

# Participatory Storytelling and Mutual Understanding in Multistakeholder Projects

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## ABSTRACT

Collaborations in multidisciplinary teams could be challenging due to the unfamiliarity of the backgrounds and a lack of understanding among the team members. Storytelling as a universal language, has shown the potential of bridging perspectives through narrations. However, whether and how fictional stories could support the real-world multidisciplinary collaboration remained to be underexplored. This research investigates how shared vision making by participatory storytelling exercises could affect mutual understanding. To evaluate the effectiveness of the approach, findings are presented based on data collected from written visions, the workshops, and co-reflection sessions. Through identifying mechanisms of the storytelling as iterative exploration, switching perspectives, and exploring future scenarios, this research shows that storytelling has great potential in bringing the individual understanding of the team vision closer and adding depths, creating a better mutual understanding about the differences, while aligning on the approaches of working towards future with fitting the individual needs and visions of the members better.

## Keywords

Participatory storytelling, design fiction, multistakeholder projects, multidisciplinary teams, mutual understanding, shared vision making

## 1. INTRODUCTION

In a world where societal problems are becoming more complex, there are more “wicked problems” waiting for us humans to solve together [45]. Climate change, COVID pandemic and economic crisis, are examples of wicked problems [45]. The complexities of these problems require multidisciplinary perspectives to solve with experts on different points of view [3]. Solving problems single disciplinary is often a more convenient approach, since the ‘language’ the solvers speak is the same. However, that might exclude insights necessary for solving a wicked problem.

Looking at Eindhoven University of Technology, apart from the multidisciplinary courses, there are 25 student teams working multidisciplinary to address “challenges in the field of sustainability, artificial intelligence, health and mobility” [37]. An issue these teams could face is the ability to understand each other and work towards the same goal. With an increase in importance to solve these wicked problems, there is a growing urgency to improve mutual understanding in project teams.

Previous studies explored ways to improve this shared understanding in multidisciplinary teams and found that storytelling as a universal language could benefit such teams [38]. Storytelling using different narratives form an opportunity to approach a design process from multiple stakeholder perspectives and document the insights, creating an understanding of the different needs the stakeholders have in these wicked, societal problems [30]. According to Talgorn et al. [38], storytelling “favors the discovery of new issues and pain points, rather than only solutions” and Noortman et al. [30] adds that it “will be helpful in projects where many voices need to be heard and connected”. These related works opened the potential for storytelling to be a suitable approach to create mutual understanding within project teams. Current applications of the storytelling approach have been researched in the HCI (Human-Computer Interaction) field for envisioning activities for the far future, e.g., Noortman et al. [30] with Hawkeye’s probe. A futuristic perspective moves people away from current ideals and invites participants to think differently. Humans are often better at predicting the future than expected, looking at the publication by Weiser, 1991 [44], predicting storage-size and interactions with the computer in the 21st century. However, the method of storytelling has not been explored to great extent in supporting real-world challenges applicable to today’s society. And if these story writing methods are used, the stories are often written by the researchers themselves instead of the participants in the workshop [30]. Simultaneously, methods such as critical design, speculative design [10] and design fiction [4] have been criticised for being negative, with privileged perspectives while bringing little action points for today [8, 19, 42]. The multidisciplinary student teams can be seen as a representation of society’s stakeholder meetings, with people from multiple disciplines meeting each other and interacting with actual stakeholders. Their differences in background bring gaps in the understanding of each other. These gaps create opportunities for this study and will be addressed through answering the research question: “How will shared vision making by (participatory) storytelling exercises during multi-stakeholder projects affect mutual understanding?”.

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This research contributed to:

- Research the use of storytelling exercises a step further by envisioning a future that could improve the mutual understanding of today;
- Examine the effectiveness of using fictional roles and a futuristic scenario on aligning visions of multidisciplinary teams;
- The design of a toolkit to support collaboration between multidisciplinary (student) teams, for closing disciplinary gaps and create awareness of the stakeholder environment;
- Investigation of a new approach to story writing, where persona creation and the story telling will be participatory as a group.

This paper presents a study of related works in design fiction and current existing knowledge on how storytelling supports collaboration. In addition, the design of a toolkit with a workshop is presented. This was tested with three groups of participants from Eindhoven University of Technology, and the qualitative findings were concluded through both inductive and deductive analysis. Lastly, study limitations and future work were elicited.

## 2. RELATED WORK

### 2.1 From Design Futuring to Design Fiction

Design futuring is a term that covers design approaches such as design fiction and speculative design [19]. It does not look at design as a way of problem-solving for today, but rather as sparking debates and reflections concerning future alternatives [19]. To intent on the future, Tonkinwise suggested 4 ways: distancing overidentification, looking at the fictional future, having incompleteness, and allowing for critical reflections and debates [42].

Design futuring in HCI covers a few approaches. It includes speculative design; design fiction; performance, enactment, and experience [28]. This research focuses on design fiction. Design fictions are the assemblage of story, material, props, and technologies, which makes up the near future world [4]. In addition, design fiction captures tensions, conflicts, or disagreements [11]. It helps to anticipate futures in experiential details [7] and provokes creativity, questions, innovations, and explorations through combining science fact, design, and science fiction [4]. The envisioning is not only fictional but rather is a mixture of fiction, forecasting, imagining and extrapolating [9, 18, 34]. Lastly, in terms of the form of design fiction, it could be in many ways such as text [36], audio [41], images [5], video [43], objects [40], or experiential prototypes [29].

### 2.2 Using Design Fiction to Speculate

Design fiction is a creative tool for doing research and gaining knowledge [15]. It could be seen as a ‘probe’, being open-ended and exploratory for use [12]. The fictional nature allows for exploring from today’s world to extrapolate and question the future as to how it could be [17]. Therefore, it moves beyond discussing the problems and solutions for today and triggers people to use their imagination [11, 19] to anticipate the future, be inspired, and draw reflections on the status quo [10].

In addition, the qualities needed for design fiction to speculate were studied from multiple related works. First, design fiction relies on creating a story. Therefore, the narration is an essential component [24, 39]. Moreover, research showed that a comprehensive backstory is needed to ensure participants believe in and situate themselves as a part of the fiction [29]. It highly relies on the details provided in the fiction [2]. Design fiction moves beyond products or technologies, but towards a conceptual or research stage to trigger debates [10]. Thus, it is not about providing solutions, it is only about questions, thoughts, ideas, and possibilities.

### 2.3 Storytelling in Design

Stories have proved to be effective for researching users’ behaviours, emotions, and context of use [6, 31], no matter if it is real or imaginary [38]. For user research, storytelling could gather, structure, and share insights, while for ideation and conceptualization, it could help to imagine and explain the experiences of using a design [22]. Through communicating with others, storytelling provokes new ideas and perspectives [33, 38]. It allows for speculating ‘what-if’ scenarios and exploring the extremes of what might happen by distancing from the current world [30].

Furthermore, as the story is a universal language for communication, with a common understanding and vocabulary [23, 33], it requires a lower threshold to actively participate, thus could include varied perspectives in a constructive atmosphere [38]. The playfulness of the approach encourages engagement and accessibility [38].

### 2.4 Storytelling to Facilitate Collaboration

Previous research showed that it could be challenging for multidisciplinary teams with very different backgrounds to effectively collaborate [38]. This is because the ways of thinking and communicating differ and the responsibilities of the individuals are varied [14, 20, 21, 25, 27, 38], as well as the structural barriers with, for example, unclear roles and poor understanding of each other’s involvement [14, 35].

Storytelling has been shown as being helpful to support multidisciplinary collaboration [16, 38]. The method was examined to be a good way of communicating information and ideas, as well as discovering new pain points by making them more tangible [1, 38]. It could potentially bridge the user-centred and the technical thinking with people from, for example, design and science backgrounds together [16, 26]. Participants are more reflective and honest in the stories, sharing personal opinions more easily by using fictional characters [1].

By giving a collaborative space for constructing stories together, it does not prioritise the input from a particular perspective [1]. Instead, it promotes an understanding of the roles and expertise of other team members and allows for diverse inputs and voices from different perspectives and backgrounds [1, 38]. A recent study showed that storytelling exercises given as a workshop could support different stages of the project [1]. At the start of the collaboration process, the narratives help to diverge to find new perspectives that were previously unknown. Over the process, the team could benefit from the study to be more aware of their current position and look for emergence. Lastly, approaching the end of the process, the exercise could help to seek ways to coherently present the results, thus being convergent.

In addition, storytelling does not only support the team but also helps to understand the outsiders’ perspectives. For example, a story created by a designer could describe and tell a product design process to technologists and developers [16, 38]. It encourages engagement with a big variety of stakeholders, motivating them to share their ideas, address tensions, understand others’ ideas, brainstorm new ideas, and make decisions together [11, 36]. The approach could be the most valuable at the start of the collaboration, for getting to know the stakeholders and the team [30]. No matter of using storytelling for internal or external collaboration, storytelling with narratives showed that it could help with capturing the team choices for a global transition, stimulate an understanding of the complexities in the design space and the involvement of different stakeholders [1].

Moreover, storytelling emphasizes with users through explaining technology/design uses in context and investigating the user responses and experiences [13, 33, 38]. This could for example

be done through persona building, and user journey mapping [38]. One related work, from Noortman et al. (2021), proposed 4 angles with different engagement levels with a transition: powerful, fighter, settled, and outsider [30]. It allows for understanding the same topic from the lives of different characters and realizing the complexity of a real-world transition.

## 2.5 Related Approaches of Using Storytelling

There are a few ways that storytelling has been used as a research method in the HCI community. First, it was used for multidisciplinary co-ideation workshops between scientists and designers, structured as knowledge sharing, imaginary personas, story arcs, storytelling and enrichment, and idea filtering [38]. In a different case, the workshop was used for exploring possibilities, affordances, and constraints of urban technology with a wider range of professions [11]. Overall, this approach is very time-consuming, which could range from about 1 hour to 7 hours [11, 28, 38].

Moreover, sometimes the storytelling was not executed by the participants. For example, the stories could be written by researchers to understand different perspectives of a real-world transition [30]. The writing exercise itself for the researchers could allow for documenting ideas from different, conflicting points of view by distancing from the writer's perspective on the matter [30]. In a different study, written fiction allowed the readers to explore the potential consequences of futuristic technologies [36]. The readers would have their own interpretations and perspectives and share them with the researchers. In this way, it would open debate.

## 2.6 Using Storytelling/Design Fiction as a Research Tool

With the method of storytelling and design fiction, the data has been found useful to be collected with an open and exploratory approach, while the use of language was less considered [36]. It also needs to be kept in mind that the differences in the group composition and the societal challenges they are addressing, could influence the appropriateness of the approach [1]. To keep the novelty and creativity in the story coherently, a process of extensive editing is needed [36]. At the same time, it should be kept in mind that building stories with sufficient depth and complexity is difficult and time-consuming in practice for everyone [38]. The exercise itself, coming up with narratives might not be immediately natural to the participants [1]. Therefore, when using the method in a workshop, an extremely clear process with guides for story building is needed [38].

## 2.7 Conclusion: The Gaps

Overall, based on a scoping review of the literature, one conclusion could be drawn that the (participatory) storytelling method has occasionally been used for ideation in the HCI community. In other cases, the end goal was undefined for the sessions [1]. A gap was spotted that the storytelling exercise has not yet been used for shared vision-making and creating the mutual understanding of a multidisciplinary team. Little has been investigated for the use of the method in the setting of today, rather than purely imagining the future of society.

The approach of storytelling showed potential in ideating in multi-disciplinary teams [38] and narratives could inform the design practices to work on wicked problems [1]. However, it has not yet been vastly investigated, especially not in the context of university student teams and for creating mutual understanding in collaborations. Additionally, with the current research done in group settings, it is often that the researchers recruited participants and put them into groups, rather than the groups already existing and working on a wicked problem. This creates a gap in adding values directly to the participants that they could apply in a real-

life case. Lastly, stories are often written by researchers and shown to readers. It seemed to be a lack of investigation into using participatory storytelling/story writing by the participants themselves.

## 3. DESIGN

The design made for this research is an exercise that sparks discussion among the participants about the student team's vision and mutual understanding. The exercise was designed to be applied in a workshop, allowing it to be brought to the natural working environment of the teams, generating knowledge about the internal dynamics of multidisciplinary teams. The workshop was integrated into the schedule of the teams, as if it was a regular team activity where the student team came together for work and discussion. This made the observations more generalizable.

An important component of the exercise was the use of personas as the characters of the story writing. This allowed the participants to reflect on their team vision while distancing themselves from their own subjective experience as a team member with their own motivations and goals. Creating this distance between participant and story character was an important factor in creating mutual understanding (Related Work 2.2). These characters were placed in the fictional scenario of receiving a surprise funding of 1 million dollars, five years from now as in the year 2027. This story setting was used to help the participants distance themselves from their current position and allow them to look at the situation from the perspectives of others. The exercise consisted of 3 activities, that individually and collectively contribute to the creation of mutual understanding. The order and content of the exercise is described in detail as follows:

1. *Selecting Personas to be used in the Participatory Storytelling Exercise:* First part of the exercise, the participants selected personas relating to stakeholders that they experienced in projects surrounding their team and the problems they solve: user/visitor, university, company sponsoring, company partnering, team leader, team member, and lastly a blank persona for the participants to fill in themselves [Appendix A.2]. These personas were generic project roles, based on PM<sup>2</sup> project management methodology (Figure 1a) [32].
2. *Writing Persona Backgrounds:* Secondly, the participants were asked to individually answer five open-ended questions about the selected personas: Who are they? How did they find the team? What do they do when they wake up? What is their highlight of the day? What is their worst nightmare? [Appendix A.3]. When the participants keep in the roles of the same persona for too long, the facilitator will ask the participants to swap the papers. By answering these questions, the personas are made more relatable, allowing the participants to take on these perspectives during the participatory story writing exercise. Besides this, it acts as a warming up to get the participants used to creative writing.
3. *Participatory Story Writing Exercise:* The last and core part of the exercise is letting the participants write a story together (Figure 1a). The participants collaborated to narrate the story, while dynamically taking on the perspectives of the different personas. A list of example questions was given to inspire the participants in story writing [Appendix A.4]. The participants collaboratively wrote a story by verbally discussing the storyline and having one participant in charge of writing the story on the provided workshop material. The story was realistic in relation to the created personas while also including the personal- and team values of the participants.

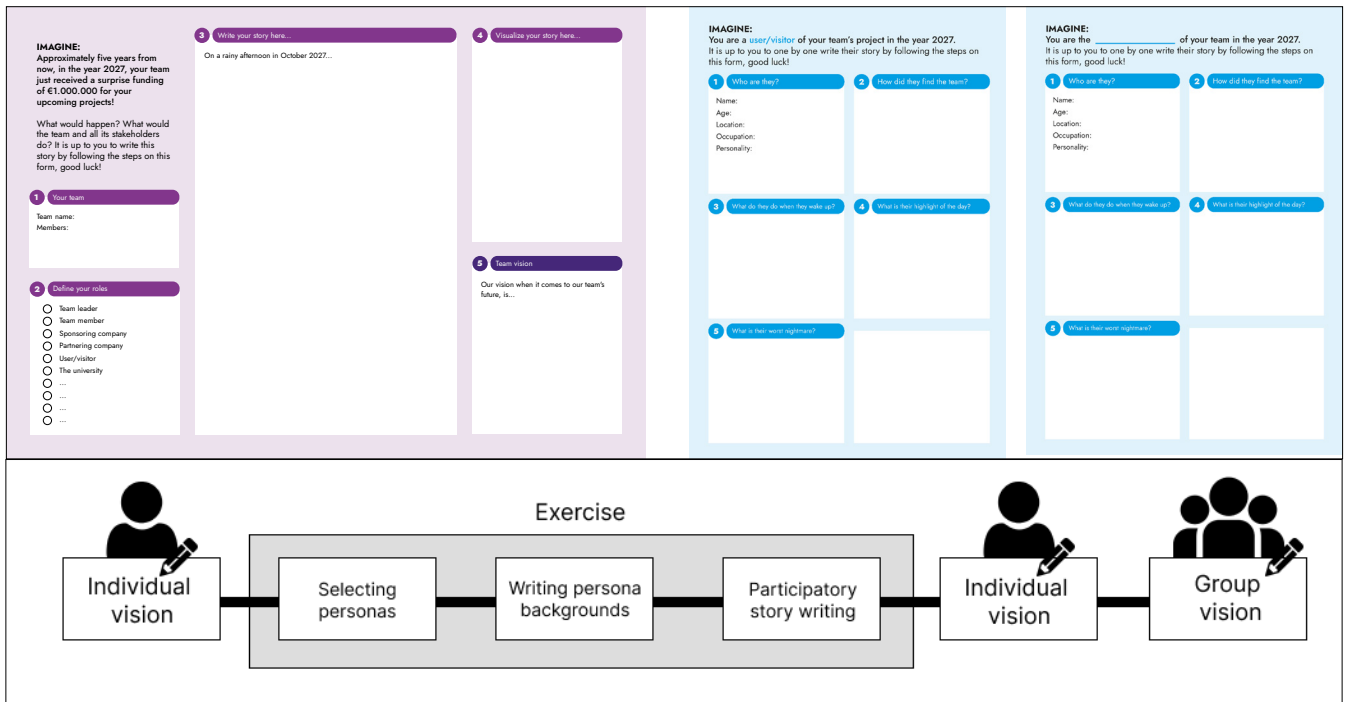


Figure 1. top: a) Workshop material, upscaled version in Appendix A.2 & A.3. bottom: b) Workshop setup.

#### 4. STUDY SETUP

The goal of the study was to elicit how mutual understanding changes through the beforementioned story writing exercise. This was examined by having the participants write down their individual vision, both before and after the exercise. Furthermore, the group vision was collected at the end to see how the individual vision has moved towards a corresponding group vision, and therefore mutual understanding, especially in terms of the long-term plans of the student team. These visions were collected by having the participants complete standardized sentences (figure 1b) [Appendix A.1].

For each step of the workshop, the task that the participants must perform was communicated on the provided workshop material. One of the researchers took the role of facilitator and prevented the participants from getting stuck by only giving extra explanations when needed. Throughout all steps in the workshop, the facilitator communicated the remaining time following a strict planning with room for only minor adjustments:

Content	Time	Appendix
- Introduction to the workshop and explanation.	(5 min.)	
- First individual vision sentence completion.	(2 min.)	[Ap. A.1]
- Exercise:		
• Selecting personas for the participatory storytelling exercise.	(10 min.)	[Ap. A.2]
• Writing persona backgrounds.	(10 min.)	
• Intermezzo and discussion.	(1 min.)	
• Participatory story writing exercise.	(20 min.)	[Ap. A.3]
- Second individual vision sentence completion.	(2 min.)	[Ap. A.1]
- Group vision sentence completion.	(5 min.)	[Ap. A.4]
- Co-reflection.	(5 min.)	

After collecting the group vision, co-reflection was held. The facilitator, and the observers asked questions to reflect on the workshop together. To collect the participants' responses to verbal questions and capture the nuance of their conversation, two researchers took observational notes to reach inter-observer

reliability. In addition, the entire study was video recorded for later observations of all researchers. Together with the story and the visions written on the provided workshop material, a large body of rich data was collected that allowed the researchers to analyse the development of the mutual understanding.

#### 4.1 Participants

The study is held with three groups (n=3) over the span of one week. Workshop 1 and 2 consisted of three participants, and Workshop 3 of four participants, as three was set as a minimum to get enough data on different perspectives to compare findings, and six as the maximum for the workshop capacity. Each group consisted of people working together in a student team at the Eindhoven University of Technology. These teams were chosen because of the multidisciplinary backgrounds. For the workshop, the researchers visited the student teams in their working space on the university campus and successfully conducted the workshop in an orderly fashion.

#### 4.2 Analysis

All results from the observations, written answers on the provided workshop material, and recordings of the three workshops were analysed and then coded by the researchers in two steps. First, all were initially coded into themes according to three encompassing categories: team dynamics, workshop-related, and vision-related content. The first set of codes was developed using a deductive technique. The coding proceeded in a second inductive iteration using the themes defined before to connect the different themes and describe the relationships between them. Both the deductive and inductive analyses were performed twice for each workshop by two different researchers and later compared.

#### 5. FINDINGS

In this research, we explored how the participants in participatory storytelling workshops generated their stories and how their mutual understanding was affected by analysing changes in their written individual and group visions [Appendix B].

First, we present what the effect of the workshop was on the vision development of the participants (Figure 2). Secondly, we explain how the dynamics of the workshop contributed to these changes.



Figure 2. Workshop with one of the participating student teams.

Finally, we share some additional findings that were also worth mentioning.

### 5.1 Shared Vision Making with Participatory Story Writing

For all participants, the individual vision after the session was changed compared to their vision before the session. The changes could be related back to the exercise and did bring the visions closer to each other. It suggests that participatory storytelling does enable shared vision-making and supports mutual understanding. This process can be explained by two important behaviours that were observed: becoming aware and aligned. Firstly, teams became more aware of the differences in needs and goals between participants (team members) and the teams' stakeholders. Then, they started to align on 'how to fulfil' as many of their needs and goals as possible. This process of awareness and alignment was consistently observed during the moment participants adopt elements from the visions of others. This happened by either exploring a middle ground or a merging of goals. It can be seen in the 'our vision's written by the teams after the exercise [Appendix B.2, B.4, B.6], where the group vision included at least one word or idea of every participating team member. For example, in one of the workshops, the three participants stated their individual vision after the workshop as:

P1: "Branding [team name] even more than it is now, having our own festivals, hackathons, courses, etc."

P2: "Creating good foundation so that future generations can focus on growing towards a big [field of work] community".

P3: "Clear policy/structure -> Everyone should know the team's goals, ambitions, and future milestones + priorities".

These individual visions were then combined into the group vision that they noted down as: "Continuous, diverse, independent, structured".

Two out of the three workshops managed to align during the workshop, one team did create awareness but did not manage to align. The lack of alignment appeared to reduce the impact of

participants' visions on each other. Their visions did show some adoption and very little adaptation when compared to the other teams [Appendix B.3, B.4].

Another prominent observation was that most visions became a more elaborate. The initial vision of the participant is: "To become stable, continuous and unique". While the revised vision after the workshop from the same participant became to be "Clear policy/structure -> Everyone should know the team's goals, ambitions, and future milestones + priorities". This was also mentioned by the participants in the co-reflection: "I feel that my first vision was broader and my second vision kind of narrowed it down. My first vision would be the first step and my second vision would be the next step after finishing this initial goal".

In addition, participants took a more futuristic and goal-oriented perspective and looked at the potential achievements that could be reached in five years, they saw the current team aspirations as a starting point for future possibilities. For instance, one participant said in the co-reflection: "I think for me, initially I just focused on what impact I thought the team would create. And then for the second one, I included how we could implement that".

### 5.2 Dynamics of the Participatory Story Writing

This section focuses on the dynamics of the exercise, as the findings around what happens during the participatory story writing had an impact on the teams' visions. During the story writing exercise, several dynamics were observed which appeared to have affect the changes in the written visions explained above. These dynamics were sorted into three themes: iterative exploration, switching perspectives, and future scenarios.

#### 5.2.1 Iterative Exploration

Firstly, the iterative nature of the exercise, vision related elements in the storytelling were revisited often, which impacted the outcomes. The sudden gift of one million euros in the scenario prompted two out of three teams to start summing up potential directions.

This is reflected with examples such as:

*“As a team member indeed, be very happy, go on vacation or something, as I imagined we worked very hard to have earned this money”.*

*“I would like some connectivity, some new team clothes, gifts, a limited addition hoodie or something”*

*“I think it would be a good opportunity to explore the festival”*

The fact that the story had to be written down encouraged the participants to consider all options and to make choices. The teams were able to make fast choices as the choice were part of a fictional story (without consequence), allowing them to move forward, creating a more complete story. It allowed the team to assess the pros and cons, and then rationalize if the choice was worth pursuing, essentially prioritizing the options on the table. This was observed by the researchers when observing but was also informed by the participants during the co-reflection: *“For me this emphasizes the importance of writing down our opinions and visions”.*

In addition, this prioritizing even inspired the teams to incorporate it into their story: *“There should be some sort of priority list of what has the highest priority at that time”.* Iterative exploration allowed them to discuss the consequences of pursuing a certain direction and served as a reality check. For example, one participant said, *“I think it also might cause some friction (...) in the team as well as outside of the team, because you have a lot of money, and everybody has their own idea about the money, the team leader might have some other ideas in mind for the money as the team member”.* Eventually, it resulted in the stories, as well as the written visions, becoming more elaborate and practical.

### 5.2.2 Switching Perspectives

By using the ‘participant created personas’ at the beginning of the process, the participants were prompted to imagine the story and future of the team through the eyes of different stakeholders and the other team members. It provoked individual, as well as group visions, to become more inclusive. In the stories, this led to the switches between the third- and first-person perspectives for two out of three teams.

From a first-person perspective, participants embodied the role of a stakeholder, allowing them to empathise with their situation. This can be seen in the exercise where participants imagined and considered the thoughts and feelings of, for example, their target users or sponsors. One participant explored the thoughts of a partnering company on their decisions: *“I wouldn’t be very fond of the idea that they are spending it on themselves, all the partying and such, I would expect that the money is invested in the team and the partnership”.* In the third person perspective, participants acted more as a director, who overviewed the whole ecosystem of stakeholders and their actions. It allowed them to explain the larger picture of a situation, while humanizing the personas by adding names to them: *“Sjoerd will probably call Robert because they have been working together on the whole project”.* Moreover, interestingly, the third team almost only used the first-person perspective during the exercise but didn’t embody the personas, they spoke mainly from the of view. Their storytelling exercise rarely had episodes of empathizing and they hardly explored alternative futures. [Appendix B.5, B.6] This team did achieve growth in awareness but did not manage to align, the following example illustrates their conversation style *“Then I can imagine that we need to call a meeting with important partners, important people in the team, active end user”.*

### 5.2.3 Future Scenarios

Finally, the workshop setup placed the team in a scenario in which they had to jump five years into the future. It detached the participants from their current roles and team structures. It sparked creativity and made it easier for the participants to freely imagine the future of their team as they explained: *“I do like that jump, because it means that the discussion is very light. It’s not what people want to do today because that might get very personal and very challenging. But the 5 years is maybe a bit long because you also don’t know where you are gonna be as a person at that point. But I think the jump was good”.*

Some participants seemed to struggle with imaginary jumping 5 years ahead. We observed them actively reminding themselves that they had to let go of what they are familiar with or their current priorities. The personas appeared to be helpful for this because in the personas they wrote themselves, they included parts of their identity and intrinsic drivers. On top of that, the future scenario enabled abductive reasoning. The team envisioned a best-case scenario during the storytelling exercise, they started to reason about how to actually get to that point: *“Thinking about the team in the far future helps to look at it like an established team, instead of the beginning phase we are currently still in”.*

## 5.3 Additional Insights

### 5.3.1 Effect of Vocality

In the observations of all teams, a clear difference in the vocality of the members could be seen. When a participant in a group was more outspoken and took more initiative than the others, the story was more strongly influenced by their vision. However, during the co-reflection all participants mentioned that they had enough space to explain themselves and suggested that they were represented in the final written vision. We were able to make a distinction between a more dominant (forcing) and a guiding (natural) way of taking the lead. Both were effective in shaping the story more towards the needs of one individual. It however appeared that ‘dominance’ is less effective than ‘guiding’ when it comes to adopting elements of their vision. One could argue that the more fictional (detached from reality) the story is, the more impact vocality could have on the story because reality- might be able to counter highly vocal participants.

### 5.3.2 Team Familiarity

While two of the teams were relatively new and inexperienced together, the other team had known each other for some time and were more comfortable working together and on their vision. Observations indicated that the familiarity of the team members had an impact on the workshop performance. Participants sometimes fixated on existing assumptions. It led to a discourse in one of the sessions, where a discussion arose around ‘research’ versus ‘commercialization’. The topic had often been discussed in the team, before participating in the workshop, but remained unresolved. A comment in the co-reflection suggested that the storytelling exercise offered a safe space to reflect on the challenge: *“I actually think this is useful. This is a discussion in the team, especially the research versus commercialization balance, that has been going on since the start of the team and is still not finished. So, this is actually a nice way to bridge between those two “camps”, I don’t know what to call it”.*

### 5.3.3 Future Implications

During the co-reflections at the end of every workshop, all teams mentioned future meetings or follow-up workshops that were inspired by the exercise we provided. One of the teams, that did not get to fully align on a team vision during the workshop, planned to have a meeting with stakeholders and other team members to discuss the workshop results: *“I believe that some of the things that*

*we worked on in this workshop can be taken out of the workshop, could be used to further our development as a team". Another member added: "I agree, from this meeting we can definitely have an all-heads meeting where we can finalize our vision and we can go towards the phase of making things more official". For another team, this exercise also created momentum and explained intentions to continue the workshop with the other team members that were not present during the workshop: "So then a reflection with the whole team. I think this is a nice one for that, if everyone writes down their vision and then we can compare later. I think it could be useful". Other members explained their impression: "Maybe it is interesting if you guys could come along again for a larger audience. Because this is very nice, I liked this more than I thought. Because we tried it with another large sheet before and that didn't really work out. We ended up writing our way to the first third and then gave up".*

## 6. DISCUSSION

### 6.1 Sample Size

For this research, three student teams participated in the workshop activity. With 10 participants in total, together with the student teams not being fully present, the results are not saturated enough to claim specific findings. A future repetition of this research will be necessary with a bigger and wider range of participants. For this, we suggest bringing more students who are part of the same student team and including multiple universities with different curricular backgrounds in the study. Since Eindhoven University of Technology is supportive towards multidisciplinary student groups, it might affect the pace at which multidisciplinary students at this university find each other and understand disciplinary differences. As this group was picked as a representation of multidisciplinary project groups within society, the familiarity of the group members with these kinds of projects in the university context might not represent the general industry where certain disciplines are forced to work together with no prior collaborative familiarity as well as predicted, inducing larger scale research should be conducted.

### 6.2 Workshop

#### 6.2.1 Involvement

The storytelling and writing exercise as provided during the workshop, together with the persona building process as described in the methodology effectively depended on the creativity and prior experience of the participants. Differences in comfortability with story writing were experienced where not every participant could contribute equally to the writing and direction of the story, building further on previous research [1]. The brainwriting exercise was, therefore, meant as a kick-starter of creative mind flowing, but differences were still experienced in the level of expression and contribution. Another challenge was the collaborative writing of the story, since there was often only one person writing the entire story, leading to less collaboration in the writing of the story itself. We, therefore, assumed that using Sticky Notes to add small pieces to the story might improve the situation. However, we noticed during the first workshop, compared to the other two teams that did not use Sticky Notes, that this worked out counterproductively as group involvement was less present. Eventually, the role of the writer was seen as a guiding / deciding role similar to the leader role within the group, representing their actual role within their student team, both roles were affecting the direction of the story. While some writers used bullet points to narrate, others were more elaborate creating a more natural flow in the story. Future studies should investigate the effectiveness of doing a collaborative story writing exercise and look for new ways / alternatives to perform the workshop with equal contribution.

Similar to [1], the vocality could amplify and spread out one's perspective in a less personal-attached way and could experience

new perspectives that they haven't explored. In this study, what was newly found is that individual vocality levels of the participants could have had significant impact on the involvement of participants in the story telling workshop. Future studies could research into whether there is a correlation between vocality of a person and the involvement in the workshop exercise, and whether a design intervention can help in the process of involvement and make others aware of these differences in personality while building a shared vision.

#### 6.2.2 Setup

As described in the related work section, workshops of this kind usually take up to seven hours to be able to get deep insights into the team's process. The length of the workshops executed in this study could, therefore, be insufficiently long with a 45-minute persona building and story writing exercise to develop a deeper understanding of the mutual understanding within the group observed. One student team could use more time for the story writing exercise, since they were not yet finished and could expand, while another team finished earlier than expected. Furthermore, this research only looks at mutual understanding twice, while other studies might reflect more regularly for changes in understanding.

While the context in which the participants wrote the story of the workshop played in the future, there was an element of fiction to the story. The participants were able to swap perspectives and look at the future. This links to one of the reflective modes found by Kozubaev et. al., [19] that the fictional story writing specifies the future with a target scenario to draw reflections on what the desired future is. However, the participants in this study, as was observed, often approached storytelling with their current perspective and role using today's point-of-view. Future work could investigate other storytelling approaches to allow for more speculation. This could for example, dive deeper into the creation of temporary representations of the future with the social, mental, and material dimensions through creating a tangible experience [19]. Tangibility, according to literature, helps to make the future accessible, to feel the connection, and to experience [29].

Furthermore, the effects of the workshop were evaluated based on the changes between the individual vision writing before and after the story writing workshop, which represents a short-term outcome. While it helped to create awareness, it could not evaluate any long-term changes to the mutual understanding within the student team. Nevertheless, this research further proved the experiential quality of the storytelling, helped with envisioning a specific long-term future of the student team, while opening different discussions in the group to understand each other better and create the mutual understanding for working towards a shared vision [19]. The uncertainty and the unclarity of the future inspired the discussions and debates in the group, encouraging to draw reflections, which are similar to the research findings of Kozubaev et. al. [19]. Future studies could research these long-term effects of the workshop and its effect on building a shared vision. Lastly, future work could examine whether a series of workshops help to an improved understanding by performing story writing exercises.

### 6.3 Student Teams

As the student teams were chosen based on their multidisciplinary setting, there was less attention towards the establishment date. While one student team existed for three years, the other two started just two/three months ago. Although both had similarities in disciplinary backgrounds of the team compositions, differences were noticed in how they interacted with each other on a familiar basis. These differences further prove the previous research [1] and inform new work to further explore the effect created by the acquisition process in terms of team composition and their

familiarity levels and spot the correlations.

The members of the student team wrote their initial vision towards the future of their team mostly on a short-term basis. The workshop helped them to explore the future. This was something they had not talked about before, which triggered discussions around the development of the new 'our' vision and looking for compromises with each other's vision. Their initial perspective towards the vision of their student team did, however, make long(-er)-term goals harder to imagine, certainly since the workshop gave them a scenario five years ahead of time.

## 6.4 General Insights

While this study aims for providing insights applicable to real-life scenarios, future studies should check implementation and effectiveness within different contexts than described in this study. Real context would then be most rewarding, such as the setting used in [11].

## 7. CONCLUSION

As the world faces more complex societal problems and multidisciplinary teams are required to solve these "wicked problems", the ability to understand each other and work together towards the same goal in these multistakeholder settings is becoming increasingly important.

In this research, we have designed a workshop with an exercise to investigate how participatory storytelling could have an impact on shared vision-making in multi-disciplinary teams. With the rich qualitative data collected and analysed, the design of the exercise showed the potential to be used for stepping away from today's world while anticipating a futuristic scenario by creating a story by the teams themselves. When reflecting on the mutual understanding of today, the results showed that the participatory storytelling was in all three cases successful in drawing group-level reflections. Therefore, the role of the storytelling exercise which was designed and crafted as a collaboration tool became apparent to support the student teams. However, future research is required to investigate better suitability of the format.

With the rich qualitative data collected and analysed, the results showed that participatory storytelling was in all cases successful in eliciting the personal drivers of the participants and creating the awareness of the differences in goals or approaches from different roles of the participants in the team. In addition, in two of the three workshops hosted, the design and the protocol setup allowed the teams to explore the middle ground. By evaluating the changes in their individual visions written before and after the workshop, it was clear that the personal visions became more aligned with the drivers of the rest of the team. The process of storytelling, supported by a series of dynamics in the storytelling exercise was studied. It was concluded that the approach encouraged participants to explore the future actively and iteratively from both individual and group levels. With the use of personas, participants could constantly switch perspectives between different stakeholders and envision the future scenarios. At the same time, the use of personas enabled participants to let go of their personal roles in the present but envision a holistic, desired future.

Looking at the results and listening to the enthusiastic comments of the participants about the future applications, it could be suggested that the participatory storytelling designed in this research could be promising and valuable for multistakeholder projects. However, future research and repetition is needed to explore this with a bigger and wider range of participants and to get a better understanding of the long-term effects of the workshop.

In short, this research sheds a light on using the participatory storytelling approach to support the future of multi-disciplinary teams while creating meaningful impact on the current mutual understanding of the teams.

## 8. ACKNOWLEDGEMENTS

First, we would like to acknowledge our coach, Renee Noortman, who supported and guided us along the research process. She provided a lot of useful sources to inspire us and valuable feedback in designing the study and analysing the results. In addition, we appreciate all the participants for their time in participating in our studies. They gave the meaning of the research. Lastly, we thank to everyone who helped us reaching out to the participants.

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## 10. APPENDIX

### 10.1 Table of Content

- A. Workshop materials for the participatory storytelling exercises
- B. Written visions
- C. Authors’ background and roles
- D. ERB form and consent form

### A.1 Individual Vision Sentence

**1** My vision when it comes to my team's future, is \_\_\_\_\_.

### A.2 Personas for the Storytelling Exercise

**IMAGINE:**  
You are a **user/visitor** of your team's project in the year 2027.  
It is up to you to one by one write their story by following the steps on this form, good luck!

**1** Who are they?  
Name:  
Age:  
Location:  
Occupation:  
Personality:

**2** How did they find the team?

**3** What do they do when they wake up?

**4** What is their highlight of the day?

**5** What is their worst nightmare?

**IMAGINE:**  
You are the \_\_\_\_\_ of your team in the year 2027.  
It is up to you to one by one write their story by following the steps on this form, good luck!

**1** Who are they?  
Name:  
Age:  
Location:  
Occupation:  
Personality:

**2** How did they find the team?

**3** What do they do when they wake up?

**4** What is their highlight of the day?

**5** What is their worst nightmare?

**Other personas used:** the University, Company Sponsoring, Company Partnering, Team Leader and Team Member

### A.3 Storytelling Workshop together

**IMAGINE:**  
Approximately five years from now, in the year 2027, your team just received a surprise funding of €1.000.000 for your upcoming projects!

What would happen? What would the team and all its stakeholders do? It is up to you to write this story by following the steps on this form, good luck!

**3** Write your story here...

On a rainy afternoon in October 2027...

**4** Visualize your story here...

**1** Your team

Team name:  
Members:

**2** Define your roles

- Team leader
- Team member
- Sponsoring company
- Partnering company
- User/visitor
- The university
- ...
- ...
- ...
- ...

**5** Team vision

Our vision when it comes to our team's future, is...

### A.4 Group Vision Sentence

2

Our vision when it comes to my team's future, is \_\_\_\_\_

#### B.1 Workshop 1; Individual Vision Sentence Completion

Participant 1, first vision: My vision when it comes to my team's future, is... "Exploring the possibilities which we can do with [product] and (new) stakeholders."

Participant 1, second vision: My vision when it comes to my team's future, is... "Branding [team name] even more than it is now, having our own festivals, hackathons, courses, etc."

Participant 2, first vision: My vision when it comes to my team's future, is... "Growing as a [field of work] community in order to be able to make more innovating [product] related projects"

Participant 2, second vision: My vision when it comes to my team's future, is... "Creating good foundation so that future generations can focus on growing towards a big [field of work] community"

Participant 3, first vision: My vision when it comes to my team's

future, is... "To become stable, continuous, and unique"

Participant 3, second vision: My vision when it comes to my team's future, is... "Clear policy/structure -> Everyone should know the team's goals, ambitions, and future milestones + priorities."

#### B.2 Workshop 1; Group Vision Sentence Completion

Our vision when it comes to our team's future, is... "continuous, diverse, independent, structured."

#### B.3 Workshop 2; Individual Vision Sentence Completion

Participant 1, first vision: My vision when it comes to my team's future, is... "Focused om making the world more accessible for [target user] so that they can live more independent lives but are included in society."

Participant 1, second vision: My vision when it comes to my team's future, is... "Bring the team towards being able to create high-tech and innovative, holistic solutions for the [target user], so that they... (see previous)."

Participant 2, first vision: My vision when it comes to my team's future, is... "Establishing as a real student team that has many years to go and will be able to realize the important goals."

Participant 2, second vision: My vision when it comes to my team's future, is... "Becoming a well-established team that has a lot of sources to reach their goal, which is helping the [target user]."

Participant 3, first vision: My vision when it comes to my team's future, is... "A large community of people enthusiastic about developing solutions for [target user]. With some .... on a large project, others on a competition and some on start-up."

Participant 3, second vision: My vision when it comes to my team's future, is... "Gaining slow independence from university and ... a start-up to scale up our dreams."

## B.4 Workshop 2; Group Vision Sentence Completion

Our vision when it comes to our team's future, is... "to create a continuous community that together develops high-tech solutions that effectively improve the lives of the [target user]. The community is enthusiastic make real-world impact."

## B.5 Workshop 3; Individual Vision Sentence Completion

Participant 1, first vision: My vision when it comes to my team's future, is... "to create something we are proud of and create awareness around why [field of work] could be important and interesting for everyone"

Participant 1, second vision: My vision when it comes to my team's future, is... "still make something we are proud of. Maybe develop multiple applications of [field of work] so we can broaden the team and develop as a team with the same flat structure."

Participant 2, first vision: My vision when it comes to my team's future, is... "a commercialised product backed by research and tests available for an audience which is as large as possible."

Participant 2, second vision: My vision when it comes to my team's future, is... "A corporation working with a student team to market products, research old and new products & application, and prototype them for the world to enjoy"

Participant 3, first vision: My vision when it comes to my team's future, is... "a working device which can be worn on multiple parts of the body that can translate all kinds of senses to an understanding language"

Participant 3, second vision: My vision when it comes to my team's future, is... "having a small brainstorm research team that has enough money for sales to higher companies to help or make stuff. Those companies could also be subgroups of the team. The sales would one [product] etc. etc."

Participant 4, first vision: My vision when it comes to my team's future, is... "creating more technologies in [field of work]"

Participant 4, second vision: My vision when it comes to my team's future, is... "to develop more technologies in [field of work] and create products that can actually be used"

## B.6 Workshop 3; Group Vision Sentence Completion

Our vision when it comes to our team's future, is... "that everyone has equal power in the team. We want to create something that we are proud of, and that people actually want to have/use. It also needs to be safe."

## C. Authors' Background and Roles

### Diederer, Lieke H.W.

Lieke graduated with her bachelor's in Built Environment last year and has a background in architecture and urban design. After completing her pre-master's, she started her master's in Industrial Design with the intention to further grow as a designer and explore her interests in (social) psychology. Lieke has only little prior knowledge of doing (design) research. In this research, she participated in all discussion sessions setting up and designing the storytelling workshop and was in charge of making the workshop materials for the exercise. She was present in the conducted workshops as an observer and actively participated in analysing the findings. In this paper, she took part in writing the findings and conclusion, as well as contributed to the study set-up section.

### Van Geenen, Nick M.

Nick graduated from Industrial Design Bachelor of the Eindhoven University of Technology this year. During this education, he was introduced to design research methods and applied these in design projects and research projects. In this research he contributed to setting up the research protocol and contacting the participants. He played the role of observer during the research sessions and contributed to the analysis. In writing the report, he was in charge of writing the design and study set up.

### Miao, Yinying

Yinying graduated from the Honors Bachelor's degree of Industrial Design this year. With several projects and courses, Yinying had some prior knowledge on doing design research. In this research, she was involved in all the discussions and bringing a critical perspective to the team, bridging the literature to the field research, while documenting down the choices the group made as a minute's taker. For the final paper, she contributed to the entire related work section, the development of the discussion section, wrote the abstract, iterated on the conclusion, supported with writing the design and the study setup section, analysed one workshop, provided extensive feedback on other paper chapters critically, and helped with academic writing (language and references).

### Raaphorst, Joris

Joris graduated from the University of applied sciences in 2018 in Industrial Product Design. After graduation he worked as a design engineer at the Design Agency VanBerlo, part of Accenture, for 3,5 years. Prior to this study he participated in several courses related to design research (e.g., Research Methods). In this study he contributed with a critical perspective and a hands-on attitude to the overall study. Starting with formulating the core of the research outline, taking lead in during the meetings and guiding in discussions on the approach and set-up of the study, he was part of conducting the study with participants, was part of analysing the whole spectrum of results and contributed for a large part to the formulation of the overall findings and conclusions.

### Stevens, Wouter J.

Wouter has a background within the department of Industrial Design, graduating from the bachelor's degree last year. Design research has been part of the bachelor's program, so Wouter has prior familiarity with the approach used in this study. Within this research, he was part of the discussion session, setting up the protocol and hosting the workshops as a facilitator. Besides the data analysis part, he contributed to the development of the discussion, created the introduction and built the layout of the document.

# Ethical Review Form Education

(Version 17.07.2020)

This Ethical Review Form should be completed for every research study that involves human participants or personally identifiable data. The form should be submitted and approved by your supervisor before potential participants are approached to take part in the research study.

## Part 1: General Study Information

<b>1</b>	Student name and email	Joris Raaphorst <a href="mailto:j.raaphorst@student.tue.nl">j.raaphorst@student.tue.nl</a> Nick van Geenen <a href="mailto:n.m.v.geenen@student.tue.nl">n.m.v.geenen@student.tue.nl</a> Wouter Stevens <a href="mailto:w.j.stevens@student.tue.nl">w.j.stevens@student.tue.nl</a> Lieke Diederer <a href="mailto:l.h.w.diederer@student.tue.nl">l.h.w.diederer@student.tue.nl</a> Yinying Miao <a href="mailto:y.miao@student.tue.nl">y.miao@student.tue.nl</a>
<b>2</b>	Supervisor name and email	Renee Noortman <a href="mailto:r.r.noortman@tue.nl">r.r.noortman@tue.nl</a>
<b>3</b>	Degree Program	Industrial Design
<b>4</b>	Bachelor/master	Master
<b>5</b>	Bachelor/master end project?	No
<b>6</b>	Course name and code	DCM100 (2022-GS1) Constructive Design Research
<b>7</b>	Project title	The effect of participatory storytelling on mutual understanding in multi-stakeholder projects.
<b>8</b>	Research location	Eindhoven, the Netherlands
<b>9</b>	Research period (start/end date)	September 2022 – November 2023
<b>10</b>	[If Applicable] Proposal already approved by (external) Ethical Review Board: Add name, date of approval, and contact details of the ERB	Not applicable
<b>11</b>	Research question	How will shared vision making by (participatory) story telling exercises during the early stage of multi-stakeholder projects affect the mutual understanding of the vision?
<b>12</b>	Description of the research method	<p>The preliminary planning for this research is a sentence completion exercise before and after a half an hour workshop (storytelling exercise) the session is finalized with a co-reflection.</p> <p>To ensure we have the freedom to deviate from our existing plan we include standard, qualitative data collection methods such as:</p> <ul style="list-style-type: none"> <li>- (Semi-) structured interviews / co-reflections</li> <li>- Questionnaires</li> <li>- Sentence completion</li> <li>- Observations</li> </ul> <p>Based on the workshop, the qualitative data collection will be used to understand how the storytelling exercise influenced their thoughts on vision and goals. The observations and co-reflections could also help to understand their experience of performing the storytelling exercise.</p>
<b>13</b>	Description of the research population, in- and exclusion criteria	This study focuses on people that are part of multi-disciplinary student teams at Eindhoven University of

## Ethical Review Form

		Technology. The groups are required to be no less than 3 people, and a maximum of 8 people.
<b>14</b>	Number of participants	8-50 participants
<b>15</b>	Explain why the research is socially important.	This research intends to reveal more about the effect of storytelling in the mutual understanding within multi-stakeholder groups. The findings could be supportive to both student teams, as multi-stakeholder groups, to understand each other better. It could also inform further research of storytelling as a method to envision future scenarios.
<b>16</b>	Describe the way participants will be recruited	Participants will be recruited from professional networks of the researchers to whom works in the student teams at Eindhoven University of Technology. This possibly would result in a snowball sampling, due to the limitations in the time for doing research.
<b>17</b>	Provide a brief statement of the risks you expect for the participants or others involved in the research and explain. Take into consideration any personal data you may gather and privacy issues.	<p>The study will try to encounter as minimal risks as possible for participants. Participants will be well informed being taking part in the research. Only the project researchers, and possibly their supervisors when consulting needed, will have the access to the data, and only with explicit consent from the participants. Participants can withdraw from the user research at any time and decline to share the results at any time. They can also retract the data afterwards.</p> <p>In this research, personal data is gathered with the video recordings of the participants. The collected personal data would be kept on a password protected academic online platform at the Eindhoven University of Technology. The data processing would be done confidentially and will be irreversibly anonymized after the study. No footages or voices or individual results will be published, as conclusions will be made from the entire cohort's data.</p>

## Ethical Review Form

<b>Part 2: Checklist for Minimal Risk</b>			
		<b>Yes</b>	<b>No</b>
<b>1</b>	<p>Does the study have a medical scientific research question or claim (see definition below)</p> <p><i>Medical/scientific research is research which is carried out with the aim of finding answers to a question in the field of illness and health (etiology, pathogenesis, signs/symptoms, diagnosis, prevention, outcome or treatment of illness), by systematically collecting and analysing data. The research is carried out with the intention of contributing to medical knowledge which can also be applied to populations outside of the direct research population.'</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes or maybe: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 2
<b>2</b>	Does the study involve human material (such as surgery waste material derived from non-commercial organizations such as hospitals)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes or maybe: This is only allowed if your supervisor has consulted with the medical coordinator. Continue with question 3	If no: Continue with question 3
<b>3</b>	Will the participants give their explicit consent – on a voluntary basis – either digitally or on paper? Or have they given consent in the past for the purpose of education or for re-use in line with the current research question?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		If yes: Continue with question 4	If no: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval
<b>4</b>	Will the study involve discussion or collection of personal data? (e.g. name, address, phone number, email address, IP address, BSN number, location data) or will the study collect and store videos, pictures, or other identifiable data of human subjects?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		If yes: The handling, storing and de-identification of the personal data should be discussed with your supervisor. Continue with question 5 if you met all requirements for handling personal data (see ...)	If no: Continue with question 5

## Ethical Review Form

		Yes	No
5	Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g. children, people with learning difficulties, patients, people receiving counselling, people living in care or nursing homes, people recruited through self-help groups)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 6
6	May the research procedure cause harm or discomfort to the participant in any way? (e.g. causing pain or more than mild discomfort, stress, or anxiety)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 7
7	Will the participants receive any compensation for their participation? Such as a coupon or a chance to win a prize?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 8 or 10, depending on the type of study (see red text below)
<p><b>The following questions 8-9 are for <i>observational</i> research (e.g. (semi-)structured interviews; focus groups; (participatory) observations). If your research is <i>experimental</i>, then skip questions 8-9 and continue with question 10</b></p>			
8	Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g. covert observation of people)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: This is only allowed when observing behavior in public space. If so, continue with question 9. If you observe people in non-public space without their consent, your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 9
9	Will participants be asked to discuss or report sexual experiences, religion, alcohol or drug use, or suicidal thoughts, or other topics that are highly personal or intimate?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with part 3





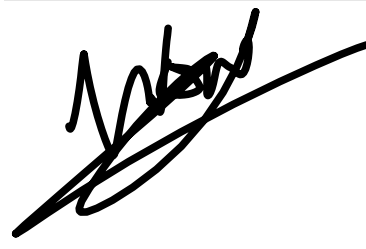


## Ethical Review Form

The following questions 10-13 are for <i>experimental</i> research (e.g. measurements on yourself or another person; testing a prototype/device; influencing behavior through manipulation (e.g. light or temperature)). If your research is <i>observational</i> , then skip questions 10-13 and continue with part 3		Yes	No
<b>10</b>	Is the study invasive (i.e. it affects the body such as puncturing the skin; taking blood or other body material (such as DNA) from the participant)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 11
<b>11</b>	Does the device have a medical purpose such as diagnosis, prevention, monitoring, prediction, prognosis, treatment or alleviation of disease or injury?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes or maybe: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 12
<b>12</b>	Will the experiment involve the use of physical devices that are 'CE' certified for unintended use (meaning you will use existing CE certified devices for other things than they were originally intended for)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: This is only allowed if they are completely harmless. They should have a harmless voltage of <5V and hazardous waste (fumes/gas/substances) should not be released. You should discuss with your supervisor whether you need to have the device tested for safety	If no: Continue with question 13
<b>13</b>	Will the experiment involve the use of physical devices that are not 'CE' certified?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: This is only allowed if they are completely harmless. They should have a harmless voltage of <5V and hazardous waste (fumes/gas/substances) should not be released. You should discuss with your supervisor whether you need to have the device tested for safety	If no: Continue with part 3

# Ethical Review Form

## Part 3: Enclosures and Signature

<p><b>1</b> Enclosures (tick if applicable):</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Informed consent form (link to template);</li> <li><input checked="" type="checkbox"/> The survey the participants need to complete, or a description of other measurements (such as interview questions or a description of the prototype);</li> <li><input checked="" type="checkbox"/> Text used to find participants (such as brochures, flyers, etc);</li> <li><input type="checkbox"/> Approval other research ethics committee;</li> </ul>	
<p><b>2</b> I hereby declare that I have completed this form truthfully</p> <p>Signature(s) of the student(s)</p> <p>Date</p>	<p>Joris Raaphorst:</p>  <p>Nick van Geenen:</p>  <p>Lieke Dieren:</p>  <p>Wouter Stevens:</p>   <p>Yinying Miao:</p>

## Ethical Review Form

	 <b>03-10-2022</b>
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Discuss this form with your supervisor. If any of the boxes you ticked in Part 2 suggest that your supervisor should submit your study to the ERB for ethical approval, try to change your research design in such a way that your supervisor can approve it instead. If this is not possible, ask your supervisor to submit the proposal to the ERB. It will take two to five weeks before you receive a decision from the ERB.

### Part 4: Review by supervisor

		Yes	No
<b>1</b>	Does the data storage adhere to all requirements of responsible data management (link toevoegen)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		If yes: Continue with question 2	If no: Discuss with your student the necessary steps to adhere to the requirements
<b>2</b>	Does the research proposal adhere to all requirements for automatic approval?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		If yes: Please skip the questions 3-6 and sign the form	If no: Discuss with your student if any alterations can be made in order to adhere to the requirements for automatic approval. If you decide that the study cannot adhere to the requirements, then you as a supervisor need to submit the proposal to the ERB. Please answer the following additional questions (3-6)

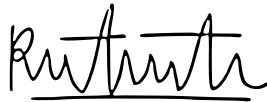
### Additional questions for ERB approval

<b>3</b>	Elaborate on the topics from part 2 that do not allow for automatic approval. Describe how you safeguard any potential risk for the research participant for each topic.	The workshop will be filmed, so that key moments of developing the mutual understanding in chronological order can be retrieved and studied. To ensure that the video content is properly handled, the video material will only be stored on the protected server (Microsoft OneDrive) by the university and not on personal devices. The footages will be removed on the recording device after transferring to the server.
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## Ethical Review Form

		The participants will be explicitly asked if they give the consent with being filmed before the session through signing the consent form before participating in the study. Those footages will be only accessible to the researchers (Nick, Lieke, Joris, Wouter and Yinying) of this study.
4	Describe and justify the number of participants you need for this research, taking into account the risks and benefits	<p>It is expected that between 8 to 50 qualitative participants will be involved. The research will be performed in groups of (minimum three) four people, with at least 2 teams. Therefore, a group of eight is the bare minimum, however a higher participant count could enrich the qualitative insights and draw saturated conclusions. If for instance the groups will be larger than expected the participant count could be rapidly increased, so a cap of 50 participants is set, due to the amount of information to be analyzed in the given time frame.</p> <p>The groups will be no larger than eight to ensure the facilitators are able to manage the teams and to intervene if things were to escalate. The teams will be instructed that they can quit the workshop at any time, likewise a facilitator can terminate the workshop at any time if for what ever reason they feel it is required.</p>
5	Explain if your data are completely anonymous, or whether they will be de-identified (pseudonymized or anonymized) and if so, explain how	In this study, the data cannot be completely anonymized because the researchers need to link the data collected in the observation to what participants tell. Therefore, the researchers will have the access to non-anonymized data. Before the study, the participants will be asked to give the explicit consent. All the data will be anonymized when publishing the study results and the conclusions will be drawn based on the entire cohort's data.
6	Who will have access to the data?	Only the researchers (Lieke, Nick, Wouter, Joris, and Yinying), potentially their supervisor (Renee) when feedback needed, will have the access to the not anonymized data.

### Part 5: Signature by supervisor

<p>I hereby declare that I have completed this form truthfully</p> <p>Signature of the supervisor</p> <p>Date 05/10/2022</p>	 <p>Renee Noortman</p>
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# Ethical Review Form

## Appendix A: Informed Consent Form

### **Research on the effect of participatory storytelling on mutual understanding in multi-disciplinary teams**

**Research on the participatory storytelling exercises in multi-disciplinary student teams to improve mutual understanding in future collaborations**

#### **Introduction**

Dear Sir/Madam,

You are asked to take part in a scientific study.

Participation is voluntary. Participation requires your written consent. Before you decide whether you want to participate in this study, you will be given an explanation about what the study involves. Please read this information carefully and ask the investigator for an explanation if you have any questions. You may also discuss it with your partner, friends or family.

#### **1. General information**

This study has been designed by Industrial Design students for the Master course 'Constructive Design Research' at the Eindhoven University of Technology and is being carried out by Lieke Diederer, Nick van Geenen, Wouter Stevens, Joris Raaphorst and Yinying Miao, who are supervised by PhD Candidate Renee Noortman.

For this study, 8-50 participants from the Netherlands are required, and are expected to participate in Eindhoven, the Netherlands.

#### **2. Purpose of the study**

The study aims to gain insights into how storytelling exercises could be supportive for aligning the future vision of the members in multi-disciplinary teams. By envisioning and anticipating the future of the project together with a storytelling approach, this study informs whether and how a change in the current mutual understanding of the team could be resulted.

#### **3. What participation involves**

During the study, the following will happen chronologically:

- We will let you first do a sentence completion as a verbal exercise.
- You will be provided with some roles (similar to the roles that exist in multi-disciplinary projects) that you and your team choose to play.
- You will participate in a workshop which you and your team will write a story together to create a shared vision.
- We will let you do a sentence completion once more as a verbal exercise.
- You will join a co-reflection together with the researchers to reflect on the findings.

The suggested time for the workshop will be around 30 minutes, while the entire study will take about an hour.

# Ethical Review Form

## 4. What is expected of you

In order to carry out the study properly, it is important that you contact the investigator:

- if you no longer want to participate in the study.
- if your contact details change.

## 5. If you do not want to participate or you want to stop participating in the study

It is up to you to decide whether or not to participate in the study. Participation is voluntary.

If you do participate in the study, you can always change your mind and decide to stop, at any time during the study. You do not have to say why you are stopping, but you do need to tell the investigator immediately.

The data collected until that time will still be used for the study.

If there is any new information about the study that is important for you, the investigator will let you know. You will then be asked whether you still want to continue your participation.

## 6. End of the study

Your participation in the study stops when

- you choose to stop
- the end of the entire study has been reached, which the participant completed the entire study including 2 sentence completion exercises, a workshop, and a co-reflection
- the investigator considers it best for you to stop
- the government or Ethical Review Board, decides to stop the study.

The study is concluded once all the participants have completed the study.

## 7. Usage and storage of your data

Your personal data will be collected, used and stored for this study. This concerns data such as your name, your student team, the video recordings of the sentence completion exercise, the workshop, and the co-reflection. The collection, use and storage of your data is required to answer the questions asked in this study and to publish the results. Your data will be stored safely with a password on the OneDrive protected by the Eindhoven University of Technology. We ask your permission for the use of your data.

### Confidentiality of your data

To protect your privacy, your data will be given a code. Your name and other information that can directly identify you, will be omitted. Data can only be traced back to you with the encryption key. The encryption key remains safely stored in the local research institute. The data cannot be traced back to you in reports, presentations, and publications about the study. This means that when publishing, your face or any recognisable, identifiable information will be taken out or blurred unless you give explicit, written consent that it is allowed for the researchers to share the data in public.

### Access to your data for verification

# Ethical Review Form

Some people can access all your data at the research location. Including the data without a code. This is necessary to check whether the study is being conducted in a good and reliable manner. The people who have access to your data for review are Lieke, Nick, Wouter, Joris, Yinying, and in case the data is needed to be discussed, their supervisor Renee. They will keep your data confidential. We ask you to consent to this access.

## **Retention period of your data**

Your data must be kept for 1 year at the research location.

## **Withdrawing consent**

You can withdraw your consent to the use of your personal data at any time. This applies to this study. The study data collected until the moment you withdraw your consent will still be used in the study.

## **More information about your rights when processing data**

For general information about your rights when processing your personal data, you can consult the website of the Dutch Data Protection Authority.

If you have questions about your rights, please contact the person responsible for the processing of your personal data. For this study, that is Yinying Miao from Eindhoven University of Technology. See Appendix A for contact details.

If you have questions or complaints about the processing of your personal data, we advise you to first contact the research location. You can also contact the Data Protection Officer of the Eindhoven University of Technology (see contact details in Appendix A) or the Dutch Data Protection Authority.

## **8. Any questions?**

If you have any questions, please contact Yinying Miao.

If you have any complaints about the study, you can discuss this with the investigator. All the relevant details can be found in **Appendix A**: Contact details.

## **9. Signing the consent form**

When you have had sufficient time for reflection, you will be asked to decide on participation in this study. If you give permission, we will ask you to confirm this in writing on the appended consent form. By your written permission you indicate that you have understood the information and consent to participation in the study. The signature sheet is kept by the investigator. Both the Investigator and yourself receive a signed version of this consent form.

Thank you for your attention.

# Ethical Review Form

## **16. Appendices to this information**

- A. Contact details
- B. Informed Consent Form(s)



# Ethical Review Form

## **Appendix A: contact details for researchers**

Yinying Miao: [y.miao@student.tue.nl](mailto:y.miao@student.tue.nl), available Monday till Friday from 9:00 – 17:00.

Renee Noortman: [r.r.noortman@tue.nl](mailto:r.r.noortman@tue.nl), available Monday till Friday from 9:00 – 17:00.

Data Protection Officer of the Technical University Eindhoven: [dataprotectionofficer@tue.nl](mailto:dataprotectionofficer@tue.nl), tel: 040-2476079

# Ethical Review Form

## Appendix B: Subject Consent Form

### Research on the effect of participatory storytelling on mutual understanding

- I have read the subject information form. I was also able to ask questions. My questions have been answered to my satisfaction. I had enough time to decide whether to participate.
- I know that participation is voluntary. I know that I may decide at any time not to participate after all or to withdraw from the study. I do not need to give a reason for this.
- I give permission for the collection and use of my data to answer the research question in this study.
- I know that some people may have access to all my data to verify the study. These people are listed in this information sheet. I consent to the inspection by them.

I  **do**  
 **do not**  
consent to storing my personal data

I  **do**  
 **do not**  
consent to video recording of this workshop

I  **do**  
 **do not**  
want to participate in this study

Name of study subject:

Signature: \_\_\_\_\_ Date: \_\_ / \_\_ / \_\_

I hereby declare that I have fully informed this study subject about this study.

If information comes to light during the course of the study that could affect the study subject's consent, I will inform him/her of this in a timely fashion.

Name of investigator (or his/her representative):

Signature: \_\_\_\_\_ Date: \_\_ / \_\_ / \_\_

*The study subject will receive the full information sheet, together with an original of the signed consent form.*

# Ethical Review Form

## Appendix B: Outline and Description of the Study Protocol

### B.1 Study Protocol & First Iteration of Questions

*Note:* Minor changes to the setup and the co-reflections might be made based on the pilot tests and how the actual study runs.

#### Participants required:

A minimum of 3, in groups, consisting of 4-8 participants per groups 3 people.

Participants for the workshop, including the storytelling activity and a reflective moment before and after the workshop, will (ideally) be selected based on existing student teams consisting of multidisciplinary roles/backgrounds. This is chosen to replicate and represent a situation in which companies are working with different disciplines on projects including stakeholders. Misinterpretation or misunderstanding can be an effect of being from different disciplines, which could potentially be reduced with the help of the storytelling workshop. These multidisciplinary teams could be found in certain student teams, e.g., IGNITE and Solid (TU/e Eindhoven) or multidisciplinary project groups from Innovation Space (TU/e Eindhoven), when they are working on wicked problems together.

#### Timeline workshop:

00:00 - 05:00 - introduction to the workshop and explanation  
 05:00 - 07:00 - **individual vision description, one minute max.**  
 07:00 - 13:00 – workshop part 1 – persona building exercise (brainwriting)  
 13:00 - 14:00 - intermezzo  
 14:00 - 44:00 - **actual workshop moment**  
 44:00 - 45:00 - intermezzo  
 45:00 - 47:00 - **individual vision description, one minute max.**  
 47:00 - 60:00 - **co-reflection and group vision description**

#### Workshop outline

Participants will start by receiving an introduction to the workshop and the structure of the research. They are informed of the duration of the overall workshop before participating and are allowed to drop out of the workshop at any given time if necessary, without giving a reason. The workshop starts with an individual question on what their personal vision is for the student team they are in to answered within one minute maximum. This will be repeated once more after the storytelling workshop.

#### *The storytelling workshop*

Participants take on a (fictional) common project-related role. The participants can pick their own roles, but if they stick too much to one role, the researchers can interfere and make them switch roles. Furthermore, the roles are created as broader roles than they usually expect in a group project, where even outsiders are included such as the municipality. The roles could be a team leader, a team member, a partner of the student team, a user, a stakeholder, the university, etc. These set of roles will be provided by the researchers and will be available in a written format on paper.

Based on these roles, they will be writing a story of the contextual situations as supplied together. To start the creative brain working, a situation is sketched for which they will be using the brainwriting technique to allow every participant to participate. The context is a situation 2 years, then 5 years and lastly 10 years in the future. The participants will in these rounds be asked what their role will be like. After the practice round, a short intermezzo will take place. The actual storytelling workshop is approximately 30 minutes long. To help the participants with the conversation, guiding questions are on the sheet of paper they will be writing the entire story on. A starting point will be defined and states a futuristic scenario, five years ahead of time, in which they just received a million dollars/euros funding for their project. Expecting a time in which the current participants are not part of the student group anymore. They will approach the story from the perspectives they have gotten and work together on a story. Besides the guidance the questions give, there will be no guidance and interaction between the researchers and the team members. The researchers will play an observative role to check whether the mutual understanding is improving during the storytelling workshop, but just as said before, they can interfere if the participants stick to their role for too long.

# Ethical Review Form

## *After the storytelling workshop*

The participants will once more, as explained above, be asked to write their own vision in relation to the student team they are in for one minute max. After which they will co-reflect on the story writing, their roles and eventually their vision towards the student team as a group. In this stage, the researchers can play an active role by asking questions about why certain decisions are being made regarding the group vision and what led to this change.

## **Individual vision description**

Before and after the workshop (5:00 – 7:00 and 45:00 – 47:00 respectively), the participants verbally communicate their current vision to the researchers. The participants are individually seated in front of a camera to prevent the participants from influencing each other.

To collect data in a standardized format, all participants are first asked to frame their vision by completing a sentence. They are given one minute to elaborate further.

*'According to my vision, [TEAM NAME] has reached success when \_\_\_\_\_.'*

*'My vision when it comes to [TEAM NAME]'s future, is \_\_\_\_\_.'*

By asking the same question before and after the workshop, we collect data on how the individual vision of the participant is influenced by the shared vision making workshop. This data is compared to see if the workshop influences the mutual understanding of the group.

## **Co-reflecting and group vision description**

After the individual vision description, the entire team of participants is gathered and given the opportunity to reflect on the workshop.

To participate in a semi-structured co-reflection session. We supply the participants with some questions tailored to the workshop observations, and some general questions:

- Did you find this workshop useful for matching your visions? In what ways?
- What group dynamics did you notice in the storytelling?
- How will the workshop influence your future meetings together?
- In what ways will the workshop make you adjust the visions/plans of your student team?
- We notice ... in the workshop, could you explain why you did this?

Lastly, the participants are asked the same standardized question from the individual vision description in plural:

*'According to our vision, [TEAM NAME] has reached success when \_\_\_\_\_.'*

*'Our vision when it comes to [TEAM NAME]'s future, is \_\_\_\_\_.'*

## **Introduction to the workshop and explanation**

Welcome everyone, today we are going to have a workshop that will help you develop- and align your vision related to you student team.

In the workshop you will together create a story that is related to your activity as a student team. Together you create the characters that play a role in the story, these are based on the roles that relate to your team.

You are given workshop material that will guide you through creating the persona's and writing a story with them.

We first ask you to sign the consent form to approve that ... [ERB information]

## **Short pinpoint approach**

- Introduction
  - o Welcome story with introduction of the research
  - o Tell about the rules and roles etc.
- Individual
  - o One after the other or at the same time finishing the vision sentence
- Together
  - o Practice round
    - Sitting at the table
    - Pick a role individually

# Ethical Review Form

- Brainwriting for 2 years ahead
  - Brainwriting for 5 years ahead
  - Brainwriting for 10 years ahead
- Intermezzo
  - Short break
- Workshop
  - Explain the scenario
  - Let them write
  - Check for roles whether they need change
  - Allow them to start over if needed
- Intermezzo
  - Short break
- Individual
  - One after the other or at the same time finishing the vision sentence
- Together
  - Co-reflecting
    - Let them talk about the benefits and how they felt during the story writing workshop
    - Ask questions about things that were interesting
  - Vision description
    - Let them answer to the vision question together
    - Ask questions about what influenced what decision regarding the vision-making process

## B.2 Form that will be Used in the Workshop

### B.2.1 Brainwriting Exercise

**IMAGINE:**  
You are a **user/visitor** of your team's project in the year 2027.  
It is up to you to one by one write their story by following the steps on this form, good luck!

<p><b>1</b> Who are they?</p> <p>Name: Age: Location: Occupation: Personality:</p>	<p><b>2</b> How did they find the team?</p>
<p><b>3</b> What do they do when they wake up?</p>	<p><b>4</b> What is their highlight of the day?</p>
<p><b>5</b> What is their worst nightmare?</p>	

**IMAGINE:**  
You are an **employee of the university** supporting your team in 2027.  
It is up to you to one by one write their story by following the steps on this form, good luck!

<p><b>1</b> Who are they?</p> <p>Name: Age: Location: Occupation: Personality:</p>	<p><b>2</b> How did they find the team?</p>
<p><b>3</b> What do they do when they wake up?</p>	<p><b>4</b> What is their highlight of the day?</p>
<p><b>5</b> What is their worst nightmare?</p>	

# Ethical Review Form

**IMAGINE:**  
You are an **employee of a company sponsoring** your team in 2027.  
It is up to you to one by one write their story by following the steps on this form, good luck!

<p><b>1</b> Who are they?</p> <p>Name: Age: Location: Occupation: Personality:</p>	<p><b>2</b> How did they find the team?</p>
<p><b>3</b> What do they do when they wake up?</p>	<p><b>4</b> What is their highlight of the day?</p>
<p><b>5</b> What is their worst nightmare?</p>	

**IMAGINE:**  
You are the **team leader** of your team in 2027.  
It is up to you to one by one write their story by following the steps on this form, good luck!

<p><b>1</b> Who are they?</p> <p>Name: Age: Location: Study: Personality:</p>	<p><b>2</b> How did they join the team?</p>
<p><b>3</b> What do they do when they wake up?</p>	<p><b>4</b> What is their highlight of the day?</p>
<p><b>5</b> What is their worst nightmare?</p>	

**IMAGINE:**  
You are a **team member** of your team in 2027.  
It is up to you to one by one write their story by following the steps on this form, good luck!

<p><b>1</b> Who are they?</p> <p>Name: Age: Location: Study: Personality:</p>	<p><b>2</b> How did they join the team?</p>
<p><b>3</b> What do they do when they wake up?</p>	<p><b>4</b> What is their highlight of the day?</p>
<p><b>5</b> What is their worst nightmare?</p>	

**IMAGINE:**  
You are an **employee of a company partnering** with your team in 2027.  
It is up to you to one by one write their story by following the steps on this form, good luck!

<p><b>1</b> Who are they?</p> <p>Name: Age: Location: Occupation: Personality:</p>	<p><b>2</b> How did they find the team?</p>
<p><b>3</b> What do they do when they wake up?</p>	<p><b>4</b> What is their highlight of the day?</p>
<p><b>5</b> What is their worst nightmare?</p>	

# Ethical Review Form

**IMAGINE:**  
You are the \_\_\_\_\_ of your team in the year 2027.  
It is up to you to one by one write their story by following the steps on this form, good luck!

<p><b>1</b> Who are they?</p> <p>Name: Age: Location: Occupation: Personality:</p>	<p><b>2</b> How did they find the team?</p>
<p><b>3</b> What do they do when they wake up?</p>	<p><b>4</b> What is their highlight of the day?</p>
<p><b>5</b> What is their worst nightmare?</p>	

## B.2.2 Creating Shared Vision – Storytelling & Writing Exercise

**IMAGINE:**  
Approximately five years from now, in the year 2027, your team just received a surprise funding of €1.000.000 for your upcoming projects!

What would happen? What would the team and all its stakeholders do? It is up to you to write this story by following the steps on this form, good luck!

<p><b>1</b> Your team</p> <p>Team name: Members:</p>	<p><b>3</b> Write your story here...</p> <p>On a rainy afternoon in October 2027...</p>	<p><b>4</b> Visualize your story here...</p>
<p><b>2</b> Define your roles</p> <ul style="list-style-type: none"> <li><input type="radio"/> Team leader</li> <li><input type="radio"/> Team member</li> <li><input type="radio"/> Sponsoring company</li> <li><input type="radio"/> Partnering company</li> <li><input type="radio"/> User/visitor</li> <li><input type="radio"/> The university</li> <li><input type="radio"/> ...</li> <li><input type="radio"/> ...</li> <li><input type="radio"/> ...</li> <li><input type="radio"/> ...</li> </ul>	<p><b>5</b> Team vision</p> <p>Our vision when it comes to our team's future, is...</p>	

## Ethical Review Form

B.2.3 Questions that could be used as guidelines / hints during the workshop  
These questions will be printed for a few copies and will be laid on the table.

Some questions to help guide you

- What would be everyone's first reaction to the funding?
- What would be everyone's opinion on the funding and on what could be done with it?
- Who have the most influence and are in a position to make a change?
- What are the steps taken afterwards, short-term or long-term?
- How would this effect everyone's future relationships with the team?



# Ethical Review Form

## Appendix C: Text Used to Find Participants

The following is an example message that could be used in the study for finding participants. However, the content could be slightly adjusted depending on the context.

Hello everyone,

I am [*the name of the sender, as one of the team members*]. I got in touch with [*the name of someone in the student team that we established the contact with*] to propose a workshop for the team.

In one of my M1.1 courses, I am doing a research project with my team for how shared vision making through storytelling exercises could affect mutual understanding.

For this we would like to hold a 1-hour workshop, with 4-8 people. To give a little more information: there would be 2 sentence completion exercises (before and after storytelling exercise), 30 minutes storytelling exercises (that the team works together on the vision making), and a co-reflection. We are trying to plan to conduct some user tests next week (October 3 - October 7). We also hope that you as a team might learn something about each other and help with shared vision making!

Let me know if you are interested in and let me know if you have any questions!

Thank you in advances!

Best regards, [*the name of the sender*]