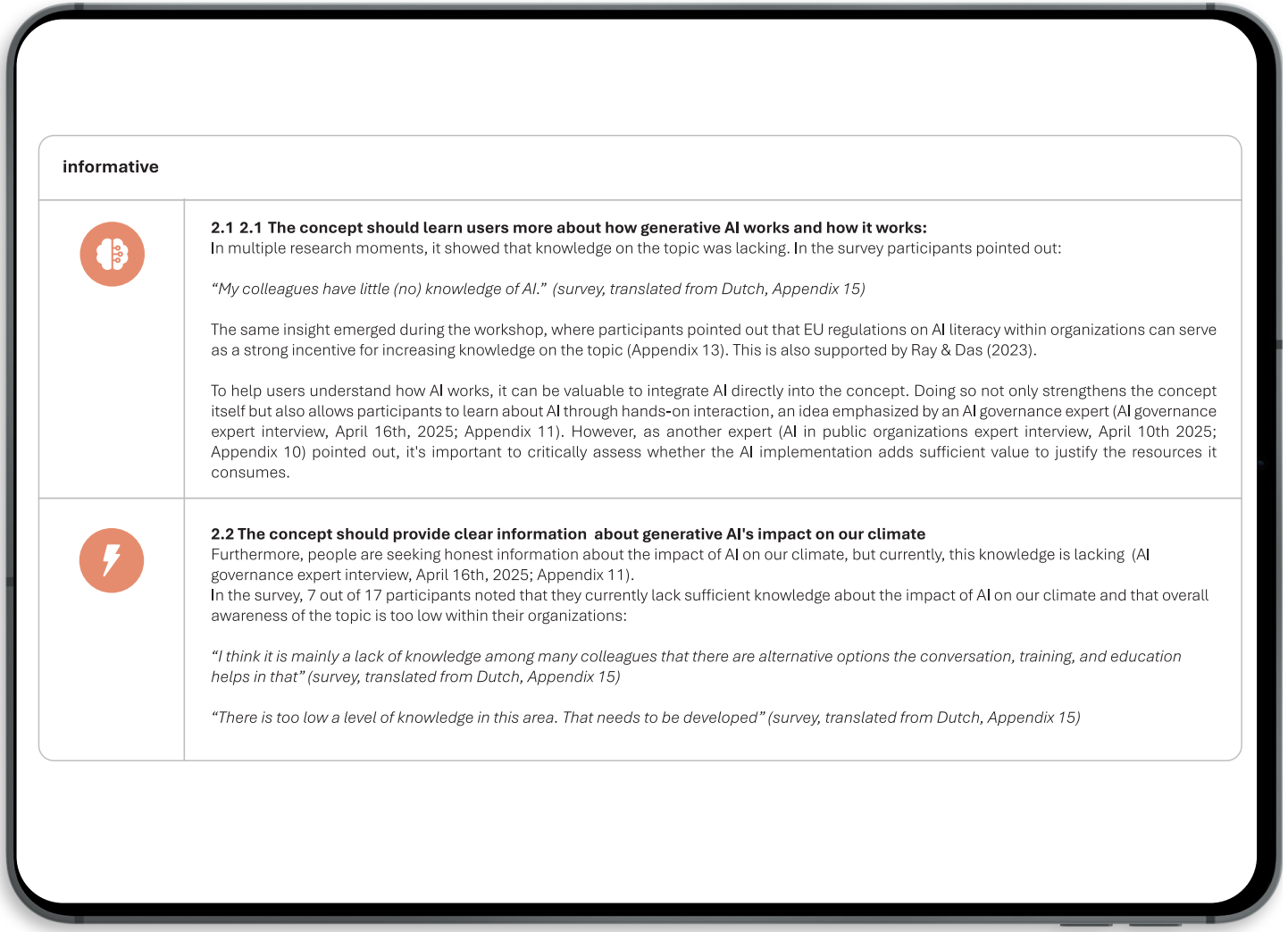
Explanation:

All research findings were incorporated into these design criteria.

Each criterion includes the relevant research insights along with the underlying motivations.

The design criteria served as a framework for brainstorming and reflecting on the outcomes.

Appendix 3: Design Criteria



informative

2.1 2.1 The concept should learn users more about how generative AI works and how it works:
In multiple research moments, it showed that knowledge on the topic was lacking. In the survey participants pointed out:

"My colleagues have little (no) knowledge of AI." (survey, translated from Dutch, Appendix 15)

The same insight emerged during the workshop, where participants pointed out that EU regulations on AI literacy within organizations can serve as a strong incentive for increasing knowledge on the topic (Appendix 13). This is also supported by Ray & Das (2023).

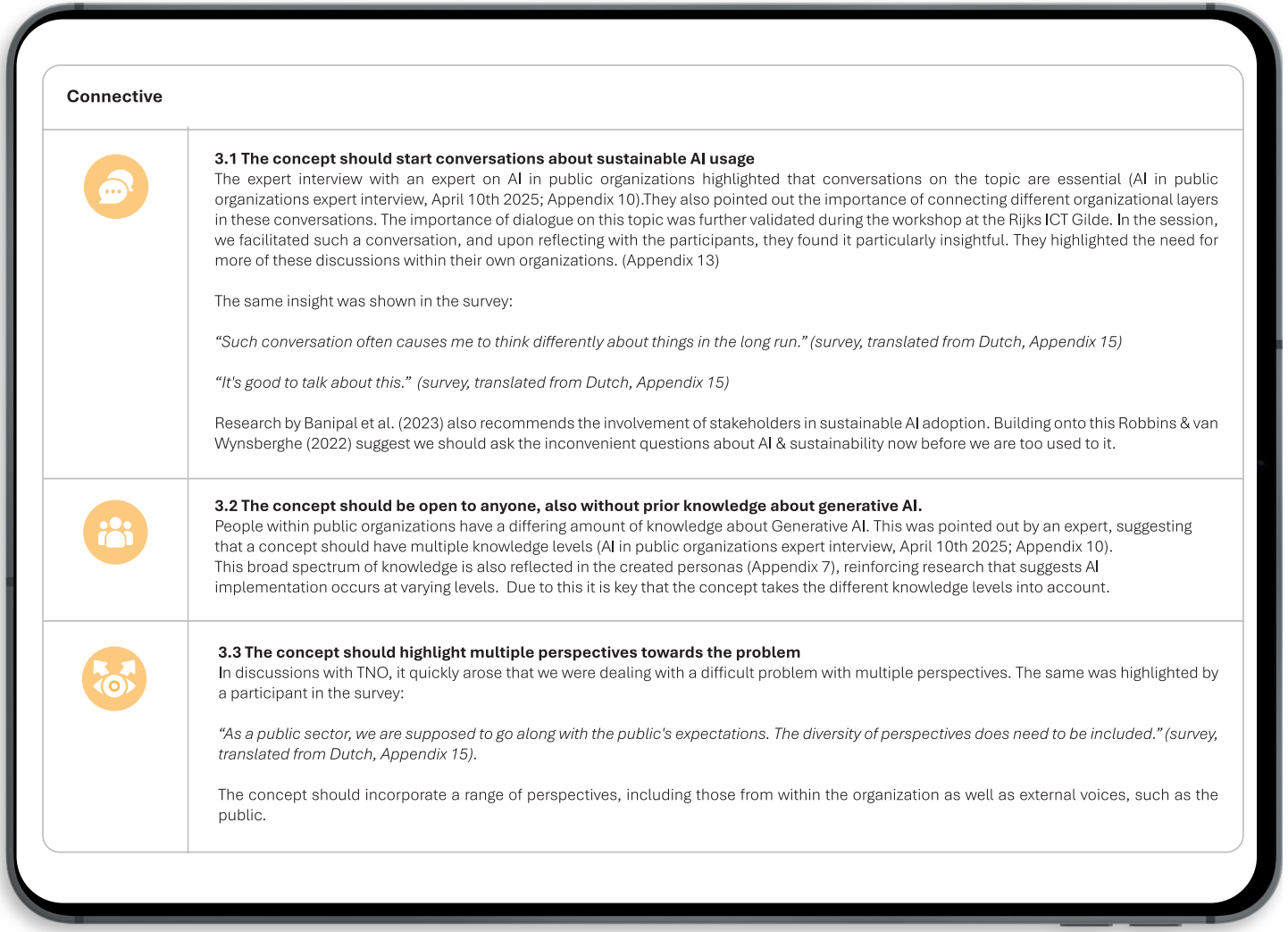
To help users understand how AI works, it can be valuable to integrate AI directly into the concept. Doing so not only strengthens the concept itself but also allows participants to learn about AI through hands-on interaction, an idea emphasized by an AI governance expert (AI governance expert interview, April 16th, 2025; Appendix 11). However, as another expert (AI in public organizations expert interview, April 10th 2025; Appendix 10) pointed out, it's important to critically assess whether the AI implementation adds sufficient value to justify the resources it consumes.

2.2 The concept should provide clear information about generative AI's impact on our climate
Furthermore, people are seeking honest information about the impact of AI on our climate, but currently, this knowledge is lacking (AI governance expert interview, April 16th, 2025; Appendix 11).
In the survey, 7 out of 17 participants noted that they currently lack sufficient knowledge about the impact of AI on our climate and that overall awareness of the topic is too low within their organizations:

"I think it is mainly a lack of knowledge among many colleagues that there are alternative options the conversation, training, and education helps in that" (survey, translated from Dutch, Appendix 15)

"There is too low a level of knowledge in this area. That needs to be developed" (survey, translated from Dutch, Appendix 15)

Appendix 3: Design Criteria



Connective

3.1 The concept should start conversations about sustainable AI usage

The expert interview with an expert on AI in public organizations highlighted that conversations on the topic are essential (AI in public organizations expert interview, April 10th 2025; Appendix 10).They also pointed out the importance of connecting different organizational layers in these conversations. The importance of dialogue on this topic was further validated during the workshop at the Rijks ICT Gilde. In the session, we facilitated such a conversation, and upon reflecting with the participants, they found it particularly insightful. They highlighted the need for more of these discussions within their own organizations. (Appendix 13)

The same insight was shown in the survey:

"Such conversation often causes me to think differently about things in the long run." (survey, translated from Dutch, Appendix 15)

"It's good to talk about this." (survey, translated from Dutch, Appendix 15)

Research by Banipal et al. (2023) also recommends the involvement of stakeholders in sustainable AI adoption. Building onto this Robbins & van Wynsberghe (2022) suggest we should ask the inconvenient questions about AI & sustainability now before we are too used to it.

3.2 The concept should be open to anyone, also without prior knowledge about generative AI.

People within public organizations have a differing amount of knowledge about Generative AI. This was pointed out by an expert, suggesting that a concept should have multiple knowledge levels (AI in public organizations expert interview, April 10th 2025; Appendix 10).
This broad spectrum of knowledge is also reflected in the created personas (Appendix 7), reinforcing research that suggests AI implementation occurs at varying levels. Due to this it is key that the concept takes the different knowledge levels into account.

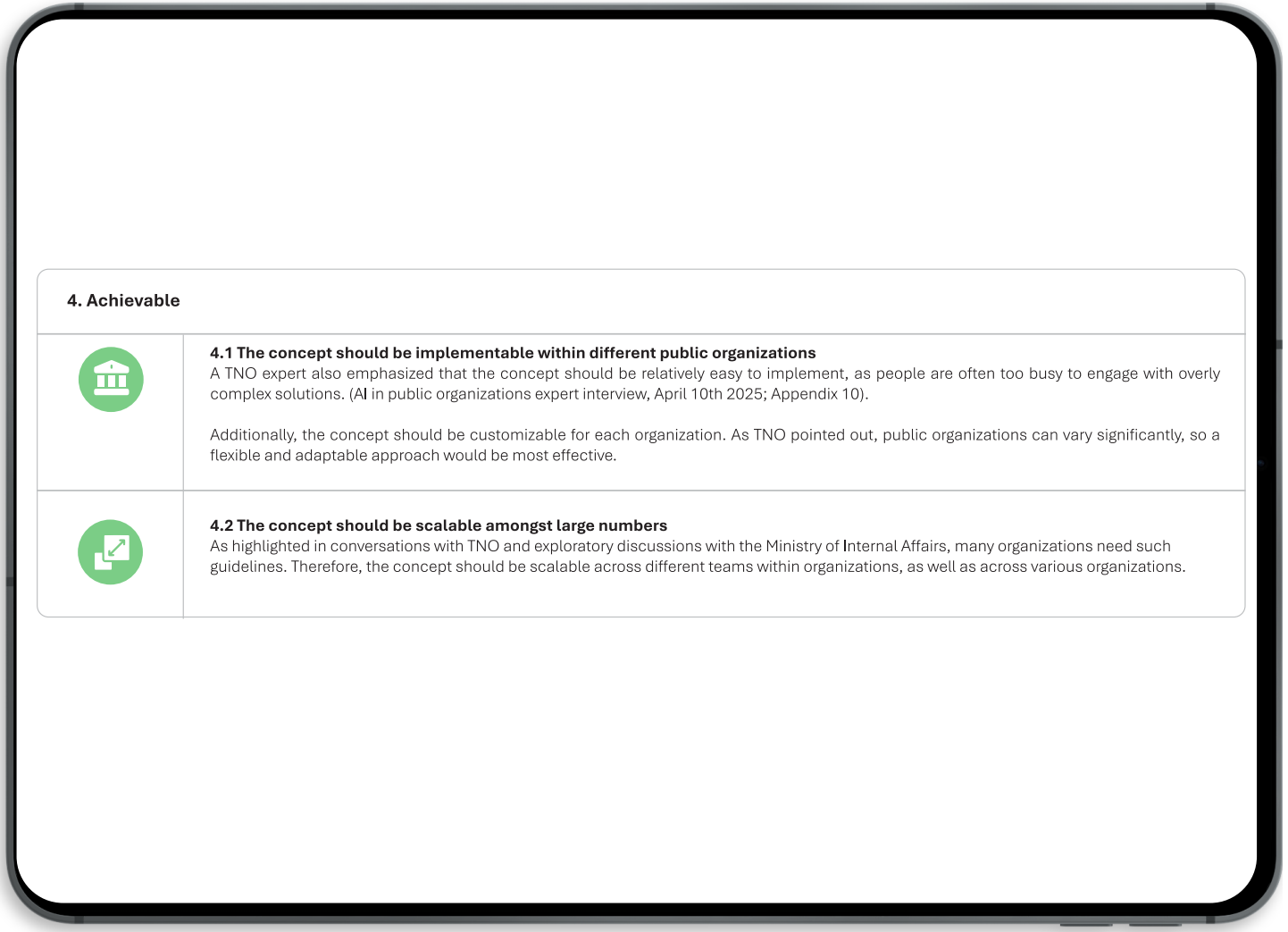
3.3 The concept should highlight multiple perspectives towards the problem

In discussions with TNO, it quickly arose that we were dealing with a difficult problem with multiple perspectives. The same was highlighted by a participant in the survey:

"As a public sector, we are supposed to go along with the public's expectations. The diversity of perspectives does need to be included." (survey, translated from Dutch, Appendix 15).

The concept should incorporate a range of perspectives, including those from within the organization as well as external voices, such as the public.

Appendix 3: Design Criteria



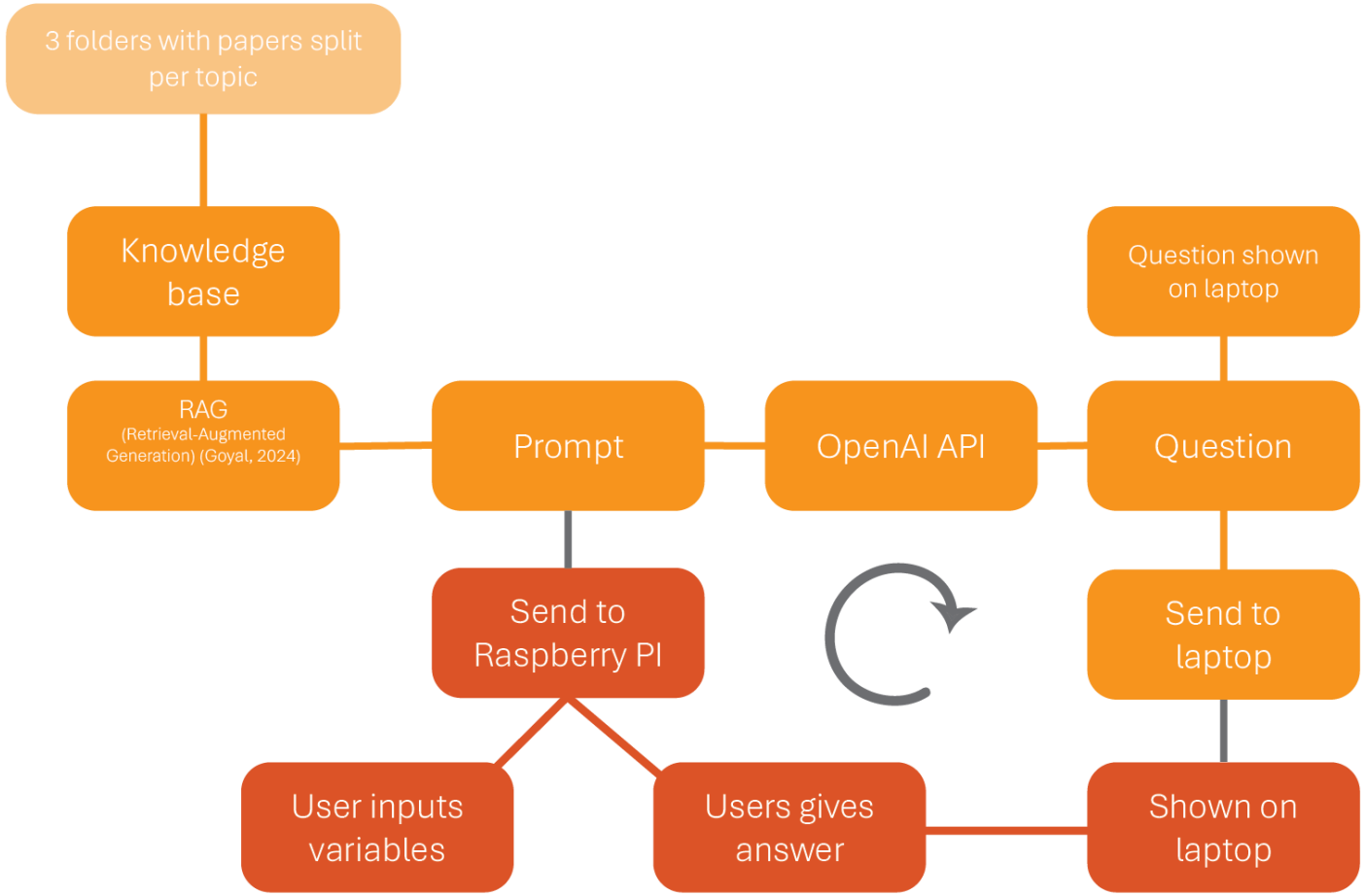
4. Achievable

4.1 The concept should be implementable within different public organizations
A TNO expert also emphasized that the concept should be relatively easy to implement, as people are often too busy to engage with overly complex solutions. (AI in public organizations expert interview, April 10th 2025; Appendix 10).

Additionally, the concept should be customizable for each organization. As TNO pointed out, public organizations can vary significantly, so a flexible and adaptable approach would be most effective.

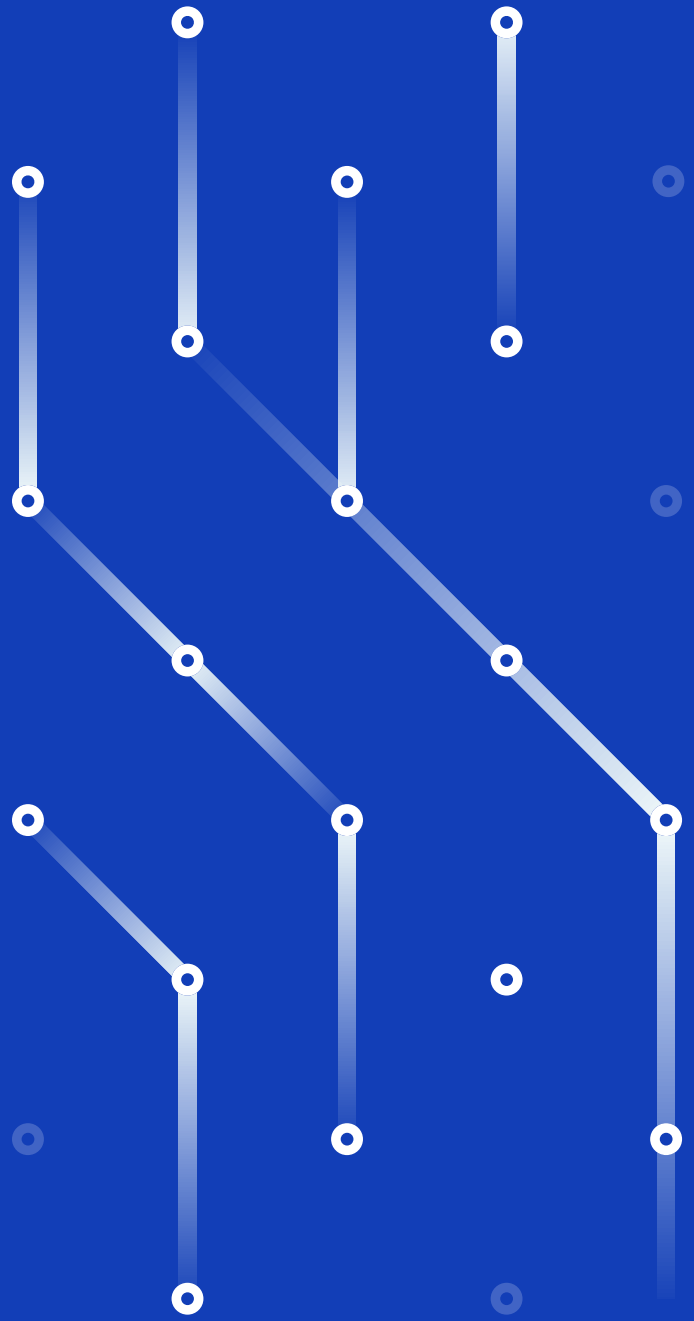
4.2 The concept should be scalable amongst large numbers
As highlighted in conversations with TNO and exploratory discussions with the Ministry of Internal Affairs, many organizations need such guidelines. Therefore, the concept should be scalable across different teams within organizations, as well as across various organizations.

Appendix 4: Prototyping



In the overview you can view a functionality scheme of the prototype, it was created using Python and the API of OpenAI.

The prototype was constructed of a Raspberry Pi connected to a HDMI screen , integrated into a wooden box within the toolkit (as you can see in the picture).



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