TECHETHOS

FUTURE ○ TECHNOLOGY ○ ETHICS

Tools to develop and advance scenarios dealing with the ethics of new technologies

D3.2

Draft version submitted to the European Commission for review

TechEthos receives funding from the EU H2020 research and innovation programme under Grant Agreement No 101006249. This deliverable and its contents reflect only the authors' view. The Research Executive Agency and the European Commission are not responsible for any use that may be made of the information contained herein.

D3.2 - Tools to develop and advance scenarios dealing with the ethics of new technologies

Work Package	WP3		
Lead Partner	Austrian Institute of Technology, AIT		
Author(s)	Steven Umbrello (TUD), Pieter Vermaas (TUD), Cristina Paca (Ecsite), Greta Alliaj (Ecsite), Andrew Whittington-Davis (Ecsite), Fabrice Jouvenot (Ecsite), Michael J. Bernstein (AIT), Wenzel Mehnert (AIT), Eva Buchinger (AIT)		
Due date	30/11/2022		
Submitted date	30/11/2022		
Version number	0.1	Status	Final

Project Information

Grant Agreement number	101006249
Start date	01/01/2021
Duration	36 months
Call identifier	H2020-SwafS-2020-1
Topic	SwafS-29-2020 - The ethics of technologies with high socio-economic impact
Instrument	CSA

Dissemination Level

PU: Public	☒
PP: Restricted to other programme participants (including the European Commission)	☐
RE: Restricted to a group specified by the consortium (including the European Commission)	☐
CO: Confidential, only for members of the consortium (including the European Commission)	☐

Quality Control

Reviewed by:	Review date:
Nitika Bhalla	15/11/2022
Sara Cannizzaro	23/11/2022
Kathleen Richardson	22/11/2022

Revision history

Version	Date	Description
0.1	09/11/2022	Initial draft
0.2	22/11/2022	Revised draft
0.3	23/11/2022	Final draft for submission

Keywords

Serious games, co-creation, stakeholder elicitation

How to cite

If you are using this document in your own writing, our preferred citation is:

Umbrello, S., Vermaas, P., Paca, C., Alliaj, G., Nishi, M., Whittington, A., Jouvenot, F., Bernstein, M.J., Mehnert, W., Buchinger, E., (2022). *Tools to develop and advance scenarios dealing with the ethics of new technologies*. TechEthos Project Deliverable. Available at: www.techethos.eu.

The TechEthos Project

Short project summary

TechEthos is an EU-funded project that deals with the ethics of the new and emerging technologies anticipated to have high socio-economic impact. The project involves ten scientific partners and six science engagement organisations and runs from January 2021 to the end of 2023.

TechEthos aims to facilitate “ethics by design”, namely, to bring ethical and societal values into the design and development of new and emerging technologies from the very beginning of the process. The project will produce operational ethics guidelines for three to four technologies for users such as researchers, research ethics committees and policy makers. To reconcile the needs of research and innovation and the concerns of society, the project will explore the awareness, acceptance and aspirations of academia, industry and the general public alike and reflect them in the guidelines.

TechEthos receives funding from the EU H2020 research and innovation programme under Grant Agreement No 101006249. This deliverable and its contents reflect only the authors' view. The Research Executive Agency and the European Commission are not responsible for any use that may be made of the information contained herein.

Table of contents

List of tables

List of figures

Definitions and abbreviations

Table 1: List of Definitions

Term	Explanation
Game Element	The structure, visuality, voting system, etc. of a game that keeps people engaged and gives the game its unique identity.
Triadic Game Design	A tripartite design philosophy divided into the worlds of Reality, Meaning, and Play. Each of the worlds implicates different people, contexts, and criteria. Various value tensions often arise in trying to find balance between these different 'worlds', as a consequence, Triadic Game Design methodology provides designers with the tools to navigate these tensions.
Technology Family	A technology family is a collection of technologies that share (techniques that have) common goals, domains, or formal or functional features.
Vulnerable Groups	Those in our societies who face a higher risk of poverty and social exclusion compared to the general population. This can mean that new and emerging

	technologies have a disproportionately negative impact on them. In TechEthos, we will work with specialised non-governmental organisations (NGOs) and citizen groups to involve such groups so that their specific needs will be taken into account.

Table 2: List of Abbreviations

Term	Explanation
DoA	Description of Action
LTP	Linked Third Party
TGD	Triadic Game Design
WP	Work Package

Executive Summary

This report describes the process of the co-creation of the TechEthos game that was developed to enhance the TechEthos scenarios (Task 3.2) during dedicated workshops in (Task 3.3).

It also presents the results of employing the Triadic Game Design methodology as an approach to working with expert game design stakeholders across the dedicated workshops in order to resolve emerging value tensions in game design.

The game resulting from the co-creation activities with expert stakeholders will be used in conjunction with the TechEthos scenarios (Task 3.2) and both expert and citizen participants (Task 3.4 and 3.5) to surface ethical issues and concerns in those scenarios and, consequently, helping to enhance the scenarios in order to be more comprehensive in their breadth.

This report was co-developed in parallel with D3.1 (Evolution of advanced TechEthos scenarios) to advance the TechEthos basic scenarios via the design and deployment of a co-designed serious game.

1. Introduction

"It takes two to tango, but it takes three to design a 'meaningful game.' For 'games with a purpose' to dance, three different worlds need to be balanced: the worlds of Reality, Meaning, and Play."

Casper Harteveld.

1.1 Background

Gaming has and mostly continues to be associated with having fun and pastime. However, designers, policymakers and educators, amongst others, have realised the power that serious games can be a helpful tool to elicit stakeholder feedback and emotions concerning important social and ethical issues.

TechEthos envisages the development of exercises and games in the framework of exploring public attitudes and awareness towards the ethical implication of the technologies it focuses on, namely Climate Engineering, Neurotechnologies and Digital Extended Reality (Buchinger et al., 2022). Upon considering the challenge of producing games and the need to address the three technology families, a choice was made to develop a single yet adaptable game with three variations, one for Climate Engineering, one for Neurotechnologies and one for Digital Extended Reality.

1.2 The role of the TechEthos game

The process of public engagement created in TechEthos begins with the drafting of basic scenarios within the project (nine basic scenarios were developed in (Task 3.2), three per technology family), which go through advancement using the inputs of experts in the field (e.g., researchers, technological, economic, legal and ethics experts, etc.) (Task 3.4) and feedback from the general public, including certain vulnerable groups (Task 3.5), as illustrated in Figure 1. The feedback from the general public will come from playing the game with citizens on three occasions on the premises of six science engagement organisations involved in the project as the Linked Third Parties (LTPs) of Ecsite in Austria, Czech Republic, Romania, Serbia, Spain and Sweden.

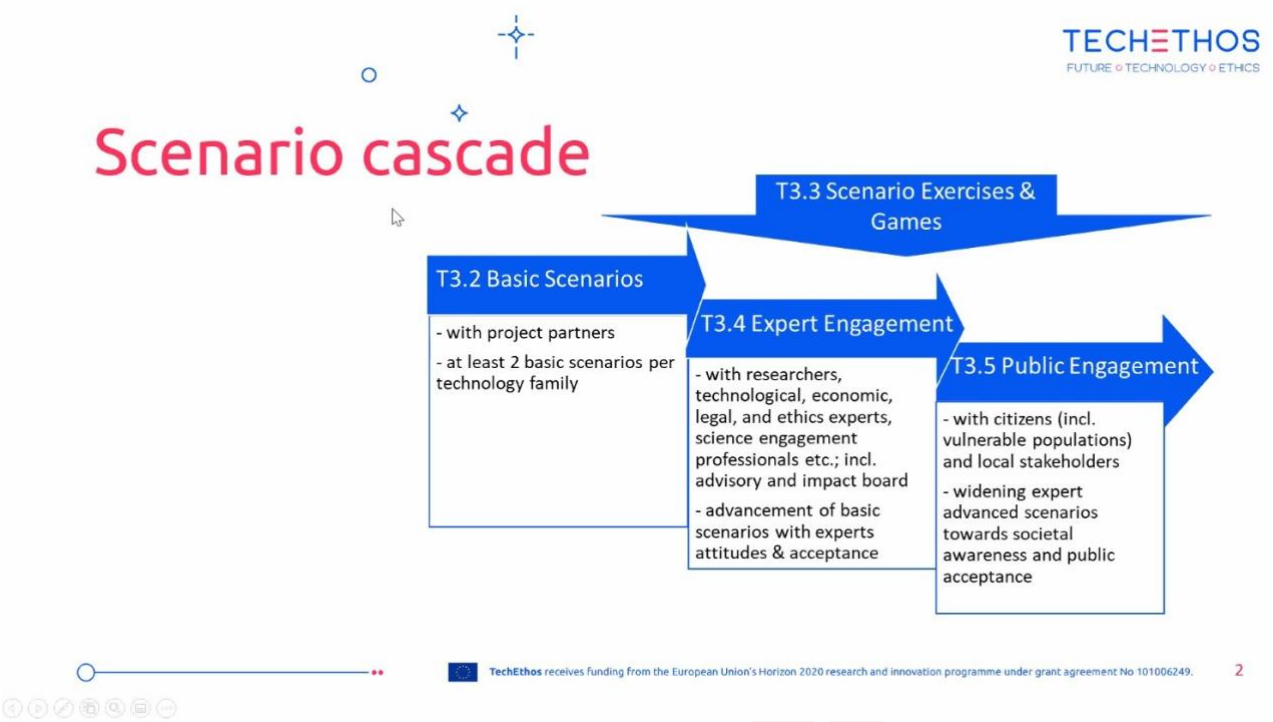


Figure 1 The 'scenario cascade' and the role of the games

This role of the game in the project sets several expectations and constraints. The expectations are that the game will elicit attitudes towards the selected technology families, provide feedback to enhance the basic scenarios and be playable by a general audience that includes vulnerable groups. The constraints to the game are that the game should generate meaningful qualitative data that can be captured for subsequent analysis. This also includes incorporating and engaging with the scenarios and ethical issues, and demand only frugal means of production and limited text to allow translation and adaptation in the national contexts of the six LTPs.

1.3 Building Blocks

The basic scenarios, the knowledge gathered by the project during the identification of the three technology families (WP1), the description of their innovation ecosystem (Task 3.1), and the first results of the analysis of ethical issues that emerge concerning them (Task 2.3) represented the starting point of the game development process.

1.4 Report Outline

This report reviews the Triadic Game Design methodology (TGD) and explores the process and the result of the series of expert workshops that were undertaken using the TGD methodology in order to create a serious game for the TechEthos project. The review of the TGD, as well as the process of expert co-creation, expert co-creation aims to identify the executive design decisions made in response to outstanding gameplay challenges by the TechEthos (Task 3.3) team. This work will prepare the ground for the societal analysis, which will be developed in tasks (Task 3.4) and (Task 3.5) of WP3.

2. Identifying resources

2.1 Best practices

The research team reviewed best practices in gaming and technology communication from previous projects outlined in the task description and Excellence section of the TechEthos project proposal to determine areas of overlap, strategies for advancement, and potential synergies.

This initial scan of best practices served as the basis for a call for similar best practices among project partners and Linked Third Parties. A spreadsheet where we could log these practices was developed so that collected information could be described at the same level of detail. These practices were then analysed according to several factors that are important to the TechEthos game, as outlined in Section 1.2, such as a focus on ethical and societal issues, future casting, development of anticipatory competencies and accessibility for certain publics.

After consultation with the TUD Gamelab, the team introduced for consideration several random games from different areas that bring inspirational and unusual game elements. (e.g., structure, visuality, voting system, etc.). By game "element", it was meant features that keep people engaged and give the game its unique identity. Some fundamental aspects of games are included in this category: levels, time, scoring, and voting, but this also includes factors such as conflict, collaboration, conflict, role play, discussion moments and so on.

The practices were split up into their components, which were considered 'building blocks' for the exercises developed and used as the game repertoire for the co-creation workshop no 1 with science engagement professionals. The six games used during the workshop are presented in Table 3.

Table 3 Game included in the game repertoire during the co-creation workshop no 1

Game	Brief description
NANO2ALL project - multi-stakeholder dialogue method Adapted as part of a Horizon 2020-funded project from the Scenario Exploration System serious game developed by the European Commission's Joint Research Center (NANO2ALL, n.d.-a, n.d.-b)	Role-based card game for exploring scenarios from different perspectives (e.g., policy, business, civil society, the public), with each scenario going through 3 rounds to determine an issues path in 5, 10 and 20 years.
Envisioning Cards Developed by the Value Sensitive Design Lab, University of Washington (Friedman et al., 2011).	Free-use cards to help think about long-term technology design decisions. The Envisioning Cards can be adapted to a wide variety of situations and uses.
Cards from the Future	The game focuses on generating positive ideas for concepts and objects from the future.

Produced by the DSISCALE EU-funded project based on 'The Thing from the Future' (Candy, 2018).	
Blickwinkel / Viewing angle - Future technologies for society Developed by Science Center Network Austria using a concepted made by TRACES (Paris, France)	Scenario based card game asking participants to discuss probable/improbable scenarios and desirable/undesirable ones
Dixit Developed by Jean-Louis Roubira & Marie Cardouat; Libellud Commercially-available game introduced in the repertoire to add variety in game elements (Roubira and Cardouat, 2008).	Dixit is an image interpretation game and relies on knowing one's audience: the clues to the images cannot be too simple or too complex.
Champions of the Wild Developed by Big Imagination Games Commercially-available game introduced in the repertoire to add variety in game elements (Clare, 2018).	This is a conversation-driven social game. You become one of the greatest animal coaches in the world and have to persuade fellow players why your animal is the best to win a race.
Cards for Biosafety Developed by the TUD GameLab and the Rathenau Instituut (Tiemersma et al., 2021).	Scenario-based card game that teaches professionals and future professionals how to deal with biosafety issues in a better way.

Using these best practices in both determining what type of game should be made and how such a game could be levied in order to achieve the TechEthos aims and goals. The Triadic Game Design methodology was chosen as the most ideal and stabilised approach to game design in order to be successful. The methodology permitted drawing from these various games and best practices to extract suitable game elements best oriented towards the goals of the TechEthos game.

2.2 Experts

In addition to the contributions of project partners AIT, Ecsite and TUD (including the TUD GameLab) and the six science engagement organisations involved as LTPs, the game design workshop benefited from inputs from the following experts, selected from partner and LTP suggestions to reflect a broad range of expertise, as outlined in the table below.

Table 4 Experts participating in co-creation workshops

Expert name	Affiliation	Expertise
Sebastien Claeys		Societal engagement with ethical issues
Matteo Merzagora	Association TRACES, France	Co-creation/co-design and public engagement methodologies
Luke R Moffat	Department of Sociology, Lancaster University, United Kingdom	Ethics through design
Kathrine Kösters	Futurium Museum, Germany	Participation, social inclusion, science communication
Gema Revuelta	Science, Communication and Society Studies Center, Universitat Pompeu Fabra, Spain	Public engagement with science; scientific journalism
Malvina Artheau	Freelance consultant, France	Game design, design thinking
Ran Peleg		Game design, immersive experiences, science education
Claudia Sodini	Freelance consultant, Italy	Game design, theatre
Antoine Vergne	Missions Publiques, France	Public engagement with science and technology

3. Triadic Game Design

The TechEthos research team draws on the specific insights of the Triadic Game Design approach (TGD). In doing so, the research team's appropriation of TGD led to a further, more nuanced assimilation of parallel and complimentary breakdown of the steps required in order to arrive at a deliverable game to meet the requisites of (Task 3.5). This was then operationalised in the three expert workshops that were facilitated for the co-creation of the final game.

3.1 Background

The methodology that was used for co-creating the serious game is Triadic Game Design (TGD). While this report is not a comprehensive account, it aims to identify the key criteria of the TGD approach.

TGD emerged from the practical experience of Casper Harteveld, Associate Professor of Game Design at Northeastern University, in the U.S. The approach is tripartite, or, more aptly, 'triadic', given that it

supports the notion that underlying all games are three ‘worlds’, each of which implicates different contexts, peoples, criteria, elements, etc. These three worlds are those of Reality, Meaning, and Play. TGD sustains that although tensions will undoubtedly arise during a game's design, game designers must nonetheless strive to balance these three worlds. TGD is offered as the “frame of reference” that can guide game designers to manage trade-offs in design decisions that will ultimately help achieve the sought balance.

Harteveld (2010) summarises Triadic Game Design (TGD) (see also Figure 2):

- “that the design of a game poses a multi-objective problem in a design space involving three equally important worlds: Reality, Meaning, and Play;
    - A game needs to be related to the domain and subject for which the game is developed (Reality);
    - A game needs to attain a value beyond the game itself (Meaning);
    - A game needs to have elements that characterise play and make it a powerful tool to use (Play);
- that each world has its people, disciplines, aspects, and criteria on how to design a game;
- that various tensions can arise within and between the three worlds, forcing designers to make trade-offs;
- that it is fundamental to keep these three worlds in balance to create a "good" game-a game that accomplishes its meaningful purpose;
- that a balance can be achieved by designing the core of the game concurrently by taking different design problems and various perspectives at the same time into account;
- that an eventual "optimum" is found when the design is satisficing in accordance with the criteria of the worlds of Reality, Meaning, and Play. “

Although the domain of game design is vast, TGD was chosen in close consultation with the TUD Gamelab as the methodology for this project given its proven track record in serious game design (e.g., see Harteveld (2010) ‘games’).

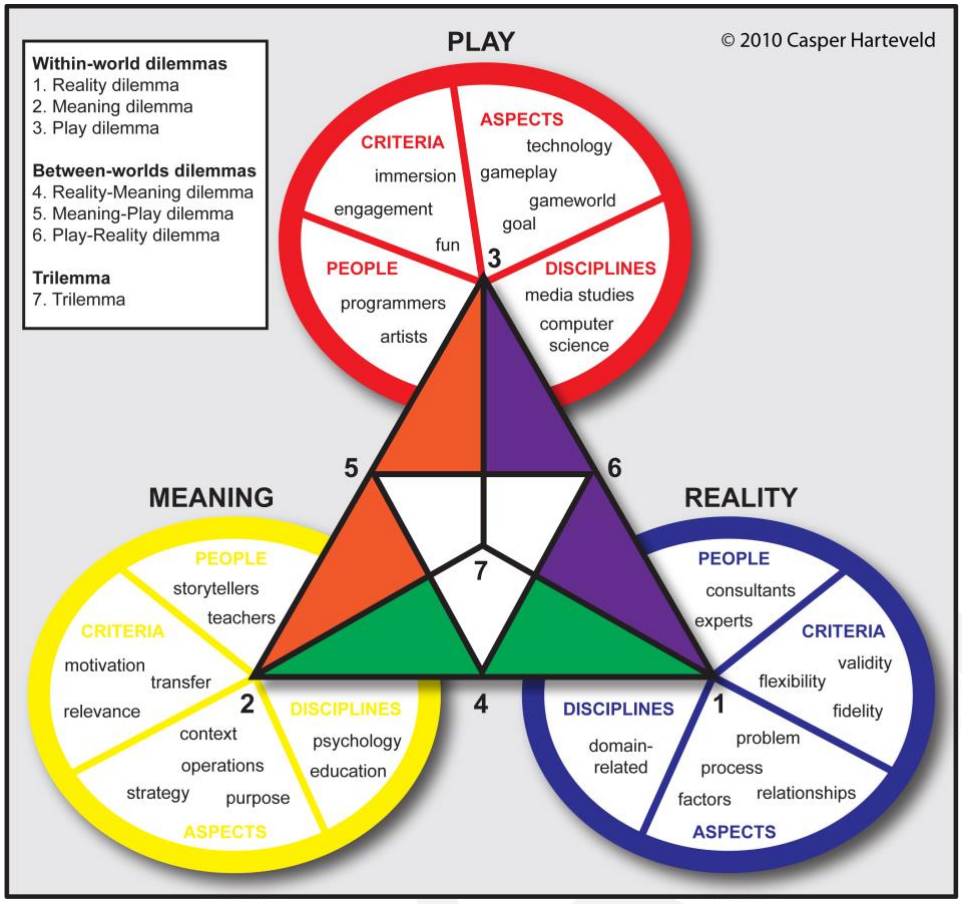


Figure 2 Reality, Meaning, and Play and their tensions. Source: Harteveld (2010, p. 226).

3.2 The three Worlds: Reality, Meaning & Play

3.2.1 World of Reality

The *World of Reality* concerns the subject and domain of the game. For this reason, the world of reality hones in on the subject matter experts and the professionals who live in this world, helping to determine the context for which the game will be designed. For example, the TechEthos research team used the project's Description of Action (DoA) as the primary basis for determining the problems to be solved by the game, the factors involved in solving the problem, as well as how those potential issues relate to one another. The world of reality can be said to be composed of four aspects and three criteria (see Table 5).

Table 5 Aspects and Evaluation Criteria for the World of Reality

Aspects	Evaluation Criteria
Defining the **problem**	Flexibility
Factors in the problem	Fidelity
Relationships between factors	Validity
Diagramming the **process**	

3.2.2 World of Meaning

The second world, the *World of Meaning*, concerns how value can be attained and operationalised by the game designers by evaluating and extracting such value from the context of use. For example, the TechEthos research team drew on subject-matter experts concerning the three technology families in order to more clearly define the motivation of the game (i.e., enhancing the TechEthos basic scenarios via using the serious game to elicit stakeholder values and concerns). The four aspects and evaluation criteria for this world are in Table 6.

Table 6 Aspects and Evaluation Criteria for the World of Meaning

Aspects	Evaluation Criteria
Determining a serious **purpose**	Motivation
Strategy for attaining value	Relevance
Operationalising the plan	Transfer
Context of use	

3.2.3 World of Play

The third world draws on the insights from both those of *reality* and *meaning* in order to help game designers create the game. This final world, then, involves the game designers and the artists as the subjects of emphasis and concerns the elements of play. For example, the TechEthos research team drew on the feedback of the co-creation workshops (see Section 4) in order to align how the final decisions of gameplay elements can meet the goals of the project. The four aspects and evaluation criteria for this world are in Table 7.

Table 7 Aspects and Evaluation Criteria for the World of Play

Aspects	Evaluation Criteria
Goal of the game	Engagement
Gameplay towards the goal	Immersion
Actions and challenges of the **gameworld**	Fun
Technology that creates and facilitates the game	

3.3 Game design pathways

The TechEthos research team, in using TGD methodology, adopted the five-phase, 21-step, research and operationalisation pathway towards the design and co-creation of the TechEthos game distinguished by Duke and Geurts (2004).

Table 8 Game Design Pathway (Source: Harteveld, 2011, p. 37-38).

Phase 1: Setting the stage for the project—complete the essential preliminaries
Step 1: Administrative set-up—organize the project.
Step 2: Define the problem—what prompts this project?
Step 3: Define the purpose of the project—what are the primary objectives?
Step 4: Relate objectives to different possible methods—is a game appropriate?
Step 5: Specifications—constraints and expectations.
Phase 2: Clarifying the problem—define both the focus and scope
Step 6: Defining the model of reality—content, boundaries, interrelationships.
Step 7: Displaying the model of reality—create a lucid depiction of this model.
Step 8: Negotiating the focus/scope with the client—set a clear target.
Phase 3: Designing the game—create a blueprint
Step 9: Translate the model of reality to a game—make a model of a model.
Step 10: Definition of gaming elements—describe each part of the game.
Step 11: Repertoire of techniques—do not reinvent the wheel.
Step 12: Select a format—what style is appropriate?
Step 13: Game concept—document the idea.
Phase 4: Developing the game—make sure it works
Step 14: Build, test, and modify a prototype—put the pieces together.
Step 15: Technical evaluation—ensure an efficient and effective tool is created.
Step 16: Graphic design and printing—develop a professional presentation.
Phase 5: Deployment—ensure proper use by the client
Step 17: Integrate the game into the context—make it fit.
Step 18: Facilitating the game—practical use of the game.
Step 19: Dissemination—deliver or publish the game.
Step 20: Ethical and legal concerns—protect the design.
Step 21: Final report—ensure proper closure.

The TGD methodology was used at various levels of action. Given the nature of EU-funded projects, several specifications covered by Phase 1 had already been identified at the proposal stage. They were further discussed and refined at the start of the game design process. For example, the set-up of the co-design workshops and the type of activities that the expert participants would be engaging with within these workshops. As well as how decisions were carried out after the conclusions of these workshops towards the act of game creation, followed insights from TGD methodology and reached Phase 4, step 14 of the game pathway.

The following section describes the process and output of the co-design workshops, which were instrumental to creating the final game, outlined in section 5.

4. Co-Design Workshops

A vital part of the game development process was the organisation of three serious game co-design workshops.

The online workshops were organised by Ecsite, with contributions from TUD and AIT. They were approximately one month apart between January and March 2022, via Zoom, with collaborative work taking place using the online whiteboard tool Miro.

The main components were icebreakers to facilitate; collective work, presentations to share project content,recapitulate the work carried out previously, group work in the form of breakout rooms, and plenary reflection sessions. The workshops are outlined in terms of objectives, session dynamics and within main outcomes in the sub-sections below.

4.1 Overview of the workshop cycle

Table 9 Overview of the workshops and their connections with the game pathway, as outlined in Table 8.

	Workshop 1	Workshop 2	Workshop 3
Date & time	Thursday, 27 January, 14:00 - 17:00	Thursday, 24 February, 14:00 - 17:00	Thursday, 31 March, 14:00 - 17:00
Relation with TGD methodology	Phase 1, specifications are further defined and negotiated.	Elements of Phase 2 and Phase 3	Phase 3 and beginning of Phase 4 (Step 14)

4.2 Workshop 1

Objectives

- Familiarise participants with the specifications of the TechEthos project and the game to be developed (see section 1.2)

- Reflect on how best to respond to those specifications
- Working in small groups, generate first ideas about game elements and possible combinations

Workshop dynamics

A knowledge repository was set up to give participants basic information about the TechEthos project, which was also presented at the start of the workshop. Participants were asked to reflect on what the game's specifications meant for them. A play session with the 'Cards for Biosafety' was organised to immerse participants into the world of interactive games about ethics of technologies. A 'game repertoire' provided additional sources of inspiration for attendees, who could brainstorm game ideas that could match the project's needs in the workshop's final session.

Main outcomes

The first workshop resulted in the first set of suggestions of how the specifications can be met, from which several broad game principles were derived; for example, the direction towards a collaborative game was set in this first workshop. Moreover, some recommendations for facilitation and game design that meet the accessibility aims of the project were also collected.

4.3 Workshop 2

Objectives

- Review the game specifications and reflect further on the way its purpose can be achieved
- Reflect on the scenarios and their components, and consider which aspects of reality should be modelled in the game and how
- Review the game concept that emerged from the first workshop and develop further the gameworld and the gameplay

Workshop dynamics

An example of a technology scenario, as well as information on a broad game concept, as it emerged from workshop 1, were shared with participants beforehand. The workshop structure corresponded to the three worlds of Meaning, Reality and Play, as present in the TGD methodology. Following short introductions to these themes, participants first worked in small groups to reflect on each of these aspects and then shared these ideas in plenary sessions.

Main outcomes

Insights were generated into what the Worlds of Meaning, Reality and Play mean for the game. Concerning the world of meaning, various modalities for capturing player feedback were proposed, and each poses different benefits and challenges. Concerning the world of reality, different typologies of cards were proposed to influence how technologies and their meanings can change over time. Concerning the world of play, gameplay elements like timing between rounds and, more broadly, the benefits of end-game outcomes (I.e., winning/losing) were collected.

4.4 Workshop 3

Objectives

- Working in small groups, play a number of game concept ideas drawn from past workshops and task groups
- Reflect on these games
- In groups, generate design ideas and adjustments concerning the game concepts

Workshop dynamics

Prior to the session, participants were invited to review two game concepts (developed by the project team and workshop participants) and their rules (see Figure 3). Both games incorporated the verbatim text of one technology scenario and proposed two discussion types.

- Game concept 1. Players are assigned a secret role (for, against or undecided regarding the realisation of the future scenario) and use their resources to unveil further scenario cards that could help them persuade other players to agree with their viewpoint. A vote is taken after each round of discussion.
- Game concept 2. Players progress through three ages, revealing each time a set of cards that characterise that age. They discuss together what aspects of the age they would like to keep or discard (by using their resources). Before moving to a new age, an event card that brings a surprising development is drawn.

The workshop consisted of two rounds of playing and reflecting on the two game concepts proposed, and a plenary reflection in which participants could express their preference for one or the other game as well as give further feedback.

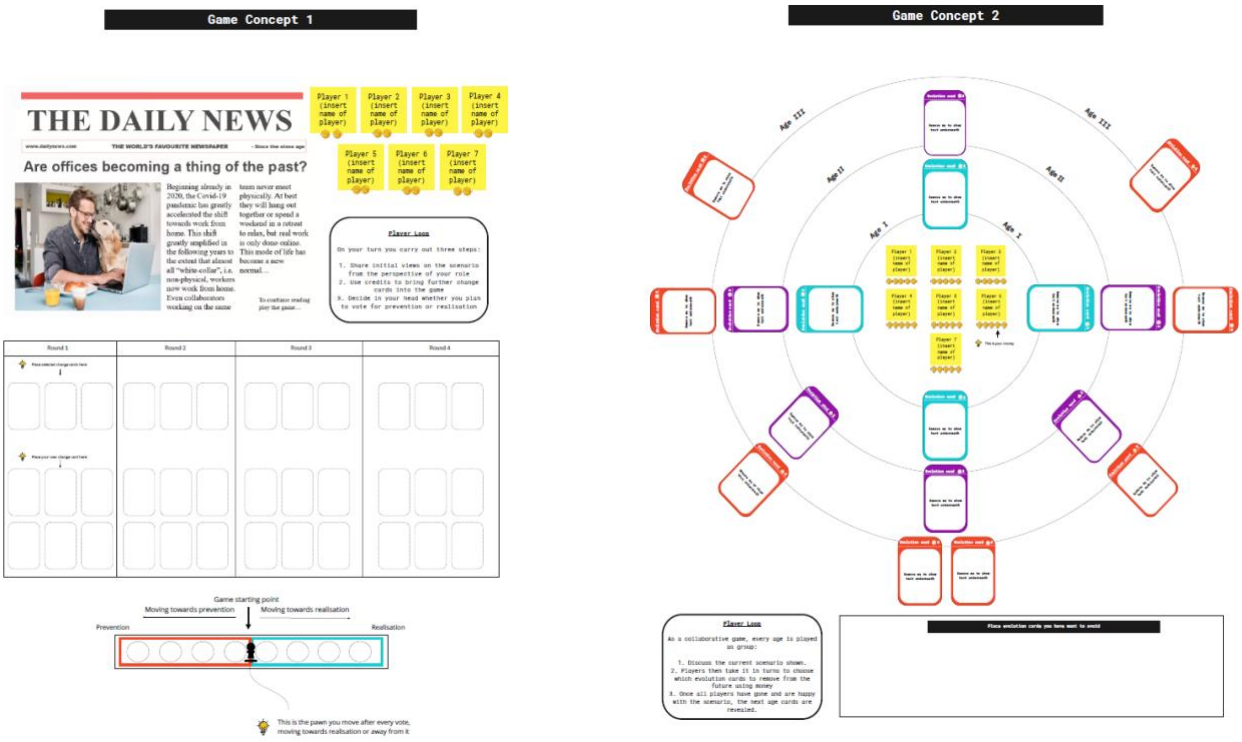


Figure 3 The game boards and instructions for the two game concepts

Main outcomes

The second game concept was validated and a number of issues to be further addressed in game development were identified. In particular, it was felt that a game that proceeds in ages should have a firm time logic where cards would be interconnected, with choices in one age having consequences on the other ages. A stronger focus was recommended on the technologies underpinning this future world and the ethical issues they raise.

5. Game Concept Rationale

Several critical choices were made in the development of the game. These and the resulting effects on game design are presented in this chapter. The game rule book can be found in Annex 1, the card decks for each tech family in Annex 2, and the workshop Script in Annex 3.

5.1 General considerations

Upon considering the challenge of producing game development and the need to address three technology families, a choice was made to develop a single yet adaptable game with four variations, one for Climate Engineering, one for Neurotechnologies, one for Digital Extended Reality, and for Natural Language Processing (in TechEthos Digital Extended Reality and Natural Language Processing are considered to be constituting one technology family; for the accessibility of the games they are considered separately in the game design).

5.2 Key principles and corresponding design decisions

Collaboration. This value was considered highly important to the participants of the co-creation workshops and adopted early on under the adage: ' Collaboration should be the way to win the game.'

In terms of game design, this means participants play together as members of a Citizen World Council. They do so against the board, trying to maintain a number of social factors (e.g., inequality, fairness etc) from reaching a breaking point and trying to keep the world in equilibrium.

Playing oneself. Moreover, for the purposes of gathering meaningful data for the project in what concerns people's values, attitudes and concerns, it was considered that playing a character might be detrimental to allowing players to express their own personal positions.

In terms of game design, this means players represent themselves in the role of citizens called upon to take decisions that can impact the future of the world. Moreover, in the debrief phase of the workshop, emphasis was placed on reflecting on; the game dynamics, which choices were made in relation to the game design and create a new setting to elicit

Trade-offs and consequences. Workshop participants pointed out that in good games, players cannot do everything but must make 'trade-offs' and 'hard choices' such as taking one course of action and abandoning another, and that these choices have consequences. This means that the game should be 'less about luck, and more about choice and strategy'.

In terms of game design, this means adopting gameplay that moves through different ages and choosing at each stage to keep or discard certain cards, thus shaping the (game) world in that age. Players make choices between different technologies (Tech Age I), their applications in everyday life (Tech Age II) and the social and ethical impacts of those technologies (Tech Age III). Discarding a card removes interdependent cards from play, solidifying the perception that choices have consequences. Choices also cost resource tokens and have an impact on key social factors relevant to each technology family via a scale factor that can move up and down and reach a breaking point.

Versatility. The game needs to address different technology families with their own timescales and social impacts. Some of them could be more focused on health or education, others about work, research, or social connections. As such, the game should reflect these differences and be able to adapt for now and in the future of the game to all these specificities.

In terms of game design, this means the game is made with a set of cards. This allows for an easy way to change the board game and specific materials to the tailored needs of future applications. Moreover, it is easier to deploy cards to different audiences. They could print-and-play or use a published set if they want a fancier game. In any case, the game adapts itself to the needs and resources of the target audience. Also, the game is set in two parts: a generic set of cards that will be used for all games, and a specific deck of cards dedicated to each technology family (see Annex 2). These follow the same kind of cards fitting the game, but their world impact, social implications, and timescales are dedicated and unique to each family.

5.3 Relationship with other TechEthos materials

A number of TechEthos materials, as well as new contributions, was used to derive the content of the Tech Age Cards in the three ages, as presented below.

Table 10 Overview of the sources of inspiration for the Tech Age Cards

Tech Age Cards	Focus	Sources
Age I	Key technologies characterising the technology family	D1.2 for the general technology portfolio description D2.2 for descriptions of the technologies characterising each technology family Internal report from (Task 3.1) for the characterisation of the technology family ecosystem, including concrete case studies of R&D in each of the areas Basic scenarios for the technologies underpinning the envisaged worlds
Age II	Tangible applications in everyday life	D2.2 for descriptions of applications and use cases characterising each technology Basic scenarios for the descriptions of aspects of life impacted by the technologies in the envisaged worlds
Age III	Social and ethical impacts associated with the applications of technologies	D2.2 for descriptions of values and principles at play in each of the technologies Basic scenarios for the varied impacts of technologies in the envisaged worlds

6. Game Workshop

The game described in section 5 and Annex 1 will be run as part of a more comprehensive workshop session. This is described in broad terms below and will be further developed as part of Task 3.5.

Each session will be run according to the classic Serious Game protocol with a phase before the game, the gameplay, and a debrief afterwards.

The '**Before the game**' phase should follow these 3 steps:

- Introduction, ice breaker, and explanation of the purpose of the session. Participants will learn about research ethics and data collection, the context, and the session's planning (timeline, schedule, etc.).

- Then teams of players are made in order to foster a sense of global cooperation in which players play against the board rather than against each other. The game rules are explained, and any other considerations that are not about the TechEthos project but the game itself.

- Finally, the game's narrative is explained, the technological family and the position of players as members of the Citizen World Council.

Gameplay

During the game, each team is playing the 3 Ages. During this time, moderators are here to help with the rules, facilitate the game itself, and answer some questions about the technological contents (mostly Tech Cards). In parallel quantitative and observational data collection should be performed following a clear user research protocol.

Finally, the '**After the game**' phase follows the classic three steps:

- Results of the game, discussions about choices, points of view, players' dynamics, and game theory related to the content. During this phase, some qualitative data collection as the result of the group itself (or individuals if enough user researchers are available) should be collected. Some modification of the game or cards or social points of view could be raised.

- Discussion, not on the game, but on technologies themselves should occur. The facilitator answers and explains impactful direction and research related. Moreover, players should express their opinions.

- At the end of the session, resources should be pointed out and provided for all players about TechEthos and the Technology Families they played/discussed. It could be leaflets, books, research articles, videos, and websites.

- A post-participation survey is shared and completed before participants leave.

7. Conclusions and future outlook

The unique technologies that are components of the three TechEthos identified technologies families are sure to raise ethical and social issues, among others, well into the future. The use of scenarios provides experts as well as citizens with the narrative tools to tangle with some of these challenges head-on. Working with these scenarios provides this project with the means of designing guidelines *for* their values rather than relegating them to afterthoughts or side-lining them altogether. The experts elicited in this task towards the goal of serious game co-design are all vested stakeholders with an active interest in the ethical design and use of these technologies.

In the first part of this work, we explored the motivations behind the necessity and creation of the TechEthos game. Given the unique ethical and social implications of the identified TechEthos technology families (climate engineering, neurotechnologies and digital extended reality), a bespoke means of eliciting both expert and citizen feedback on the ethical and social concerns regarding these technology families was required. This report outlines the extant best practices that have aimed to undertake similar stakeholder elicitation. In consultation with the project partners AIT, Ecsite, and TUD (including the TUD GameLab), as well as the LTPs, the Triadic Game Design methodology (TGD) was adopted as the underlying philosophical and organisation approach used to guide the subsequent expert workshops that were levied to co-construct the final game.

The second part of this report highlights this TGD methodology, its underlying philosophical precepts, and how it can contribute to explicitly orientating the co-creation of the game towards achieving the TechEthos objectives. Three expert co-creation workshops are described in the third part of this report. How these workshops were organised is described, as well as the feedback used to undertake the backend work by the project team, towards the subsequent workshops and the general game design.

The final sections of the work describe the rationale behind how the final game was arrived at, how it functions and how it is designed to achieve the TechEthos goals vis-a-vis scenario game workshops.

8. References

Buchinger E., Kinegger M., Zahradnik G., Bernstein M.J., Porcari A., Gonzalez G., Pimponi D., Buceti G. (2022). TechEthos technology portfolio: Assessment and final selection of economically and ethically high impact technologies. Deliverable 1.2 to the European Commission. TechEthos Project Deliverable. Available at: www.techethos.eu.

Candy, S. (2018). Gaming futures literacy: The thing from the future. In Transforming the future (pp. 233-246). Routledge.

Clare, T. (2018). *The Champion of the Wild*. Oxford, UK: Big Imagination Games.

Duke, R. D., & Geurts, J. (2004). *Policy games for strategic management: pathways into the unknown*. Amsterdam: Dutch University Press.

Friedman, B., Nathan, L., Kane, S., & Lin, J. (2011). *Envisioning Cards*. Seattle: University of Washington

Harteveld, C. (2010). *Triadic game design: Balancing reality, meaning and play*. TGD, Retrieved 12 May 2022. https://web.northeastern.edu/casperharteveld/tgd/tgd.html

Harteveld, C. (2011). *Triadic game design: Balancing reality, meaning and play*. London: Springer Science & Business Media.

NANO2ALL (n.d.-a). *National Multi Stakeholder Dialogues - Moderator Manual*. NANO2ALL Project resource. Retrieved from http://www.nano2all.eu/resources/nano2all-dialogue-materials-and-results/

NANO2ALL (n.d.-b). *Scenario Exploration Game - Instructions*. NANO2ALL Project resource. Retrieved from http://www.nano2all.eu/resources/nano2all-dialogue-materials-and-results/

Roubira, J., & Cardouat, M. (2008). *Dixit*. San Martino in Rio: Asterion Press. Retrieved from https://www.asmodee.it/giochi_dixit.php

Tiemersma, S., Freese, M., & Boschma, D. (2021). *Cards for Biosafety*. Delft: Rathenau Instituut, Lis Consult, NWO. Retrieved from https://seriousgaming.tudelft.nl/game/cards-for-biosafety

Annex 1: Game Rulebook

Game Rulebook

30-45 minutes

3 to 7 players

Getting started

You have been chosen, from a wide array of applicants, to sit on your regional delegation to the Citizen World Council (CWC) and decide in good conscience what may be best for future generations of people and the Planet.

The CWC has to forge the future starting with a specific set of technologies that we see emerging and whose potential is not yet realised. It will be your duty to decide which technological developments you personally value the most for a better future.

Be careful: each of your decisions will have unforeseeable consequences on three aspects of society. At each step in the game, you will learn the impact of your choices. Your mission is to avoid that any of the three social factors reach their limit. Because if the impacts are too significant, the world as we know it will change beyond our recognition.

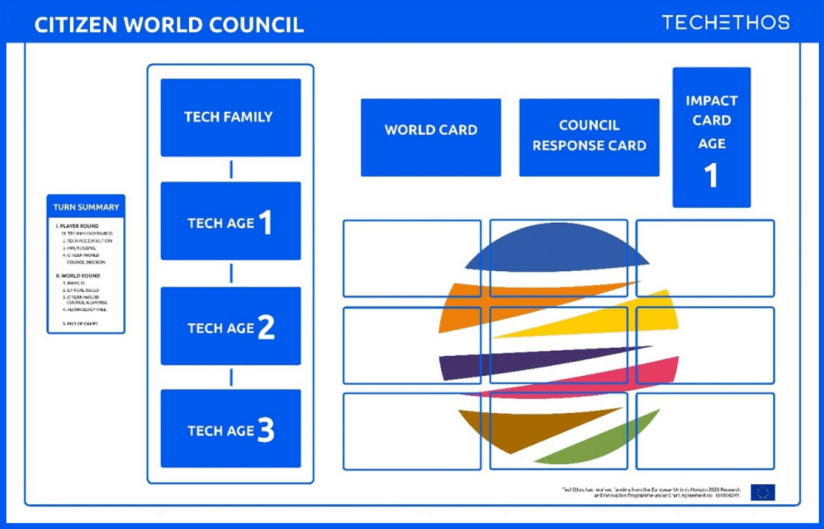
But do not despair! There is hope: if at some point the impact on a social factor during the game reaches its limits, the Citizen World Council has the power to respond with global actions that set ethical boundaries to technological developments. This will help cancel a card's impact on social factors and make the world safe – at least for another round.

Let's play!

QUICK OVERVIEW

All games contain:

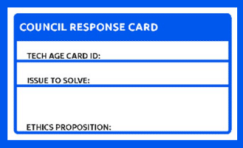
A ***Citizen World Council board***



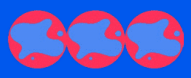
7 ***+1 Vote Cards***

7 ***+2 Vote Cards***

10 ***Council Response Cards***



3 ***Impact Tokens***



1 **Turn Card**

1 **Credits Card**

Solution Sheets (optional)

In the form of a notepad or loose sheets

1 ***Rulebook***

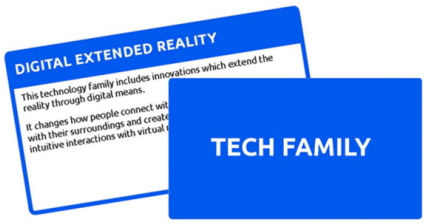
QUICK OVERVIEW

So far, this game can be played with four distinct deck of cards corresponding to broad families of technologies: Neurotechnologies, Extended Reality, Natural Language Processing, and Climate Engineering Technologies.

Each ***Technology Family*** deck of cards contains:

1 ***Tech Family Card***

This card provides a short description of the broad Technology Family.



3 ***World Cards***

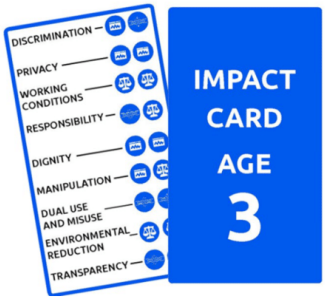
This card describes the ***Social Factors*** that will be impacted by the introduction at a large scale of specific technologies and innovations. It tracks the evolution of those factors as you play the game.

21 Tech Age Cards: 3 ***Tech Age-I Cards***, 9 ***Tech Age-II Cards*** and 9 ***Tech Age-III Cards***

These cards are the essence of the game. They describe some of the technologies that form part of the technology family (Age I), their possible application domains (Age II), and the societal and ethical impacts that they might raise (Age III).

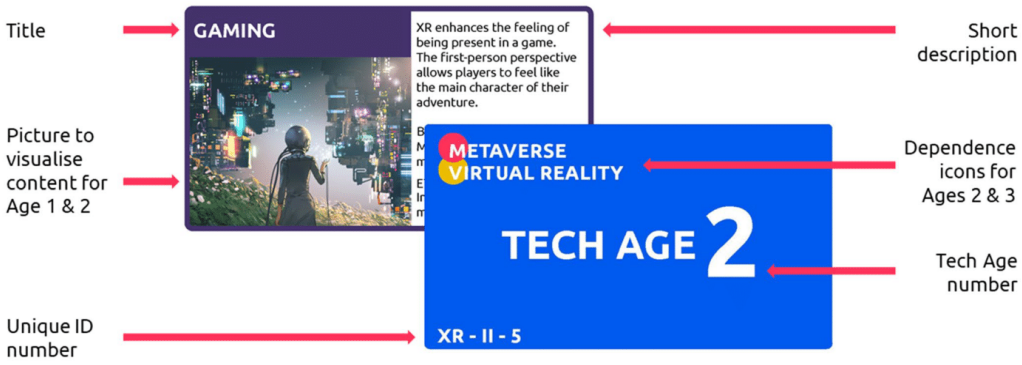
3 ***Impact Cards***

There is one impact card per age. All ***Tech Cards*** from the associated age are listed on the corresponding ***Impact Cards***. Next to the name of the ***Tech Card*** is a combination of ***Social Impacts***. They are used to move tokens on the World Card between each Age.



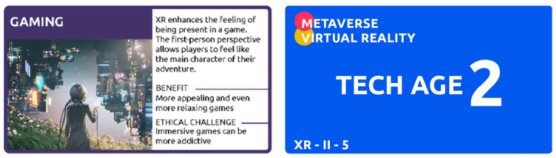
QUICK OVERVIEW

Anatomy of a ***Tech Age Card***:



Tech Age-1 Cards (3) depict a specific technology associated with the overall Technology Family.

Tech Age-2 Cards (9) depict the possible applications domains of Tech Age-I Cards in everyday life. They are linked to one or two cards belonging to the previous age, illustrated by the Dependence Icon on the back of these cards.



The ***Gaming*** card is dependent on ***Metaverse*** and ***Virtual Reality***.

Tech Age-3 Cards (9) are ethical questions raised by a specific Tech Age-II Cards. Players will have to pick the most important one to discuss boundaries and ethical issues.

The ***Manipulation*** card is dependent on ***Gaming***.

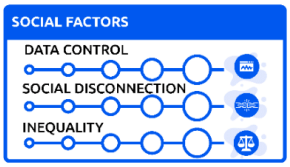
Setting up the game

- Place the ***Gameboard*** in front of you on the table.
- Give each player two ***Vote Cards*** (one ***+1 Card*** and one ***+2 Card***).
- Choose the right **Card Deck**. Every game is about a specific ***Technology Family*** which has to be decided before the game starts. If your game has a moderator, they might have chosen your deck already.
- Choose your level of difficulty (**Easy**, **Normal** or **Expert**), pick the according ***World Card*** and place it face up on the gameboard. Put the other two World Cards back in the box. If your game has a moderator, they might have already chosen the difficulty level for your game.

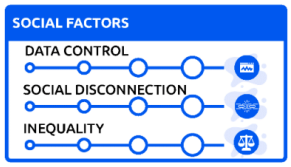
Choosing your World Card

The scales featured on a ***World Card*** represent the number of impacts the world can endure without falling apart. If any of them reach their maximum during the game, the game is over.

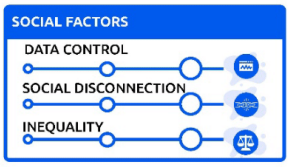
- If you want to focus the debate exploring the problems that can emerge with future technologies, you should pick a long scale (e.g., **Easy**) to leave more room for discussions.
- If you like to discuss possible solutions for the problems, pick a smaller scale (e.g., **Hard**) to fill out more of the ***Council Response Cards***.



Easy



Normal



Hard

- Put 3 ***Impact Tokens*** at the beginning (0) of each scale of the chosen ***World Card***. ***Impact Tokens*** will help you keep track of the impact your choices have on the scales of social factors present on your chosen World Card.
- Place the ***Tech Family Card*** face down in the middle.
- Place all ***Tech Age Cards*** in 3 different deck (3 Tech Age-1 Cards, 9 Tech Age-2 Cards and 9 Tech Age-3 Cards), face down, in their designated space on the board.
- Place the 3 ***Impact Cards***, face down, in their designated space on the board.

Playing a round

Follow these steps, in order:

Player Round

(only for the first round) Technology Family

The ***Technology Family Card*** is flipped and read out loud

Tech Age Evolution

Pick the ***Tech Cards*** corresponding to the current age and place them all faced up around the ***Technology Family Card*** in the middle. They will unveil the evolutions taking place in the World.

Take turns to pick up, read out loud and place cards back on the table.

Open debate

As members of the Citizen World Council, you and your fellow players must decide which ***Tech Cards*** you value the most to bring forward into a future world. Take turns to express your points of view and pros and cons for specific cards.

Guiding questions for the open debate & vote

In **Age-1**, you must decide which technology should be developed in your ideal future. You might decide to explain to your fellow players, for example, why the Metaverse would be beneficial in the future and why Digital Twins would be better not to be developed further. **Vote for the technology which should be developed further.**

In **Age-2**, you must decide in which areas of life you would like the technologies selected in Age 1 to be applied. **Vote for the application areas you would like to see become a reality.**

In **Age-3**, you are called to reflect on the principles and values that may be impacted by your previous choices. You must decide which ethical issues are the most important for your group to tackle, in relation to the technologies you have selected and the areas of life in which they have been applied. **Vote for the most crucial societal and ethical issues that need to be addressed so to preserve the values you believe in most.**

Citizen World Council Vote

After the debate, it's time for the council to vote in secret for the ***Tech Cards*** they want to keep in the game. The ***Tech Card*** that has scored the least will be discarded.

In each age, one ***Tech Card*** should be removed and no more.

Place one or both of your ***Vote Cards (+1 Vote Card*** and/or ***+2 Vote Card)*** face down next to any ***Tech Cards*** of the current ***Age***. If you wish, you can use both of your ***Vote Cards*** for the same ***Tech Card***, to increase its chances of being kept in the game.

When all players have voted, flip over all ***Vote Cards*** and count the number of votes for each ***Tech Card***. In case of a tie, take back your ***Vote Cards***, discuss and vote again on the cards in the tie.

World Round

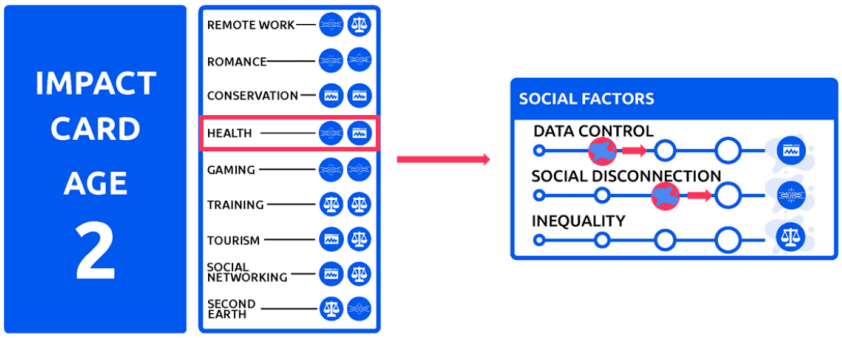
Impacts

After you decided which cards will stay, flip over the ***Impact Card*** corresponding to your Age. On this card, you find the impact scores of all ***Tech Cards*** remaining on the table.

Move the ***Impact Tokens*** on the ***World Card*** according to the scores on the ***Social Factor*** modifiers written next to each ***Tech Card*** remaining on the board in the current ***Age***.

Counting Impact

In Age 2, you decide that the card **Health** will stay. This has a +1 impact on **Social Disconnection** and a +1 impact on **Data Control** you move the relevant tokens one step to the right on the **World Card**.



World status

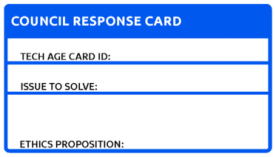
Check the status of the ***World Card***. If any ***Impact Token*** has reached the end of the scale, the world is in peril. Players can now take a decision regulating the technology, area of people's lives where it is making a change or ethical issue that has caused the world to break.

Citizen World Council Response

To do this, select a ***Tech Card*** whose effects you would like to cancel and think about who might be impacted negatively by the situation described on the ***Tech Card*** and how you, as a Citizen World Council, would solve the problem. After each player has thought about their solution individually, the results are discussed as a group.

Discuss to find a common response to the problem at hand. If the solution seems plausible for everyone at the table, and if at least half of the players agree, write down the solution on a ***Council Response Card.***

Filling out a Council Response Card



As a group, you should write directly on this card:

- The reference of the card whose effect you want to cancel; you find the ***Tech Card ID*** on the back of the ***Tech Card***
- The most pressing issue that needs to be solved; and
- The solution proposed and agreed

Put the ***Council Response Card*** next to the ***Tech Card*** it addresses. As you have solved the problem, undo all the impacts of the ***Social Modifiers*** connected to this card, by moving the ***Impact Tokens*** backwards. Proceed to another one if needed.

Congratulations! You found a solution and the world survives for another age. If no satisfying solution has been found between players, the game is over.

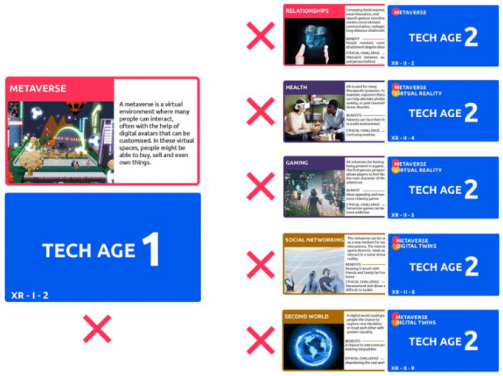
Moving on to the next Tech Age

Pick up the deck corresponding to the next Tech Age. Look at the back of all new cards.

Remove any ***Tech Cards*** in that deck that have ***Dependence Icon*** of the cards you eliminated in the Age before.

Discarding cards based on the dependencies

In **Tech Age I** you removed **Metaverse**. Before you enter **Tech Age II** you have to discard **Gaming**, **Social Networking** and **Second World** from the **Tech Age 2** deck, as they have the **Dependence Icon Metaverse** on the back of the cards.



Proceed to play the Player Round.

If you have reached the end of Age-3, move on to the next section, 'End of the Game'.

End of the game

At the end of each ***Age***, the remaining ***Technology Cards*** still on the board for the current ***Age*** change the World and modify at least one of the 3 ***Social Factors***. Players have to prevent the World from collapsing during each of the 3 ***Ages***.

If at any time any of the ***Social Factors*** reach their ***Breaking Point***, players will have to agree on a common solution to the problem at hand, using ***Council Response Cards***. If a joint solution is not found by players, the game is over.

At the end of ***Age 3***, all players win if the world has not collapsed. Unfortunately, this may not be a World you'd like to live in. But take heart: the discussion afterwards will offer you an opportunity to reflect on alternative pathways!

You can now proceed to the next step of the workshop or play a new game with the same ***Technology Family*** deck or a different one.

About the game

TechEthos project

This game was developed in the framework of the EU-funded project TechEthos. TechEthos aims to bring ethical and societal values into the design and development of new and emerging technologies from the very beginning of the process.

We are focusing more specifically on three technology families: Neurotechnologies, Climate Engineering and Digital Extended Reality. The game allows you to discover each of them, thanks to the analysis carried out by the project, and to share your ideas with fellow players (and our project partners) about the kind of future world you'd want to be living in.

Ethics should be an intuitive part of technological research and innovation; TechEthos is committed to deliver guidelines that work for actors in the field. Your feedback in the game will fuel the project's work in this respect.

Game developers

The game concept was developed by the TechEthos Work Package 3 team: Greta Alliaj, Fabrice Juvenot, Cristina Paca and Andrew Whittington-Davis (Ecsite), Michael Bernstein, Wenzel Mehnert, and Masafumi Nishi (AIT, Austrian Institute of Technology), Steven Umbrello and Pieter Vermaas (TU Delft).

Contributions and feedback were received from the TU Delft GameLab (Simon Tiemersma) and science engagement experts participating in the co-creation workshops, either as the project Linked Third Parties or as invited experts.

The game card content is based on several internal reports and the following published report:

Adomaitis, L., Grinbaum A., Lenzi, D. (June 2022) *TechEthos D2.2: Identification and specification of potential ethical issues and impacts and analysis of ethical issues of digital extended reality, neurotechnologies, and climate engineering.*

Credits

Rulebook

Icons: Time Icon (p.1) by Muhazdinata on IconScout; Person icon (p.1) by Fiki Ahmadi on IconScout; Attention Icon by Loritas Aventura on IconScout

Gameboard

Icons: Adobe Stock 481674788.

Extended Reality Card Deck

Icons: Data Icon by Jemis Mali on IconScout; Splash visual by Irdat Purwadi on IconScout; Weak chain Icon in Glyph Style by WEBTECHOPS LLP on IconScout. Balance Icon by Grafix Point on IconScout.

Photographs: Vanessa Loring from Pexels. Adobe Stock 509802541; 262995960; 509419439; Adobe Stock 255418686; CultLab3D: Automated Scanning Technology for 3D Digitalisation; Winner of a EU Prize for Cultural Heritage / Europa Nostra Award 2018; Adobe Stock 500884386; Adobe Stock 504247272; Adobe Stock 254487269; Adobe Stock 260655912; Adobe Stock 490283930; Adobe Stock 409819147.

Natural Language Processing Card Deck

Icons: Text search Icon by ch.designer on IconScout; Group Icon by Zky Icon;

Photographs: Adobe Stock 482132921; Adobe Stock 526710714; Adobe Stock 383936306; Adobe Stock 509530604; Adobe Stock 293059971; Adobe Stock 393652002; Adobe Stock 378740721

Other notes: Images for cards 'People replicas', 'Artistic works' and 'Healthcare' were produced with AI involvement, using the website DALL-E from the OpenAI Lab. The image on the card 'Virtual Influencers' comes from the Instagram profile of virtual influencer @lilmiquela, https://www.instagram.com/lilmiquela/. The image featured on the card 'Text analysis and generation' comes from InfraNodus, https://infranodus.com/

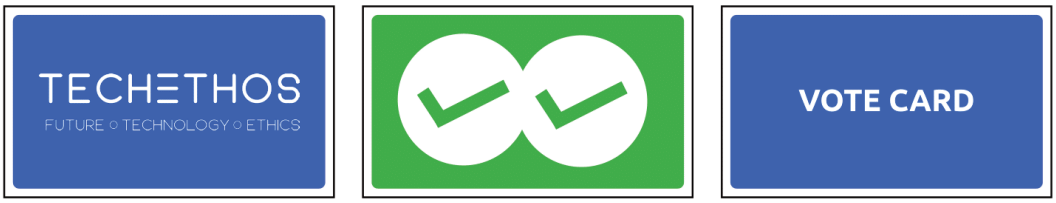
Neurotechnologies

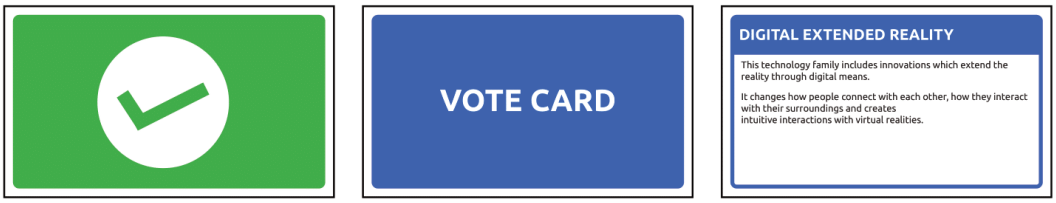
Photographs: Adobe Stock 270916294; Adobe Stock 170691466; Adobe Stock 194165520; Adobe Stock 444414682; Adobe Stock 220269394; Adobe Stock 314028559; Adobe Stock 372231498; Adobe Stock 217094326; Adobe Stock 308702722.

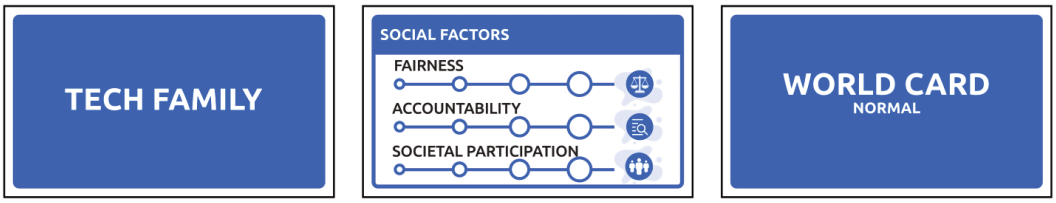
Other notes: The image for the card 'Medicine' comes from Zephyr/Science Photo Library. The image used for the card 'Marketing' comes from Unravel Neuromarketing Research. The image used for the card 'Education' comes from the Centre for Neurotechnology, University of Washington, US.

Annex 2: Card Decks

Natural Language Processing







SOCIAL FACTORS

FAIRNESS

ACCOUNTABILITY

SOCIETAL PARTICIPATION

WORLD CARD

EASY

SOCIAL FACTORS

DATA CONTROL

ACCOUNTABILITY

SOCIETAL PARTICIPATION

WORLD CARD

HARD

COUNCIL RESPONSE CARD

TECH AGE CARD ID:

ISSUE TO SOLVE:

ETHICS PROPOSITION:

COUNCIL RESPONSE CARD

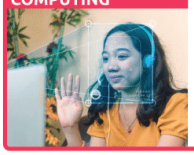
CHATBOTS

Chatbots use NLP techniques to interact with users, either orally or in writing. They already provide a wide array of services in customer support or via voice assistants.

TECH AGE 1

NLP - I - 1

AFFECTIVE COMPUTING

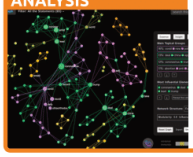


NLP contributes to making it possible for devices to recognise, simulate and respond to human emotions. Interacting with these devices can influence what people think or believe. This can encourage people to change their behaviour, without forcing them.

TECH AGE 1

NLP - I - 2

TEXT GENERATION & ANALYSIS



The availability of big datasets of original text and increasingly powerful ways for programmes to learn means that applications can generate text at a level close to humans. It is also possible to analyse text to reveal the sentiments or opinions of people who wrote it.

TECH AGE 1

NLP - I - 3

EDUCATION

NLP can assist teachers to support students' learning. Since not all students understand and learn in the same way, teaching can be personalised to help them learn in the best way.

BENEFIT
Unlimited possibility to repeat instructions

ETHICAL CHALLENGE
Collection, storage and use of sensitive information

CHATBOTS

TECH AGE 2

NLP - II - 1

'PEOPLE' REPLICAS

Digital replicas can imitate the speech and language of deceased or living persons. These can be famous authors and philosophers, but also deceased family or friends.

BENEFIT
Alleviating grief and offering the illusion of presence

ETHICAL CHALLENGE
Damage to people's reputation or dignity

AFFECTIVE COMPUTING

TECH AGE 2

NLP - II - 2

TRANSLATION

Translation from one language to another can happen without human involvement, even in simultaneous and natural conversations.

BENEFIT
Facilitating communication between a large number of people

ETHICAL CHALLENGE
Threat to the livelihood of professional translators

TEXT ANALYSIS & GENERATION

TECH AGE 2

NLP - II - 3

HEALTH

NLP is used to make diagnoses, recommend treatments, and conduct follow-up interviews. "Virtual" doctors and nurses help to monitor patients.

BENEFITS
Talking to an NLP device without feeling judged

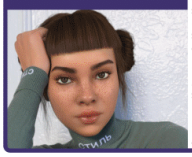
ETHICAL CHALLENGE
Difficult information disclosed without support

AFFECTIVE COMPUTING
CHATBOTS

TECH AGE 2

NLP - II - 4

SOCIAL MEDIA



Virtual influencers are increasingly present on social networks. They behave like human users, sharing messages and attracting new followers.

BENEFIT
Messages against racism, sexism and violence

ETHICAL CHALLENGE
Risk of manipulating users and misinformation

AFFECTIVE COMPUTING
CHATBOTS

TECH AGE 2

NLP - II - 5

WORKPLACE

HR uses NLP to analyse CVs and make decisions about hiring. In the workplace, it is used to assign tasks, monitor progress and remind staff of rules and norms.

BENEFIT
Easy to share information and optimise workload

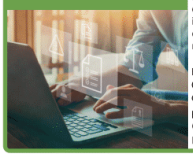
ETHICAL CHALLENGE
Opportunities allocated according to biases

CHATBOTS
TEXT ANALYSIS & GENERATION

TECH AGE 2

NLP - II - 6

LEGAL ADVICE



Lawyers use NLP applications to process client data and conduct legal interviews. Text analysis can be used to handle laws, regulations and factual data.

BENEFITS
Overcoming faults like error or subjective views

ETHICAL CHALLENGE
Consequences of wrong predictions

CHATBOTS
TEXT ANALYSIS & GENERATION

TECH AGE 2

NLP - II - 7

JOURNALISM

NLP can be used to create media content. Applications can produce text on their own or generate samples for a human to select.

BENEFITS
Content available on every subject and place

ETHICAL CHALLENGE
Easy for readers to find only opinions that resonate with their own

AFFECTIVE COMPUTING
TEXT ANALYSIS & GENERATION

TECH AGE 2

NLP - II - 8

ARTISTIC WORKS

NLP can be used to generate creative or poetic text, usually by relying on existing creative work. Applications can imitate the style of some classic authors.

BENEFITS
Users produce creative outputs with little or no effort

ETHICAL CHALLENGE
A threat to human works and creativity

AFFECTIVE COMPUTING
TEXT ANALYSIS & GENERATION

TECH AGE 2

NLP - II - 9

When can a chatbot reveal a private conversation?

It is expected that NLP applications would not share information from users' private conversations with third parties. However, exceptions can be made for situations such as cyber-bullying, illegal activities, or other kinds of threats.

PRIVACY

EDUCATION

TECH AGE 3

NLP - III - 1

How can we make sure the dignity of living or deceased people is protected?

NLP applications make it possible to capture personality traits of a deceased or living person. Past conversations are used to generate new phrases that the person being imitated has never said, in ways that can do damage to their reputation and dignity.

DIGNITY

'PEOPLE' REPLICAS

TECH AGE 3

NLP - III - 2

How can NLP be adapted for a particular audience, culture, or dialect?

Exchanges using natural language are expected to respect the values of the culture in which they take place. NLP applications, however, do not understand meaning. Depending on the dataset available for a given language, NLP can perform better or worse.

RESPECT OF CULTURAL DIFFERENCES

TRANSLATION

TECH AGE 3

NLP - III - 3

How can we make sure that NLP applications remain secure?

There are security risks linked to the technology behind NLP applications. For example, malicious attacks can damage the application or extract any sensitive information that might have been provided to train the application.

SECURITY

HEALTH

TECH AGE 3

NLP - III - 4

How can we make sure that NLP applications do not insult or humiliate humans?

Given that "toxic" language, such as insults and threats, is part of the data chatbots use to train and learn, they might themselves respond in a "toxic" manner to users. Nevertheless, "toxic speech" differs between individuals and social groups, and depending on the context.

DECENCY

SOCIAL MEDIA

TECH AGE 3

NLP - III - 5

How can bias be avoided when using NLP?

The presence of biases in the behaviour of chatbots can be a major source of discrimination. As a result, one person could be treated less favourably than others with regard to age, sex, gender, or skin colour, when applying for a job, a loan or housing.

AVOIDING BIAS

WORKPLACE

TECH AGE 3

NLP - III - 6

Who should be responsible when NLP applications malfunction?

NLP applications can behave in a way that is considered morally objectionable or wrong: they can lie, mislead, hurt, misinform or insult. However digital agents are not capable of assuming responsibility when their actions have consequences on people.

RESPONSIBILITY

LEGAL ADVICE

TECH AGE 3

NLP - III - 7

How can we deal with applications designed to trigger a particular response?

Some NLP applications influence a user's behaviour in a way some might consider positive for the user. This might pose a problem when deception or manipulation are used to do so, if the methods used are not clearly presented to the users.

NON-MANIPULATION

JOURNALISM

TECH AGE 3

NLP - III - 8

How can we make sure that people remain aware that they are interacting with NLP applications?

People may not understand that they are interacting with NLP applications, especially if the messages generated are made to look like they are coming from humans. People might want to attribute human qualities to chatbots, like trust and responsibility.

AUTONOMY

ARTISTIC WORKS

TECH AGE 3

NLP - III - 9

EDUCATION

'PEOPLE' REPLICAS

TRANSLATION

HEALTH

SOCIAL MEDIA

WORKPLACE

LEGAL ADVICE

JOURNALISM

ARTISTIC WORKS

IMPACT CARD AGE 2

PRIVACY

DIGNITY

RESPECT OF CULTURAL DIFFERENCES

SECURITY

DECENCY

AVOIDING BIAS

RESPONSIBILITY

NON-MANIPULATION

AUTONOMY

IMPACT CARD AGE 3

TEXT ANALYSIS & GENERATION

AFFECTIVE COMPUTING

CHATBOTS

IMPACT CARD AGE 1

CREDITS

TURN SUMMARY

I. PLAYER ROUND

(1. TECHNOLOGY FAMILY)

2. TECH AGE EVOLUTION

3. OPEN DEBATE

4. CITIZEN WORLD COUNCIL DECISION

II. WORLD ROUND

1. IMPACTS

2. ETHICAL ISSUES

3. CITIZEN WOLRD COUNCIL RESPONSE

4. TECHNOLOGY TREE

5. END OF GAME?

TURN CARD

CREDITS

THIS GAME WAS DEVELOPED BY THE EU-FUNDED PROJECT TECHETHOS, BASED ON NEW RESEARCH CARRIED OUT BY ITS PARTNERS.

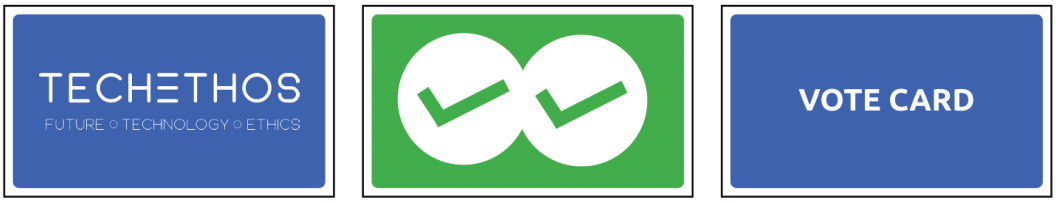
FOR MORE INFORMATION, VISIT:
WWW.TECHETHOS.EU
OR MEET US ON SOCIAL MEDIA:

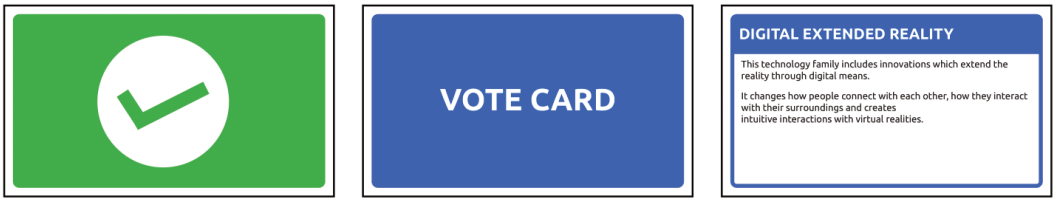
@TECHETHOSEU

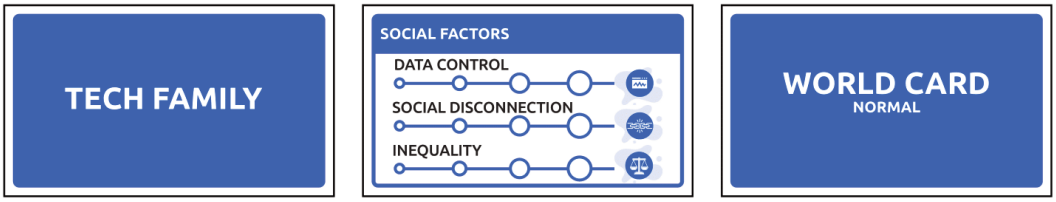
TECHETHOSEU

TechEthos has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement no. 101006249. This game and its contents reflect only their authors' view.

Digital Extended Reality







SOCIAL FACTORS

DATA CONTROL

SOCIAL DISCONNECTION

INEQUALITY

WORLD CARD
EASY

SOCIAL FACTORS

DATA CONTROL

SOCIAL DISCONNECTION

INEQUALITY

WORLD CARD
HARD

COUNCIL RESPONSE CARD

TECH AGE CARD ID:

ISSUE TO SOLVE:

ETHICS PROPOSITION:

COUNCIL
RESPONSE CARD

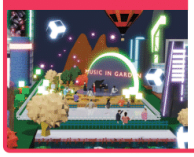
VIRTUAL REALITY

Virtual reality creates digitally simulated experience. Virtual reality environments are built by combining digital graphics and inputs to other senses.

TECH AGE 1

XR - I - 1

METAVERSE



A metaverse is a virtual environment where many people can interact, often with the help of digital avatars that can be customised. In these virtual spaces, people might be able to buy, sell and even own things.

TECH AGE 1

XR - I - 2

DIGITAL TWINS

Digital twins are replicas of real objects, but in a digital space. They can be used to simulate, monitor, and improve the way their physical originals work. Engineers, doctors and aviators train with digital twins to better understand the systems they work with.

TECH AGE 1

XR - I - 3

REMOTE WORK

Co-workers can interact without being in the same location. Team meetings can be held in virtual and mixed realities with physical and avatar participants.

BENEFIT

People move away from the city and live closer to nature

ETHICAL CHALLENGE

Keeping a balance between work and life

VIRTUAL REALITY

TECH AGE 2

XR - II - 1

RELATIONSHIPS

Conveying facial expressions, vocal intonation, and speech-gesture coordination creates more intimate communication, reshaping long-distance relationships.

BENEFIT

People maintain constant attachment despite distance

ETHICAL CHALLENGE

Mismatch between avatar and person behind

METAVERSE

TECH AGE 2

XR - II - 2

CONSERVATION

Duplicating the real world helps us to preserve art, locations, and built worlds in their original forms.

BENEFIT

Regardless of what the future holds, art can be viewed in its original form

ETHICAL CHALLENGE

Abandoning authenticity

DIGITAL TWINS

TECH AGE 2

XR - II - 3

HEALTH

XR is used for many therapeutic purposes. For example, exposure therapy can help alleviate phobias, anxiety, or post-traumatic stress disorder.

BENEFITS
Patients can face their fears in a safe environment

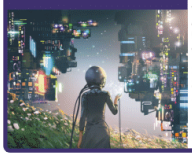
ETHICAL CHALLENGE
Confusing realities

METAVERSE
VIRTUAL REALITY

TECH AGE 2

XR - II - 4

GAMING



XR enhances the feeling of being present in a game. The first-person perspective allows players to feel like the main character of their adventure.

BENEFIT
More appealing and even more relaxing games

ETHICAL CHALLENGE
Immersive games can be more addictive

METAVERSE
VIRTUAL REALITY

TECH AGE 2

XR - II - 5

TRAINING

XR applications are used to train different skills. This is especially helpful for high-risk or expensive training, like in medicine and aviation.

BENEFIT
Earning certificates more quickly and with greater flexibility

ETHICAL CHALLENGE
Transfering skills from XR to the material world

VIRTUAL REALITY
DIGITAL TWINS

TECH AGE 2

XR - II - 6

TOURISM

People can tour faraway places without leaving the convenience of their home. With the push of a button, they can visit other cities or wild places, like a mountain peak.

BENEFITS
Fewer income barriers to cultural exchange and travel

ETHICAL CHALLENGE
Increase in sedentary lifestyles

VIRTUAL REALITY
DIGITAL TWINS

TECH AGE 2

XR - II - 7

SOCIAL NETWORKING

The metaverse can be used as a new medium for social interactions. The internet opens doors to meet and interact in a social virtual reality.

BENEFITS
Keeping in touch with friends and family far from home

ETHICAL CHALLENGE
Harassement and abuse are difficult to tackle

METAVERSE
DIGITAL TWINS

TECH AGE 2

XR - II - 8

SECOND WORLD

A digital world could give people the chance to explore new identities or treat each other with greater equality.

BENEFITS
A chance to overcome pre-existing inequalities

ETHICAL CHALLENGE
Abandoning the real world

METAVERSE
DIGITAL TWINS

TECH AGE 2

XR - II - 9

How can we ensure fair working and economic conditions in the digital world?

New ways to make money in the digital world will emerge, like trading in goods and services, or even getting a job. However, the labour market and the economy in virtual realities may not be regulated in the same way as the material world.

WORKING CONDITIONS

REMOTE WORK

TECH AGE 3

XR - III - 1

How can we ensure that XR is not exploited for malicious purposes?

These technologies can be used for a purpose that differs from their intended one. Deepfakes, or avatars that may be indistinguishable from the avatars of real persons, can be exploited to manipulate, damage people's reputations, or influence society illegitimately.

DUAL USE AND MISUSE

RELATIONSHIPS

TECH AGE 3

XR - III - 2

How can the environmental impact of XR applications be contained?

Producing XR devices and infrastructures requires significant amounts of raw materials. Oil and gas reserves might be used to power them. The supply and use of these scarce resources causes damage to the environment and people.

ENVIRONMENTAL IMPACT

CONSERVATION

TECH AGE 3

XR - III - 3

How do we deal with the privacy concerns raised by XR?

XR devices can collect sensitive data about people's bodies, emotional reactions, and social interactions, such as eye tracking and heart rate measurements. They can also pick up data from the physical surroundings of the users' personal or work space.

PRIVACY

HEALTH

TECH AGE 3

XR - III - 4

Should nudging be controlled in XR?

In XR, strong immersion in a virtual environment can lead to more effective manipulation of users' behavior. Collection of data that users might remain unaware of, such as eye movement, temperature and heart rate, can be used to attract their attention and ultimately impact their ability to focus.

MANIPULATION

GAMING

TECH AGE 3

XR - III - 5

How can we ensure that XR developments are socially just?

XR often relies on high-cost devices developed based on the experiences of able-bodied people. This creates discrimination and social exclusion for those who can't afford the technology, who can't use it due to bodily constraints, or who do not have access to it due to economic inequalities.

DISCRIMINATION

TRAINING

TECH AGE 3

XR - III - 6

Should there be limits for immersion?

Users are not always given clear and transparent information on the nature of the environment in which they engage when they use XR applications: for example, which aspects they perceive are material and which are digital in nature, or when they enter and leave a virtual session.

TRANSPARENCY

TOURISM

TECH AGE 3

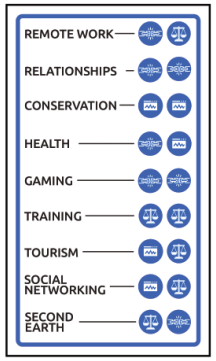
XR - III - 7

Should avatars simulate the presence of real people, including those who have died?

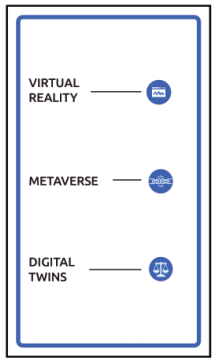
XR technologies make it possible to simulate the presence of deceased people by using data collected when they were still alive. Deepfake technologies can also be used to create avatars that are indistinguishable from the deceased.

DIGNITY


IMPACT
CARD
AGE
3


REMOTE WORK
RELATIONSHIPS
CONSERVATION
HEALTH
GAMING
TRAINING
TOURISM
SOCIAL NETWORKING
SECOND EARTH

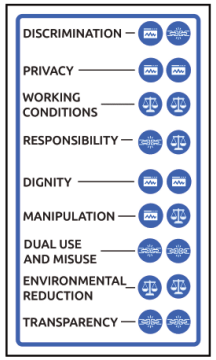

SOCIAL NETWORKING
TECH AGE 3
XR - III - 8

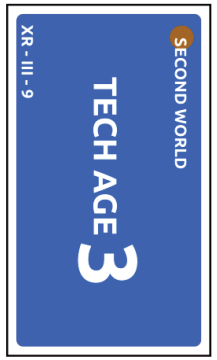

VIRTUAL REALITY
METAVERSE
DIGITAL TWINS


IMPACT
CARD
AGE
2


How can virtual misconduct be prevented or managed?
While morally reprehensible acts happen virtually in virtual social environments, they can have significant moral and psychological effects on the people behind the avatars, causing real harm.
RESPONSIBILITY


IMPACT
CARD
AGE
1


DISCRIMINATION
PRIVACY
WORKING CONDITIONS
RESPONSIBILITY
DIGNITY
MANIPULATION
DUAL USE AND MISUSE
ENVIRONMENTAL REDUCTION
TRANSPARENCY


SECOND WORLD
TECH AGE 3
XR - III - 9

CREDITS

TURN SUMMARY

I. PLAYER ROUND

(1. TECHNOLOGY FAMILY)

2. TECH AGE EVOLUTION

3. OPEN DEBATE

4. CITIZEN WORLD COUNCIL DECISION

II. WORLD ROUND

1. IMPACTS

2. ETHICAL ISSUES

3. CITIZEN WOLRD COUNCIL RESPONSE

4. TECHNOLOGY TREE

5. END OF GAME?

TURN CARD

CREDITS

THIS GAME WAS DEVELOPED BY THE EU-FUNDED PROJECT TECHETHOS, BASED ON NEW RESEARCH CARRIED OUT BY ITS PARTNERS.

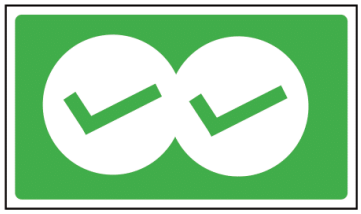
FOR MORE INFORMATION, VISIT:
WWW.TECHETHOS.EU
OR MEET US ON SOCIAL MEDIA:

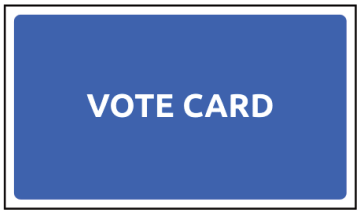
@TECHETHOSEU

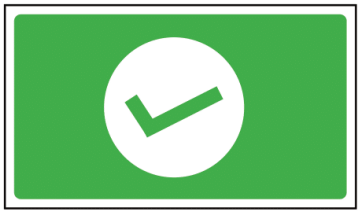
TECHETHOSEU

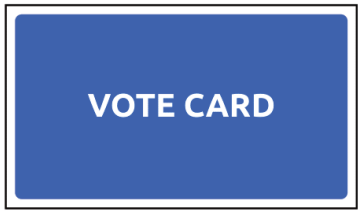
TechEthos has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement no. 101006249. This game and its contents reflect only their authors' view.

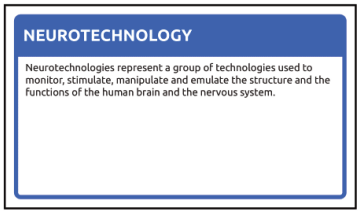
Neurotechnologies

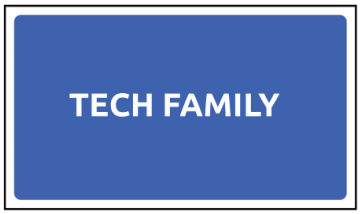


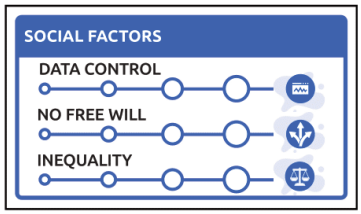


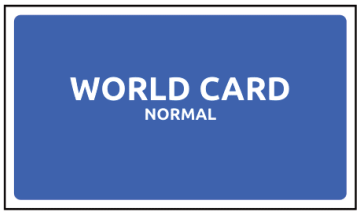








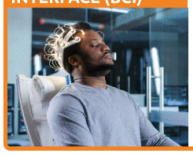




TECH AGE 1

NT - I - 2

BRAIN-COMPUTER INTERFACE (BCI)

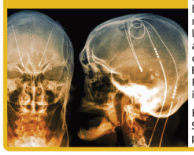


Brain-Computer Interfaces first read and collect brain activity data and signals related to thought and action. Then, they transform it into a desired result, such as moving a prosthetic limb, or a computer cursor.

TECH AGE 1

NT - I - 3

MEDICINE



Neurotechnologies can better prevent and treat brain disorders, both neurological diseases like Parkinson's disease and epilepsy, and mental disorders like depression.

BENEFIT
Patients' quality of life is improved

ETHICAL CHALLENGE
Significant changes in personality

NEUROSTIMULATION

TECH AGE 2

NT - II - 1

CRIMINAL JUSTICE

Neurotechnologies are used to identify the biological factors that contributed to somebody committing crime and determine the most appropriate punishment.

BENEFIT
Reducing the risk that people reoffend

ETHICAL CHALLENGE
Human traits like values, history and intentions stop mattering

NEUROIMAGING

TECH AGE 2

NT - II - 2

HUMAN ENHANCEMENT

Users can improve their physical and psychological conditions. Using BCI and neuroprosthetics, people can control body parts, but also things like drones and automobiles.

BENEFIT
Body functions can be restored or improved

ETHICAL CHALLENGE
Going beyond one's normal healthy state

BCI

TECH AGE 2

NT - II - 3

NEUROSURVEILLANCE

Neurodata can be used by state security agencies to understand the population's psychological state, or by employers to monitor employees' productivity.

BENEFITS
Greater focus in fields like medical surgery

ETHICAL CHALLENGE
Discrimination on the basis of brain profile

NEUROIMAGING
NEUROSTIMULATION

TECH AGE 2

NT - II - 4

MARKETING

Neurotechnologies are used to better understand consumers' behaviour and preferences. Using that knowledge, marketing strategies can be personalised and targeted.

BENEFIT
More accurate insights about unconscious and emotional responses

ETHICAL CHALLENGE
Violation of privacy and data protection

NEUROIMAGING
NEUROSTIMULATION

TECH AGE 2

NT - II - 5

MILITARY USE

Neurotechnologies are used to improve combatant's equipment and augment their cognitive, physical, and psychological capacities. BCIs can also help restore functions lost in combat.

BENEFIT
Combatants are more effective on the battlefield

ETHICAL CHALLENGE
Military conflict becomes more radical

NEUROSTIMULATION
BCI

TECH AGE 2

NT - II - 6

ENTERTAINMENT

Neurotechnologies help users feel more immersed in entertainment content by stimulating their nervous system and giving them control over hardware and software.

BENEFITS
People can play games or do sports beyond their own capacities

ETHICAL CHALLENGE
Stimulation can cause addiction

NEUROSTIMULATION
BCI

TECH AGE 2

NT - II - 7

PREDICTIVE DIAGNOSTICS

Early diagnostics allows the identification of signs that people might be predisposed to neurological diseases. This helps to prevent diseases or decrease their impact.

BENEFITS
Reduction of the incidence and costs of diseases

ETHICAL CHALLENGE
Knowing in advance changes how people see themselves

NEUROIMAGING
BCI

TECH AGE 2

NT - II - 8

EDUCATION

Students' brain activity linked to curiosity, attention or stress is used to personalise learning. Devices can help with learning difficulties such as dyslexia.

BENEFITS
Better educational practices and greater autonomy

ETHICAL CHALLENGE
Less cognitive diversity and fewer points of view

NEUROIMAGING
BCI

TECH AGE 2

NT - II - 9

How to preserve people' autonomy?

Neurotechnologies are often used for patients with physical or psychological disabilities, who might have limited autonomy to give consent. Furthermore, patients' autonomy can be negatively impacted if neurotechnology devices have more control over decision-making than themselves.

AUTONOMY

MEDICINE

TECH AGE 3

NT - III - 1

How can we ensure that human dignity is respected?

The capacities of neurotechnologies can strengthen the belief that human actions are determined by neurobiology. People might not be treated with the human dignity they deserve, in the name of preventing crimes and reducing reoffending.

HUMAN DIGNITY

CRIMINAL JUSTICE

TECH AGE 3

NT - III - 2

How can physical and digital safety be ensured?

In non-medical settings, users might decide to undergo enhancement procedures with the desire to feel or perform "better". These procedures are highly invasive and entail known as well as unknown risks.

RISK REDUCTION

HUMAN ENHANCEMENT

TECH AGE 3

XR - III - 3

Who gets access to neurological data and on what terms?

Usually, people know for which data they give consent. The potential to extract mental imagery is unlimited. As a result, people might consent to handling data that they do not understand at that moment.

INFORMED CONSENT

NEUROSURVEILLANCE

TECH AGE 3

NT - III - 4

How do we deal with the privacy concerns raised by neurotechnologies?

Mental privacy is the idea that people should have control over the data produced by their neurological activity. In certain cases, this data could be used for mental manipulation to influence the behaviour of specific target groups.

PRIVACY

MARKETING

TECH AGE 3

NT - III - 5

Who should be considered responsible when neurotechnologies are misused?

Neurotechnologies can limit the freedom of the individual to act. For example, a BCI user could be made to act in a certain way by the BCI manufacturer or operator. Such cases raise questions on how the responsibility can or should be shared.

RESPONSIBILITY

MILITARY USE

TECH AGE 3

NT - III - 6

How do we ensure the quality of hardware and software and avoid obsolescence?

As tech companies come and go, the prospect of consumers' neurotech devices becoming obsolete becomes real. If a company goes bankrupt, for example, users might not be able to use or even to remove their device.

SUSTAINABILITY

ENTERTAINMENT

TECH AGE 3

NT - III - 7

How do we ensure that we minimise inequality??

The use of brain images to predict and diagnose brain conditions could lead to discrimination. People diagnosed with neurological disease years ahead of their first symptoms might face discrimination at work or in relationships.

INEQUALITY

PREDICTIVE DIAGNOSTICS

TECH AGE 3

NT - III - 8

How do we respect and support neurodiverse individuals?

If mental conditions can be changed by neurotechnology, the diversity of individuals' unique mental features risks being reduced to "normal" development. Children might be directed to reach a similar level of mental capacity through neuro-education.

NEURODIVERSITY

EDUCATION

TECH AGE 3

XR - III - 9

IMPACT CARD AGE 3

- MEDICINE
- CRIMINAL JUSTICE
- HUMAN ENHANCEMENT
- NEURO-SURVEILLANCE
- MARKETING
- MILITARY USE
- ENTERTAINMENT
- PREDICTIVE DIAGNOSTICS
- EDUCATION

IMPACT CARD AGE 2

- AUTONOMY
- HUMAN DIGNITY
- RISK REDUCTION
- INFORMED CONSENT
- PRIVACY
- RESPONSIBILITY
- SUSTAINABILITY
- INEQUALITY
- NEURODIVERSITY

IMPACT CARD AGE 1

- NEURO-STIMULATION
- NEUROIMAGING
- BRAIN-COMPUTER INTERFACE

CREDITS

TURN SUMMARY

I. PLAYER ROUND

(1. TECHNOLOGY FAMILY)

2. TECH AGE EVOLUTION

3. OPEN DEBATE

4. CITIZEN WORLD COUNCIL DECISION

II. WORLD ROUND

1. IMPACTS

2. ETHICAL ISSUES

3. CITIZEN WOLRD COUNCIL RESPONSE

4. TECHNOLOGY TREE

5. END OF GAME?

TURN CARD

CREDITS

THIS GAME WAS DEVELOPED BY THE EU-FUNDED PROJECT TECHETHOS, BASED ON NEW RESEARCH CARRIED OUT BY ITS PARTNERS.

FOR MORE INFORMATION, VISIT:
WWW.TECHETHOS.EU
OR MEET US ON SOCIAL MEDIA:

@TECHETHOSEU

TECHETHOSEU

TechEthos has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement no. 101006249. This game and its contents reflect only their authors' view.

Annex 3: Game Workshop Script

Pre-event welcome (30 minutes)

- Be available to welcome people into the room 30 minutes before the start of the session.
- As they arrive, ask them to sign an attendance sheet and present them with their workshop pack.
- Point out the Informed Consent Form in the pack and ask them to take the time to read it.

Introduction (30 minutes)

Objective: Participants will learn about; research ethics,data collection, the context and the planning (timeline, schedule, etc.) of the workshop.

- Goal of the day
- Getting to know each other (icebreaker)
- Informed consent & pre-participation survey (see Annex)
- Programme & house rules
- Intro to TechEthos & the technology family being discussed
    - A set of slides will be made available
    - Ensure that all technologies present in the room on the posters are presented at this stage.

Warm-up (35 minutes)

Objective: Triggering a reflective mindset on the question, 'What's important for me?'

Part I: Sticky dots (awareness; attitudes) (10)

Data collection: At the end of the session, take pictures of the posters and note the number of sticky dots on each technology poster. Use the pre-prepared table to do it.

Each workshop is dedicated to one technology family. Posters should be set up around the room for each exemplary technology or use case. The moderator can then say something like:

- "As you heard in the presentation, there are a number of technologies associated with Technology Family X. We've put up a few posters around the room."
- "Please stand up, shake a bit, and then go on a tour and use the sticky dots in your pack."
    - Place blue dots on technologies you have heard about before; you can choose to indicate how familiar you are with them: very, somewhat, or not at all.
    - When you think about these technologies, do you feel excited, do you feel concerned?
        1. Place green dots if you remember feeling excited about the technology when hearing about it, before or during the earlier presentation.
        2. Place red dots if you remember feeling a little concerned about the technology when hearing about it, before or during the earlier presentation.

Part II: Talk to your neighbour (attitudes) (25)

Discussion in pairs

Participants pair up to discuss their excitements and concerns regarding the technology family.

"Great, thanks, everyone. Looks like (short recap of visual perception of dot distribution).

Now let's have everyone find a partner and share a bit about our choices. You have 10 minutes to discuss it together. We will give you a warning (say what form this will take) when you have about 1 minute left; then, the other person should begin to share their impressions. Here are the questions":

- What were the technologies you'd heard about? Where did you hear about them?
- Is there something really exciting to you about the technology that you'd like to share?
- Is there something about the technology that concerns you that you want to share?

Plenary

Moderators gather the thoughts of participants and take the pulse of the room.

Data collection: One person in your team should take notes of the answers and the number of hands that are raised for each answer. Use the pre-prepared observation sheet to record this information.

- "Would somebody like to volunteer to share what was discussed in your pair? Could you share with us what your interview partner was excited about?" Moderator to probe whether it is about a specific tech.
- "Thank you for the answer. Everybody else, could you raise your hand if in you were excited about the same thing?"
- Then ask the actual person who was excited about it: "Why were you excited about it?"
- Ask for a new answer from a different group: "Did another group have a different reason to be excited? Could you share with us?" Repeat the show of hands and asking the reason behind the excitement, until about 5-6 answers are shared.
- Repeat the same steps for concerns.
- Depending on how long the exchanges take, you could consider reducing the number of answers to 2-3 for excitement and 2-3 for concerns.

Break (15 minutes)

Gameplay (45 minutes)

Data collection: the moderator will be using the pre-prepared template to record game actions (e.g., which cards are eliminated), which cards are discussed, and the reasons brought up by participants.

Prepare the game

- Teams of players are made by inviting everybody to take a seat at a random table. The game can be played by 3 to 7 players per table. The game rules are explained, alongside any other considerations about the game itself. **Refer to the game manual for more information**.
- Next, the narrative of the game is explained, the technological family and the position of players as members of the Citizen World Council.

During the gameplay, moderators are there to:

- Help with the rules;
- Facilitate the game itself; in particular, moderators should be aiming at eliciting the "why" behind the choices made by participants;
- Answer questions about the card content (e.g., the technological contents of the Tech Cards; and
- Carry out data collection.

Reflection (45 minutes)

Objective: Reflections will be getting at concerns, values, and things that could be done differently, to inform scenario revision.

Part I: Reflection on the game (15 minutes)

Data collection: the moderator will use the pre-prepared template to write down the issues players raise and the cards further discussed in this reflection.

- "We played a game by REMOVING undesirable things and trying to keep the world in equilibrium…did we arrive at a world that you like? Why or why not?"
- Are there other issues left on the board that you would have liked to address? Which ones should be a priority?
- Share a bit about why these are priority issues.
- Do you have thoughts on what might be done about these kinds of issues?

Break (15 minutes)

Part II: Building a story from the future? (30 minutes)

Data collection: the moderator will use the pre-prepared data collection template to write down the issues players raise and the cards that are further discussed. The story-building sheet is also photographed at the end of the session.

- 'Let's imagine that we are in the shoes of a character from this future world we built in the game. Let's tell a story about how a day-in-the-life of this person might look.'
- 'Who is the character? What does their day look like? We have this large sheet where we can describe them. We will take turns to come up with ideas, using the simple rule of 'Yes, and…', meaning that we have to listen and build on the idea of the person that spoke beforehand.'

Conclusion (15 minutes)

Resource sharing & next steps. At the end of the session, resources should be pointed out and provided for all players, for example, covering TechEthos and the Technology Families they played/discussed. It could be leaflets, books, research articles, videos, and websites. Each LTP can generate their own based on the material available in the local language.

A **post-participation survey** is shared and completed before participants leave.

Thanks. Thanking everyone for participating, for their energy, and for sharing their perspective. The project takes their input seriously and will be working to include it in the results and tools that will be built to guide the actions of researchers and innovators in these technology areas, as well as those of people assessing the ethical aspect of their work and policymakers.

Disclaimer

The serious game '*TechEthos Game*' was developed as part of the research project TECHETHOS, which has received funding from the European Union's *Ethics for Technologies with High Socio-Economic Impact Project* (EU Horizon 2020 Grant Agreement no. 101006249).

TECHETHOS

FUTURE ○ TECHNOLOGY ○ ETHICS

Coordinated by

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

Partners

Airi ASSOCIAZIONE ITALIANA PER LA RICERCA INDUSTRIALE

allea All European Academies

cea

dmu.ac.uk DE MONTFORT UNIVERSITY LEICESTER

ecsite EUROPEAN NETWORK SCIENCE CENTRES & MUSEUMS

eurec

TRILATERAL RESEARCH

TU Delft

UNIVERSITY OF TWENTE.

Linked Third Parties

BUCHAREST SCIENCE FESTIVAL

CENTER FOR THE PROMOTION OF SCIENCE

iQ LANDIA

Consorcio Parque de las Ciencias

ScienceCenter NETZWERK

Vetenskap & Allmänhet VA – PUBLIC & SCIENCE

@TechEthosEU

TechEthosEU

www.techethos.eu

info@techethos.eu