



“THE HYPER EXPERT COLLABORATIVE AI ASSISTANT”

# Deliverable D2.2

## AI co-creation representations

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## D2.2. AI co-creation representations

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# 1 Executive summary

This deliverable 2.2 'AI co-creation representations' describes the work done in task 2.2 'Co-creation with representations of AI systems'. The aim of task 2.2 is to develop representations of AI systems so that parts of the AI system become design materials in workshops with end-users. With these representations, users can co-create their ideal human-AI collaboration form — input certain preferences and settings so they define and structure the interaction with the AI system so they achieve a shared goal through collaboration with the system.

This task evolved in the creation of human-AI collaboration cards; a card set to use within a workshop with end-users to define their ideal human-AI collaboration form. The aim of the workshop is to define requirements for human-AI collaboration, keeping in mind the envisioned AI systems of the use-cases in PEER.

The human-AI collaboration cards consist of two different cards: the AI collaborator cards and the AI characteristic cards. The AI collaboration cards describe the type of human-AI collaboration, for example, the AI system needs to be an assistant, a guide, an advisor, or something else. End-users can use these cards to discuss how they envision their ideal human-AI collaboration. The AI characteristic cards contain several elements of a human-AI collaboration, such as trust enablers, attributes, capabilities, qualities, tone of voice, and interface types. By using these cards, the end-users can further form and build their ideal human-AI collaboration by expressing what characteristics they deem more important, or less.

As such, this deliverable contains: 1. the human-AI collaboration cards, 2. the workshop methodology to use the cards in a facilitated workshop with end-users, and 3. an additional template for the end-users to indicate their preferred AI characteristics and AI collaboration form. This template is used to summarise the group discussion and to make sure that at the end of the workshop the group agrees on how they envision their ideal human-AI collaboration with the envisioned AI systems developed in PEER. We describe and elaborate in detail all the necessary steps.

The work done in task 2.2 will help the technical partners within the PEER project, as well as the use-case owners and the end-users to have a discussion on the human-AI collaboration form of the envisioned AI systems. The card set steps away from technical explanations and jargon so end-users can also take part in a discussion on the characteristics and collaboration types of AI systems.

## 2 Description of work

The task 2.2 'Co-creation with AI representations of AI systems' builds further on the work done in task 2.1 'Requirements definition', and the work done in PEER so far (i.e. the development of MVPs of the envisioned AI systems by the technical partners within WP3). Within PEER, the aim is to build truly interactive AI systems in which user and technology enter a collaboration to achieve a shared goal. The user can input certain preferences or settings and the AI system will learn in concordance with the user over time. To further design these envisioned collaborative AI systems, the characteristics of the systems must be discussed together with the end-users to make sure the collaboration between AI and human will be effective. These characteristics can range from how the tone of voice of the systems should be, to what qualities or strengths they need to have, and to the type of collaboration that is the most favoured. This discussion with end-users allows for co-creation of the envisioned AI systems based on the very specific and particular needs and requirements of the end-users. With the collaboration cards we developed in this D2.2, we design a method to structure and guide this discussion amongst end-users on how they envision the particular AI systems.

### 2.1 Aim of task

The task 2.2 'Co-creation with representations of AI systems' aims to develop representations of AI systems so that parts of the AI system become design materials in workshops with end-users. With these representations, users can co-create their ideal human-AI collaboration form. The aim of the PEER project is to involve the end-users of the envisioned systems not just as users, but to engage them as equal partners in the design of the AI systems. PEER wants to include end-users in all stages of the design and development of the AI systems, when the systems are still not technically "closed". As we have also shown within deliverable D2.1, end-users have specific needs and requirements with regards to the envisioned AI systems that need to be translated into technology design. The same is true for their vision on the ideal human-AI collaboration. However, end-users are not experts in technology and design, and we don't expect them to be. Therefore, we chose to develop cards with accessible explanations of system elements that are easy to handle within a workshop setting and can support end-users in formulating their needs, wishes and requirements, without overloading them with information. Incorporating their needs, requirements, and visions will not just ensure that the final technical design and implementation of the AI systems is according to the needs and requirements of the end-users, but it will also guarantee their acceptance, adoption, and trust in these systems. End-users are thus becoming co-designers of the AI collaborative systems.

Deliverable D2.1 looked more into general values, needs, and requirements of end-users (more "ethical" principles), whereas deliverable D2.2 gives input on the translation of requirements into practice (i.e. algorithms, interface, etc.). To inquire this, we developed in task 2.2 the human-AI collaboration cards, a card set to be used in a workshop with end-users to define their ideal human-AI collaboration form.

## 2.2 Methodology

### Desk research & creation of human-AI collaboration cards

To develop the representations of AI systems, **desk research** about existing representations of AI systems was conducted. These existing representations ranged from tech cards to design probes and other materials to discuss the capacities of AI systems within co-creative development processes. The main goal of this desk research was to see what tools and methods are already out there and being used to discuss with end-users what an AI system could look like. The desk research also inspired in terms of methodology, design, and content of the tools and methods. The desk research allowed us to gather insights on the subjects and objects of participatory processes, the co-design process and methodology and to inquire about the mechanisms and tools they use and the way they use them. We also used this overview to see what works and what does not, so we can approach the design of the AI representations in the best way possible. Some of the methods and tools we explored were too abstract (Chow et al., 2016<sup>1</sup>), some were too narrow and limiting (Ocnareescu et al., 2011<sup>2</sup>). Some were more explaining the technology or the process itself (e.g., Knowledge Centre Data & Society, 2023<sup>3</sup>), others focused more on socio-technical general values (Logler et al., 2018, ESWA, 2024<sup>4</sup>), some on the impact of the envisioned technology (Artefact, 2018<sup>5</sup>), and others could be useful for the next activities within the PEER project (e.g., Subramonyam et al., 2011<sup>6</sup> or Mitchell et al., 2019<sup>7</sup>). The elements that we found useful in the examples we found were tools or studies that broke down complex AI systems into its different skills, features and/or characteristics. This is a way to make the complexity of AI more accessible and understandable to lay people and supports them in defining their needs. Card-based design tools are well-established and well-developed tool for aiding user's participation in the processes of technology design<sup>8</sup>.

After the desk research, the **human-AI collaboration cards** were developed. Based upon deliverable 2.1 'Social and technical requirements and the conversations we had with the different use-cases, we chose to create a card set in which the type of human-AI collaboration can be co-created with end-users and the characteristics that define these types of human-AI collaborations. A method to use the human-AI collaboration cards in a **workshop with end-users** of the envisioned AI systems in PEER was created as well.

### Collaborative, participatory action research at the base

The inclusion of the end-users within the initial, early stages of the design of novel technological systems brings several benefits both for the users themselves and for the technical team developing it. First, it allows for a more

<sup>1</sup> Chow, J., Kusoffsky, M., & Kurti, A. (2016). From abstract to concrete: Telling math stories with cards. *Proceedings of the 14th Participatory Design Conference: Short Papers, Interactive Exhibitions, Workshops - Volume 2*, 90–91. <https://doi.org/10.1145/2948076.2948108>

<sup>2</sup> Ocnareescu, I., Pain, F., Bouchard, C., Aoussat, A., & Sciamma, D. (2011). Improvement of the industrial design process by the creation and usage of intermediate representations of technology, "TechCards." *Proceedings of the 2011 Conference on Designing Pleasurable Products and Interfaces*, 1–8. <https://doi.org/10.1145/2347504.2347559>

<sup>3</sup> Knowledge Centre Data & Society. (2023). *Tool: Create your own datawalk*. <https://data-en-maatschappij.ai/en/tools/datawalk-handleiding>

<sup>4</sup> ESWA. (2024). *Sex Work & Tech Tarot Cards*. European Sex Workers' Rights Alliance. [https://www.eswalliance.org/tarot\\_cards](https://www.eswalliance.org/tarot_cards)

<sup>5</sup> Artefact. (2018). *The Tarot Cards of Tech | The power of predicting impact*. Artefact. <https://www.artefactgroup.com/resources/the-tarot-cards-of-tech/>

<sup>6</sup> Subramonyam, H., Seifert, C., & Adar, E. (2021). Towards A Process Model for Co-Creating AI Experiences. *Proceedings of the 2021 ACM Designing Interactive Systems Conference*, 1529–1543. <https://doi.org/10.1145/3461778.3462012>

<sup>7</sup> Mitchell, M., Wu, S., Zaldivar, A., Barnes, P., Vasserman, L., Hutchinson, B., Spitzer, E., Raji, I. D., & Gebru, T. (2019). Model Cards for Model Reporting. *Proceedings of the Conference on Fairness, Accountability, and Transparency*, 220–229. <https://doi.org/10.1145/3287560.3287596>

<sup>8</sup> Roy, R. & Warren, P.J. (2019). Card-based design tools: a review and analysis of 155 card decks for designers and designing. *Design Studies* (63), 125-154. <https://doi.org/10.1016/j.destud.2019.04.002>

user-centred design of the technology as users' needs and wants are considered - this relates both to the values and principles embedded within the system (e.g., transparency, privacy, data protection, efficiency) and to the material enactment of the systems (interface, language, usability). It also diminishes significantly the risks associated with acceptance, adoption, and trust of the system, including the business risk (Breytenbach et al., 2020, p. 2<sup>9</sup>). We understand the systems to be designed within PEER as "material under construction" and we treat them like that - an object of continuous and iterative inquiry, feedback, and modifications. However, it needs to be stressed that involving end-users within the design process does not by default mean that all their needs and requirements would be taken into account — some of these will be not possible technically, or they might introduce unforeseen risks, or they might clash with other principles and/or features. Sometimes, trade-offs might emerge and final decisions will have to be made taking into account the user's input, but also current technological development, and existing regulatory mechanisms.

For the task T2.2, we propose a co-creation approach, which is a participatory and user-centric approach to design collaborative human-AI systems, using principles of participatory design and co-design. **Participatory design**, in its essence, is designed and developed to enable non-expert stakeholders the opportunity to provide direct input on the design of the technology-in-the-making (Delgado et al., 2023, p. 2<sup>10</sup>). As such, it also touches upon not just the technical design of the system, but also the overarching values and principles (something that we also investigated within task T2.1). **Co-design**, on the other hand, focuses more explicitly on the specific design and other elements that need to be translated into technical executions. As such, the co-design process also can be seen as a more direct collaboration with the technical designers of the systems (ibid.). We could also define our process as a **Value-Sensitive Design process**<sup>11</sup>, since it focuses on both identifying and incorporating the values of the direct and indirect stakeholders of the particular systems. In that sense, the work done within this task T2.2 needs to be seen as continuation to the work done in task T2.1 and as complementary to each other.

The research resulting in the AI collaboration cards must be seen as **action research**<sup>12</sup> too, since it allows the end-users to consider AI attributes before the system is developed, to understand parts of it before its final design and deployment and to provide meaningful input throughout the entire process. This input will have a practical translation in the final design of the system.

## 2.3 Partners involved

CATIE gave feedback on the human-AI collaboration cards, and the technical partners within the PEER project also have been given the opportunity to give feedback on the human-AI collaboration cards (i.e. the content of the cards and the methodology of the workshop).

<sup>9</sup> Breytenbach, J., & Kariem, I. (2020). A Living Labs Approach to Manage Co-created Design Knowledge through Ideation Artefacts. *2020 6th International Conference on Information Management (ICIM)*, 343–349. <https://doi.org/10.1109/ICIM49319.2020.245373>

<sup>10</sup> Delgado, F., Yang, S., Madaio, M., & Yang, Q. (2023). The Participatory Turn in AI Design: Theoretical Foundations and the Current State of Practice. *Equity and Access in Algorithms, Mechanisms, and Optimization*, 1–23. <https://doi.org/10.1145/3617694.3623261>

<sup>11</sup> Delgado, F., Yang, S., Madaio, M., & Yang, Q. (2023). The Participatory Turn in AI Design: Theoretical Foundations and the Current State of Practice. *Equity and Access in Algorithms, Mechanisms, and Optimization*, 1–23. <https://doi.org/10.1145/3617694.3623261>

<sup>12</sup> Ibid.

## 3 Human-AI collaboration cards

The human-AI collaboration cards are made to discuss with the end-users how their ideal human-AI collaboration should look like, this includes the different capabilities and functionalities of the AI system. They are designed to be used in a workshop setting with the envisioned end-users to define in group how they imagine this collaboration based on their specific contexts of use, their needs, and their requirements. The card set consists of two different cards sets: 1. the **AI collaborator cards** and 2. the **AI characteristic cards**. By making use of the card set, end-users can build their ideal AI partner and define the characteristics, features, and elements of the human-AI collaboration.

An additional document is an essential part of the collaboration cards set— a **template** on which the end-users can write which of the AI characteristics and AI collaborators they prefer. This template is used as an input to summarise the group discussion and to make sure that at the end of the workshop the group agrees on how they envision their ideal human-AI collaboration with the envisioned AI systems developed in PEER.

In the next sections, we give an overview of the different materials that are part of the Human-AI Collaboration card set. The complete card set, including the AI collaborator cards, the AI characteristic cards, and the workshop template can be found in the of this deliverable.

### 3.1 AI collaborator cards

The **AI collaborator cards** describe the type of human-AI collaboration. Within this card set the collaborator cards are limited to 'an assistant', 'a guide' and 'an advisor'. These cards are serving as a conversation starter to discuss how the end-users envision their ideal human-AI collaboration (see Annex 7.1).

In the context of the PEER project, we propose only three types of AI collaborators, and these are the result of the insights we received during T2.1 and are based on the expressed preferences of the end-users' of each-use case (see D2.1). The three types correspond with how the end-users see the AI collaborators specifically within the PEER use-cases, the role that they need to play within the collaboration, and the goals they wish to achieve with the collaboration. The AI collaborator for each PEER use-case is:

- **MC Sonae - 'the assistant'**: the AI system supports its end-users in fulfilling their actions. It provides useful information at the right moment (on request for example). As such, this AI system is welcomed, but not always necessary - it is seen more as an assistant that is requested whenever the end-user feels it is needed. That is why, within this human-AI collaboration, the level of autonomy of the end-users is rather high, and the authority of the AI system is rather low.
- **City of Amsterdam - 'the guide'**: the AI system gives clear instructions and directs the end-users to reach their goals. The end-users rely heavily on the system as they are following the instructions of the AI system. This AI system is seen as indispensable. The system is a very important guide that should know more than the users, and whose output should be correct and easy to follow. Therefore, the level of autonomy of the user is in this case rather low, and the authority of the AI system is more likely to be high.



- **Proditec - 'the advisor'**: the AI system proposes possible actions to its end-users, and the end-users can choose to accept these actions or reject them. End-users turn to this AI system when they need an additional advice from a knowledgeable (and more efficient) source. However, the proposed solution by the AI system might or might not be accepted. The level of autonomy of the user is in this case high (as the users takes the final decision), and the level of authority of the AI system is rather high too, as the end-users expect the AI system to propose correct actions.

Of course, what is understood as each of the AI collaboration types might differ from end-user to end-user. Some participants will perceive 'the advisor' as having less authority or providing less autonomy to the user, than other participants. Therefore, an **empty template of an AI collaborator card** is included in the card set as well. During the workshop, and guided by the facilitator, the participants can come up with their own AI collaboration type and describe how they envision the level of autonomy of the user and the level of authority of the AI system in this human-AI collaboration.

Within this card set, three (3) AI collaborator cards are included, but when used outside of the context of PEER (i.e. in other research projects, workshops or when other AI systems are envisioned), other AI collaborator cards can/must be considered and designed as preparation of the workshop.

## 3.2 AI characteristic cards

The **AI characteristic cards** describe several elements of a human-AI collaboration, such as trust enablers, attributes, capabilities, qualities, tone of voice, and interface types. The organisation and definition of the different categories within the card set are based upon our extensive knowledge as social science researchers in the field of technological innovation, the meetings with WP3 partners, and on scientific literature. Song, B., Zhu, Q. and Luo, J.<sup>13</sup> developed a scheme to classify AI roles that describes expected AI capabilities, interactive attributes, and trust enablers to integrate AI in human teams. Molenaar, I.<sup>14</sup> stresses the importance of tone of voice of the AI system (see also the article of Dandavate, U. on Medium<sup>15</sup>) and the type of interface it embodies. Another element of the AI character cards is the collaboration quality, meaning the characteristics that make human-AI collaboration comfortable (see also the article on Nelson Miller<sup>16</sup>).

The elements of the AI characteristic cards are given a clear definition, as these concepts (trust enablers, etc.) might have a different meaning amongst its users (i.e. the facilitator and participants of the workshop). It is the facilitator's role to inform the end-users of the AI systems what is meant with each of the elements. By doing so, all participants are on the same page in the workshop, and it will smoothen the discussion in the workshop.

<sup>13</sup> Song, B., Zhu, Q., Luo, J. (2024). Human-AI collaboration by design. International Design Conference. <https://doi.org/10.1017/pds.2024.227>

<sup>14</sup> Molenaar, I. (2022). Towards hybrid human-AI learning technologies. European Journal of Education, Research, Development and Policy, 57(4), 632-645. <https://doi.org/10.1111/ejed.12527>

<sup>15</sup>Dandavate, U. (May 19, 2024). Responsible use of tone of voice in human and AI interaction. *Medium*. <https://uday-dandavate.medium.com/responsible-use-of-tone-of-voice-in-human-and-ai-interaction-e76526284d75#:~:text=The%20responsible%20use%20of%20tone,trust%2C%20and%20create%20meaningful%20connections.>

<sup>16</sup>[Author unknown] (2016, February 24). 6 key qualities of an effective human machine interface. Nelson Mille. <https://nelson-miller.com/6-key-qualities-of-an-effective-human-machine-interface/>

By using these cards, the end-users can elaborate more on what their ideal human-AI collaboration would look like by expressing what characteristics they deem more important, or less. If a characteristic is missing according to the end-users, they are given the ability to add the missing characteristic on an empty card.

The AI characteristics are grouped together according to their purpose (e.g. enabling trust, being an attribute of the system, etc.). This categorisation is based on the interpretation of the researchers, however, it can be that for the facilitator or the participants of the workshop this distinction might be done otherwise. The facilitator and end-users can regroup the AI characteristics according to their wants and needs.

An overview of the AI characteristic cards is given in 'Table 1: Overview of the AI characteristics cards'. The detailed definition of each card is provided in the cards themselves (in Annex 7.2).

Table 1: Overview of AI characteristics cards

Element of human-AI collaboration	Definition of element	Related AI characteristics
Trust enablers	Enablers are AI characteristics that can increase the feeling of trust in AI systems.	<ol style="list-style-type: none"> <li>1. Transparency</li> <li>2. Empathy</li> <li>3. Reliability</li> <li>4. Explainability</li> <li>5. Ethically</li> <li>6. Privacy</li> <li>7. Accuracy</li> <li>8. Controllability</li> </ol>
System attributes	Attributes allow AI systems to interact, work together, and adjust efficiently in changing environments. They enhance the usability and significance of AI systems for end-users.	<ol style="list-style-type: none"> <li>1. Sensing</li> <li>2. Predictability</li> <li>3. Directivity</li> <li>4. Directability</li> <li>5. Adaptability</li> <li>6. Awareness sharing</li> <li>7. Customisability</li> <li>8. Traceability</li> </ol>
Capabilities	Capabilities refer to the tasks or functions that an AI system can perform exceptionally well, particularly in scenarios where the AI assists humans in a collaborative setting.	<ol style="list-style-type: none"> <li>1. Recognition</li> <li>2. Prediction</li> <li>3. Reasoning</li> <li>4. Generation</li> <li>5. Recommendation</li> </ol>
Collaboration qualities	Qualities are the essential characteristics that make a human-AI collaboration comfortable and distinguishable.	<ol style="list-style-type: none"> <li>1. Clarity</li> <li>2. Familiarity</li> <li>3. Ergonomics</li> <li>4. Responsiveness</li> <li>5. Consistency</li> <li>6. Guidance</li> </ol>
Tone of voice	Tone of voice refers to the way the AI-system is interacting with the user and communicating its personality.	<ol style="list-style-type: none"> <li>1. More formal</li> <li>2. More serious</li> <li>3. More respectful</li> <li>4. More straightforward</li> <li>5. More casual</li> <li>6. More funny</li> </ol>

		<ul style="list-style-type: none"> <li>7. More irreverent</li> <li>8. More enthusiastic</li> <li>9. More simple</li> <li>10. More complex</li> <li>11. Adjustable</li> </ul>
Interface types	Interface types refer to the medium through which the human and the AI system can collaborate. A system can use a combination of different interface types.	<ul style="list-style-type: none"> <li>1. Visual commands</li> <li>2. Visual information</li> <li>3. Auditory commands</li> <li>4. Auditory information</li> <li>5. Haptic commands</li> <li>6. Haptic information</li> </ul>

### 3.3 Workshop template

Each participant is given the opportunity to decide which characteristics are preferred for their ideal human-AI collaboration (see also section 4. How to use the human-AI collaboration cards?). A template (see Annex 7.4) is foreseen to structure this exercise; this template also allows to gain insights into the assessment of the relevance of the AI characteristics for each individual participant. For each characteristic they can indicate how they perceive it: as highly important, as fairly important, or as not at all important, for their ideal human-AI collaboration. Within the workshop, the end-users are given this template separately, and first they do this exercise individually. By doing so, their individual preferences are captured as well. Later in the workshop, these individual insights are grouped and summarised, so at the end of the workshop the group agrees on their ideal human-AI collaboration with the envisioned AI systems developed in PEER.

Figure 1 shows the workshop template. The participants can sort the AI characteristics in the corresponding column, going from highly important to not important at all for them to consider in the final AI technology design and human-AI collaboration. Each AI characteristic card is given a number, so the participants only need to write down the number of the corresponding AI characteristic in the template.

	TRUST ENABLERS	SYSTEM ATTRIBUTES	CAPABILITIES	COLLABORATION QUALITIES	TONE OF VOICE	INTERFACE TYPES
HIGHLY IMPORTANT						
FAIRLY IMPORTANT						
NOT IMPORTANT						

Figure 1: The workshop template

## 4 How to use the human-AI collaboration cards?

The materials are used in a **facilitated workshop with end-users** of the envisioned AI systems. There are **three main sections** in the workshop with the human-AI collaboration cards: 1. the AI collaborator cards, 2. the AI characteristics cards and 3. the design of the ideal human-AI collaboration in group. In the **facilitator's guide** (see Annex 7.3), a fully detailed workshop flow is described, including more information on the different characteristics, the different steps of the workshop, and tips & tricks.

### 4.1 When to use the human-AI collaboration cards?

Because the human-AI collaboration cards aim to discuss the ideal human-AI collaboration form from the perspective of the end-users, a workshop with these cards is best planned before a technical solution is fully developed. Ideally, this workshop is done in the **concept planning and design phase of the technical solution**, so changes to the AI system can still be made. The output of this workshop is a description of the ideal human-AI collaboration form, so the technical partners can consider the outcomes of the workshops in the further development of the envisioned AI systems. Important to keep in mind — not all outputs from the workshop must be considered and taken as inputs in the further development of the AI system. Some preferences or suggestions of the end-users might not be technically feasible or might be more an additional feature than a core feature of the AI system. Within the PEER project, a discussion between the use-case owners and the technical partners on the output of the workshop is strongly suggested, so it can be jointly decided on what can be considered in the further design, development and deployment of the AI systems, and what can or must be left out.

The cards can also be used after the technical system is developed as a means to **evaluate the AI system**. The end-users can test (a demo of) the AI system, and by using the cards they can describe how their experience was with the system and how they perceived the human-AI collaboration. The results of this workshop can be considered by the technical partners to further develop (a new iteration of) the AI system.

### 4.2 Overview of the workshop flow

When using the Human-AI Collaboration cards for a facilitated workshop during the concept planning and design phase of a technical solution, the workshop consists of three stages.

First, the group chooses a type of **AI collaborator** (i.e. assistant, guide, advisor) based on the use-case. This is done by a group discussion in which they discuss what the envisioned AI system must be for them and the kind of role it plays within the collaboration. Since the given three AI collaborator cards are based on the PEER use cases, there are also empty AI collaborator cards foreseen, in case the facilitator or the end-users come up with a different kind of role.

Second, after the type of collaboration is chosen, the participants use the other cards with **AI characteristics** to further define what this collaboration can look like. There are 6 categories of AI characteristics (trust enablers, attributes, capabilities, qualities, tone of voice, interface types) which they can choose characteristics from that speak to them. Using the template they can sort the characteristics into 'highly important', 'fairly important' or

'not at all important' piles per category. They can do this step either first individually and then in group, or directly in group — both are possible and have their own advantages and disadvantages. Doing this exercise individually ensures that every participant has the chance to define their own preferences. Afterwards, the facilitator can bring the conversation towards the group level to consolidate the preferred human-AI collaboration (see next paragraph). It might be possible to skip the individual exercise and focus on a group discussion from the start, for example if your goal is more towards finding a consensus within the group, but it will be more difficult to record the individual differences of preference, which are beneficial for finding the nuances and the potential trade-offs that have to be made regarding AI characteristics.

Third, the group discusses their insights and preferences for the human-AI collaboration. The goal of this exercise is to learn from each other and jointly define a centralised idea of their **ideal human-AI collaboration**. This can also be done on a template, or by sorting the cards together on the table. The participants discuss what role their AI collaborator should take on, and which characteristics it should entail to make their collaboration effective, pleasant, and productive: how does it behave, how does it communicate and what can it (not) do? The facilitator consolidates the discussion and writes down on which of the characteristics all participants agreed, or on which a consensus was not found. This gives a clear idea to the use-case owners and technical partners of PEER which of the characteristics are more or less important to consider in the development of the AI systems.

### 4.3 The participants of the workshop

The workshop is made to be conducted with **end-users of the AI system**: the people who are going to collaborate with the system either in their professional or daily life. The number of participants is minimum 10; this number allows for a diverse group in terms of age, gender, education, socio-economic status, and similar. This will depend on the characteristics of the actual and the envisioned end-users themselves.

The human-AI collaboration cards are made in such a way that the participants of the workshop do not need to know what AI is and what it can or cannot do. The text on the cards describes characteristics of AI in an understandable way without the use of jargon. However, the human-AI collaboration cards are developed in English; when used in workshops with end-users the cards need to be translated to the language spoken by the participants of the workshop (Dutch for the use-case of the City of Amsterdam, Portuguese for the use-case of MC Sonae, and French for the use-case of Proditex). This will lower the threshold to use the card set with the participants of the workshop and will ensure that participants understand better what the AI characteristics and AI collaboration types can be.

### 4.4 The facilitator's role

The cards are designed and developed in such a way, that we are not overburdening the end-users (the participants) with a lot of information. The information on the cards is simple and concise, so the participants are not influenced by the cards themselves. It is the **facilitator's role** to provide a good guidance of the workshop. The cards are not too technical; first, because the AI systems are not yet fully developed (so information is missing), and second, because the purpose of the cards and the workshop is to inquire insights while the AI systems are still in the early stages of their making. If consequent iterations are to be made further along the

process, where more information is available on the technicalities of the AI systems, this can be included/communicated by the facilitator.

In essence, the **facilitator acts as the bridge between end-users and technology designers**. On the one hand, they must understand what the characteristics of AI are and be able to explain what is written on the human-AI collaboration cards (in the facilitator's guide, more information is given for each characteristic). An extensive knowledge of AI is not necessary, but the facilitator must be able to explain technical details in an accessible way. The facilitator could be someone from the field/or with experience in UX design, interaction design, user/market research, or an internal researcher from the organization (if applicable). The most important aspect would be the familiarity and ability to explain the complex system. If the complexity surpasses the abilities of the facilitator, a co-facilitator could be an AI expert who should, aided by the facilitator, help translate the complex concepts into an understandable material for the end-users. An example can help the end-users to better understand what is meant with that characteristic. On the other hand, the participants will probably each have different kinds of definitions in their head for each characteristic. It is therefore also up to the facilitator to listen and ask about these definitions and capture what they mean exactly when they are building their ideal human-AI collaboration. These are the kind of nuances that should be communicated back to the technology designers after the workshop. The cards are specifically designed to be focussing on the end-user perspective, it is always the system telling the user what can do. The technical translation towards the system is up to the technology designers, in concert with the input from the facilitator.

Besides limited technical knowledge of AI, the facilitator must be able to engage a group of participants, to guide a discussion so it leads to concrete results. For PEER, the facilitator knows what the use-case is about, what minimal viable product is discussed, what the needs and wants are of the use-case owners and the what the requirements are of the end-users. The facilitator has (basic) knowledge of the technical possibilities and impossibilities.

## 4.5 After the workshop

The outputs from the workshop should serve as input for the consecutive technical design phases - a translation towards the design of the AI system needs to be made after the workshop. This could result in a description of the preferred AI collaborator and a list of the chosen AI characteristics. The facilitator can, based on what they heard in the workshop, express what AI characteristics were fully agreed on by all end-users, what characteristics were heavily discussed, etc. These insights are also useful for the technical partners. A concise but clear summary of the results of the workshop, with a translation towards what this would mean for the technology design, is needed so the technical partners have a good overview of how they can incorporate the end-users' preferences in the further technology design.

## 5 Deviations occurred and corrective actions taken

During the planning, research, development, and writing of this deliverable D2.2 no deviations occurred.



## 6 Conclusion

For this deliverable 2.2 'AI co-creation representations', the human-AI collaboration cards were developed as a tool to inquire, capture, and define the requirements of end-users for human-AI collaboration, keeping in mind the envisioned AI systems of the use-cases in PEER. This card set is intended to be used in a facilitated workshop and consists of the AI collaborator cards and the AI characteristic cards. The AI collaboration cards describe the type of human-AI collaboration, for example, the AI system needs to be an assistant, a guide, an advisor, or something else. End-users can use these cards as a starting point to discuss how they envision their ideal human-AI collaboration. The AI characteristic cards contain several elements of a human-AI collaboration, such as trust enablers, attributes, capabilities, qualities, tone of voice, and interface types. By using these cards, the end-users can further form and build their ideal human-AI collaboration by expressing what characteristics they deem more important, or less. Within this deliverable, the workshop methodology to use the cards in a facilitated workshop with end-users is elaborated in detail as well.

The work done in task 2.2 will help the technical partners within the PEER project, as well as the use-case owners and the end-users to have a discussion on the human-AI collaboration form of the envisioned AI systems. The card set steps away from technical explanations and jargon so end-users can also take active and equal part in a discussion on the characteristics and collaboration types of AI systems. As a participatory, value-driven, and action-oriented approach, the use of the human-AI collaboration cards ensures that the needs, wishes, and requirements of the end-users are solicited, and later translated into the technological design. The outputs from the workshop should serve as input for the consecutive technical design phases — a translation towards the design of the AI system needs to be made after the workshop.

While the human-AI collaboration card set was developed from the input and within the PEER project, we have opted for designing a more robust approach, making the card set as a tool applicable and usable for other envisioned AI systems and projects, both of the partners involved in the PEER project, but also other developers, academics, and/or researchers. That is why we have also made them available at the website of the Knowledge Center Data & Society<sup>17</sup>, together with other tools used in research and industry.

<sup>17</sup> The card set can be found on this link: <https://data-en-maatschappij.ai/en/human-ai-collaboration-cards>

## 7 Annex

The card set (AI collaborator cards, AI characteristic cards) and all the related documents (Facilitator's guide of the workshop, Template used in the workshop) will be made available in the Zenodo open-access repository, in the [PEER repository](#).

### 7.1 AI collaborator cards

The AI collaborators cards can be found [here](#) (SharePoint link)

### 7.2 AI characteristic cards

The AI characteristic cards can be found [here](#) (SharePoint link, starting page 6).

### 7.3 Facilitator's guide of the workshop

The facilitator's guide of the workshop can be found [here](#). (SharePoint link)

### 7.4 Template used in the workshop

The workshop template can be found [here](#). (SharePoint link)

PEER will focus on how to systematically put the user at the centre of the entire AI design, development, deployment, and evaluation pipeline, allowing for truly mixed human-AI initiatives on complex sequential decision-making problems. The central idea is to enable a two-way communication flow with enhanced feedback loops between users and AI, leading to improved human-AI collaboration, mutual learning and reasoning, and thus increased user trust and acceptance. As an interdisciplinary project between social sciences and artificial intelligence, PEER will facilitate novel ways of engagement by end-users with AI in the design phase; will create novel AI planning methods for sequential settings which support bidirectional conversation and collaboration between users and AI; will develop an AI acceptance index for the evaluation of AI systems from a human-centric perspective; and will conduct an integration and evaluation of these novel approaches in several real-world use cases.





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