

UNIVERSITY
OF TWENTE.

Theatrical Technology Assessment

MODERATOR MATERIALS
SCREENING SOCIETY

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Theatrical Technology Assessment - Moderator Material

Screening Society

In this document the key elements for moderation of the Theatrical Technology Assessment (TTA) case on “Screening Society” are highlighted.

What is TTA?

TTA is a learning activity designed by Klaasjan Visscher (2020) which “aims to enable engineering students to explore and anticipate the socio-technical dynamics of emerging technologies, and to find ways to integrate their insights in nuanced innovation plans” (2020, p.5). The method is based on the concept of Constructive Technology Assessment (CTA) (Rip et al., 1995), which is a research methodology to assess technological developments in society and enable real-world stakeholders to anticipate or influence this development and embedding (Te Kulve, 2011). In the educational setting, the focus is put on understanding new technologies in complex and uncertain situations while developing the competencies to deal with this. The roleplay simulation aspect of it allows the student to get an inside experience of stakeholder positions, including the conflicting and constructive relationships this stakeholder may have (Tjosvold, 2008). The materials of the case should facilitate sufficient information for the actor to play out the stakeholder in a realistic fashion. The method includes improvisational theatre to make actors more confident in their role while interactions are quicker and more interesting. It allows for the construction of the situation during the play because of its “yes-and” nature, which creates a certain path dependency and has room for alternative, new, or unexpected outcomes (Van Bilsen et al., 2013).

Goals of the TTA roleplay “Screening Society”:

- Students experience different stakeholder perspectives and get an idea of the interaction between stakeholders in a particular setting
- Students learn about innovation dynamics and the effects of new and emerging technologies
- Students understand the theoretical models of innovation which can be linked to the scenarios in the role play

Screening society – case (governance focus, including Manager of division at Ministry)

- Students learn about the socio-technical dynamics around an emerging technology, experience the involved stakeholder dynamics and tensions, and learn specifics about the medical sector in a governance-centred context.

Screening society – case (business focus, including shareholder of LQBio)

- Students learn about the socio-technical dynamics around an emerging technology, experience the involved stakeholder dynamics and tensions, and learn specifics about the medical sector in a business-centred context.

Setting and materials

Number of attendees: 5-15 (possible to use all 6 roles in case sufficient time and attendees)

The complete set of material for this case can be found [online](#) and consists of the following:

- Moderator Material (this document)
- Moderator Cheat Sheet (Appendix 1 and separate .pdf)
- Technology description (Appendix 2 and separate .docx)
- Role descriptions (Appendix 3 and separate .docx)
- Observer instructions (Appendix 4 and separate .docx)

Organisational aspects

This section covers the organisational aspects needed to execute a TTA roleplay. Make sure to read into the materials before implementing a specific case. We provide bullet points on what to address to make the introduction and moderation of the case easier.

Materials to bring

It is important that the people who will act out as well as the ones who will observe the roleplay are well informed about the context of the play. This can be facilitated by bringing printed materials to class and allowing students a moment to read.

- Moderator Cheat Sheet
- Technology description (x number of persons present)
- Role descriptions (5 or 6, depending on choice to add additional role)
- Observer instructions (x number of non-players)
- Blank sheet of sturdy paper for character names (1 for each role + yourself as moderator)
- Markers for writing the character names
- A watch for keeping time

To improve the readiness of those playing and to save time during the lecture, role descriptions can be shared with the actors before the play. This however requires the distribution and assigning of the roles prior to the meeting. Only share the role description with the persons who will play the roles and do so two days in advance latest. Do bring prints of the role descriptions to the lecture, this is often appreciated.

Setting the room

Put all tables to the side to create a large open space. Put chairs in a semi-circle facing the front. At the end of the warming up, make a **V-formation** of two tables facing the audience. Put a chair for the moderator at the closed end and 5 chairs behind the tables. The tables only serve to put up the name of the character. This set-up gives the actors room to play, unobstructed by a table and allows the observers an unobstructed view of the goings-on.

No multimedia equipment is required for the roleplay, unless this is preferred during the introduction or reflection moments.

Timeline of the play

Phase	Duration	Description
Introduction	5 min	·Introduce technology, aim of the meeting, and assign roles.
Preparation	10 min	·Give attendees time to read materials, think of a name, and write this on a paper card.
Warming up (extend in case of more time)	10 min	·Improvisational theatre exercise, make people enthusiastic, enter character.
Session 1 'CTA workshop'	20 min	·Introduction by the moderator, mention the setting, the reason for gathering, and goal of the session. Ask characters to introduce themselves and their perspective on the situation.
Reflection 1	15 min	·Analyse stakeholder dynamics, observed tensions, group formation, and applied strategy. Involve observers, ask about acting.
Break & Preparation of pressure cooker	15 min	·Prepare pressure cooker (5-10 year time jump). Involve observers.
Session 2 'Pressure cooker' (15min)	15 min	·Players are introduced to changed circumstance and presented with a challenge. Moderator can decide to step out and let actors discuss.
Reflection 2, Theory & Reflection assignment (extend in case of more time)	15 min	·In case of large group, involve students with digital platform of choice. Focus on discussion analysis, changes in the discussion compared to first session, and stakeholder influence on outcomes. If applicable, draw links to innovation and Safe-by-Design theories addressed in earlier lectures, link the outcome to the other assignments of the course (VSD).
After the workshop [Suggested]		
Reflection assignment		·Reflect on theory in relation to the role play experience ·Articulation of (new) insights

Facilitating the Play

This section describes how to facilitate the play and provides important tips for the form and decisions during the session. It is good practice to lead the group with 2 persons, one to introduce the technology, stakeholders, and to play the moderator, and one to lead the warming up, pressure cooker, intermediate reflection sessions, and to keep track of the time. Make sure to guard the time well, often more can be discussed than time allows for.

Starting the session

When introducing the session be as clear as possible on the origin of the concept, the outline of the session, and the goals. The introduction and goals can be found at the start of this document and the outline is included under “Timeline of the play”.

Then, briefly **introduce the technology**. This should provide an overarching frame for the students to put the technology description and potentially their role in. This overarching frame can be found under “Context of the play”. Address the following:

- Who works on the technology
- The aims of the project
- Main functional characteristics of the technology
- The reason for the stakeholder meeting
- The aim of the stakeholder meeting

Now, roles have to be assigned to the attendees (if not done before the roleplay). **Assign the roles** based on interest if you have not distributed this beforehand. Try to take into account the (first) impression you have of a person when assigning the roles to align these a little. This makes it easier for the person to play the character. Otherwise let students choose which role they want to play.

After the introduction, give people **time to read** their materials and prepare for their role. Invite actors and observers to read together and discuss a potential strategy of the stakeholder during the discussion, make sure of an even spread of observers among actors. Ask the actors to **think of a name** for their character, write this down on a sheet of paper, and put this in front of them. As a moderator you also think of a name and put this up (see Role description of moderator). Make sure to only refer to the actors by their fictive name during the session.

The **warming up** is next. Depending on the group size this can be done with the complete group, only the actors, or with the group of observers as ‘one’ role. There are several activities you can choose from:

- *Circle of emotions*: Everyone stands in a circle. You request a regular sentence that an attendee has said during the day (“I want coffee” or “What a beautiful morning” or the like). Additionally, you request an emotion. This makes a pair. One person starts by saying the sentence with the accompanying emotion. This is passed on through the circle and with each repetition, the emotion has to be stronger. After completing the round ask for a new sentence-emotion-pair and repeat. Make sure you have had a positive and a negative emotion. If at the end of the second round the emotion can still grow stronger, surprise them by announcing another round of the same prompt, while continuing to enlarge the emotion.
- *Walk around*: In the open space, ask everyone (observers pick a role) to walk as their character in silence. Begin this session by showing examples yourself, it is all about body language. During the session, prompts like “Does this person walk around like they are the top dog or more shy”, “Are they comfortable looking others in the eye”, and “Is this

person intimidating towards others or not? [remember no shoving or pushing, can be laughed at].”

- *1 min introductions*: Ask the actors to introduce themselves to the observers in their group as the character they will be playing.
- *Cheerleading*: Ask the actors and observers to psych each other up in groups (already formed), as if they were in a way too enthusiastic start-up environment. Sentences like “You/we can do this!” and “Go get ‘em!” are well suited. Ask them to do this in a circle of emotions style, several rounds of repeating the sentence each time with more hype. Mention that this can be completely over the top.
- *Clapping*: Go round the circle clapping with eye contact, amp up the game by the possibility of going back with double clap. Pointing a clap to someone skips the circle. You can also try make two claps go around the circle.
- *Cluedo*: Have all but one participant leave the room, the location and murder weapon are told to the first person. One by one come in, location is portrayed without words, just sounds until the person knows and shakes their hand, then the weapon is portrayed, hand is given and then this person acts it out to the next one.

People will be nervous about playing, so make sure to **exert enthusiasm** towards the group from the introduction onwards. In the end, you are also playing a role and enthusiasm is contagious.

After the warming up, request the actors to enter the stage as their character (think of the way they walk, talk or sit), introduce themselves to each other, and make some small talk (the journey, building, lunch, etc.). As a moderator you play along with this. This enables the actors to step into the character role and activate the improvisational aspect of the play.

Starting the play

When everyone is seated at the table the moderator starts the play with a welcome and short introduction. The following points can guide this introduction

- Name the setting (The Hague, Ministry or City Hall), introduce yourself in character
- Mention who initiated the meeting and the reason for meeting
- Mention the goal of the meeting
- Mention some of the clear tensions present, for example:
 - Ensuring a safe and reliable home-test environment
 - Whether to do self-tests at all or only let medical experts test people
- Give the word to the actors at the table
- “I believe not everyone knows each other at the table, so let’s start with a round of introductions, and please elaborate on what you think of the technology”
- [After introductions] As soon as the discussion picks up, leave it to the actors. If this does not happen, ask one stakeholder to elaborate their perspective on the situation.
- [In the second half of the first round] Help the discussion to work towards the intended outcome

How to design the pressure cooker

During the break, you as a moderator will have to design the prompt for the pressure cooker. The design has to **build forth** on the outcomes and decisions made in the first CTA session. **Imagine** a situation that is five to ten years into the future. Try to centre the design on two considerations:

- Have tensions remained unaddressed that would be interesting to highlight?
- Have stakeholders been in the background, formed strong alliances, or any other consolidated position that should be shaken up?

Involve the observers in this process. Make use of the pressure cooker examples described further on in this document. These might help when designing a pressure cooker in limited time. Make

sure to write down the key points of the pressure cooker prompt before starting the second session to increase the clarity of your story. Ensure to create a sense of **urgency** in the pressure cooker.

Starting the pressure cooker

After the break and designing the pressure cooker, the stakeholders will come back to the table. In the case that 2 actors are assigned to each role, make sure the other person is at the table. As a moderator you can choose to do another brief warming up exercise in character, like meeting the others in a hotel lobby. Make sure to address this in the introduction.

- Start the pressure cooker by introducing the time setting (5 years later) and the reason to convene (often the request of a relevant Minister)
- [When having new actors] Make sure everyone introduces themselves again
- Make sure any papers with information are withdrawn (such as role description) are removed from the table. This will help the actors act more freely.
- An overview of what has happened, the pressure cooker prompt
- An element to create a sense of urgency
- The request for a timely response
- [Depending on how comfortable actors are playing] Moderator leaves upon the prompt of another important meeting or call
- [Three quarters into pressure cooker] Moderator drops in to push for concrete outcomes, can decide to keep moderating

Intermissions and ending of the session

During the session there are two moments of reflection with the actors and observers on the roleplay and a break, one after the first discussion round and one after the pressure cooker. The moderator, or preferably a well-informed colleague, leads the reflection. During the break, the moderator is responsible for deciding on the prompt for the pressure cooker, together with the observers of the session.

How to reflect during session

Begin the reflection on what happened between the stakeholders during the play. Allow all people present to contribute to this. When possible, already make a link between underlying theories and observations. Some examples:

- Which tensions or conflicts did you observe during the discussion?
- How were the stakeholder positions distributed (dominant vs weak stakeholder positions, neutral vs engaged)? Who formed alliances, who were opponents?
- [To the actors] Why did you follow this particular strategy to defend your position during the discussion? Are you satisfied with the result of the discussion? How can you feed it back to your peers / colleagues?

Do not start off with the question of how it was to play, while it may be natural to do so. The discussion on the contents of the play will be difficult to start up afterwards. Also, this is a question that can be best left for the second reflection or feedback in a digital survey after the session.

During the **second reflection** round, try to **draw out contrasts with the first session** and reasons why this may have occurred. Especially a reflection on what the group of the first session could have done differently in the first session can be of interest.

Reflection assignment

The stakeholder roleplay can be combined with a reflection assignment to deepen the experience, e.g.:

- Describe the stakeholder dynamics you observed during the discussion. How did these change during the pressure cooker and why?
- Which Safe-by-Design elements did you observe in the roleplay? How could these elements impact the development of the technology?
- Which aspects could have been taken into account already in the first round of the discussion to overcome challenges and tensions present in the pressure cooker?
- Which conclusions do you draw from the roleplay for developing technologies in general?
- What other underlying theoretical concepts regarding stakeholder discussions are applicable to the roleplay?

The Play

This section provides an introduction to the play, your own role during the roleplay, an overview of the actors present, and the designed tensions in the discussion.

Context of the play

The Netherlands has a growing population of citizens over 50. Rising numbers of prostate cancer related deaths has put the Ministry of Health, Welfare, and Sport under pressure to come up with a solution. Since prostate cancer is a treatable condition in its initial stages, the number of related deaths could be combatted with early-stage diagnosis. Public screening is a largescale and often effective method for early-stage diagnosis.

Never before has there been a public screening on prostate cancer, the campaign is costly, impacts the public perception of the illness, and available test methods were considered to be insufficiently accurate. Now, based on extensive self-test experience from the COVID-19 pandemic, LQBio has developed a more sensitive and specific (self-)test for diagnosing prostate cancer.

Up for discussion is the following proposal: a public screening campaign that requests and facilitates every man aging 55 or older to carry out a liquid biopsy at home, which is followed by a visit at his GP if the test turns out positive. The aim of the meeting is to affirm this plan and fill in important details for the execution of the campaign.

The meeting takes place at the Ministry of Health, Welfare and Sport in The Hague.

Role description of moderator

As a civil servant to the Ministry of Health, Welfare, and Sport, you work closely with the responsible Minister. They have asked you to chair the stakeholder meeting because of your extensive experience with chairing meetings and stakeholder discussions.

Your aim is to enable all stakeholders present to put forward their perspective in full. In the beginning of the discussion, you love to solely intervene when the discussion comes to a halt. When this happens, you do not shy away from pointing out conflicting opinion or topics that are brushed over and giving this person the word. While each stakeholder obviously has their own stake in specific outcomes, you try to ensure that the discussion satisfies its overall goal towards the end of the discussion.

Overview of actors

Chief Executive Officer of LQBio

Enactor

The CEO of LQBio leads an ambitious private start up. The home test and bench-top systems are awaiting certification and only require procedural standardisation to be implemented in medical practice.

The price of the tests will drop when higher rates of production can be achieved. A deal to deliver tests for the public screening would be the first large scale implementation of the test and would ensure the economic viability of LQBio.

Manager of the Public Health Division of the Ministry of Health Welfare and Sport

Selector/Enactor

The manager of the public health division represents the political decision maker in the discussion. The manager and their division are concerned about the (projected) rise of prostate cancer related deaths. The manager sees risks with self-testing like inducing anxiety,

misinterpretation, or people not reporting, while also observing that willingness to test at home has gone up during the COVID-19 pandemic.

The manager attempts to balance the harms and the good a screening program brings, while searching for wide support among stakeholders.

Chairperson of the Royal Dutch Medical Association (KNMG)

Selector

The chairperson of the KNMG represents the medical professionals during the meeting. The chairperson scrutinizes and guards the quality of health care provided in the Netherlands with the aim of optimising the health of Dutch citizens.

The chairperson is worried about the accessibility and reliability of the program when run in home test format. Additionally, alignment of the campaign with and potential increase in pressure on the existing medical practice are worries of the KNMG.

Chairperson of the Prostate Cancer Foundation

Selector

The chairperson of the Prostate Cancer Foundation represents the (recovered and deceased) patient population. The chairperson has to balance the priority of early detection and personal wellbeing (or quality of life) of the patient. This especially pertains to the persons who are diagnosed, but in a stage before treatment.

The chairperson is convinced of the effectiveness of early screening and brings testimony of men with prostate cancer to the meeting.

Manager of the Center for Population Screening

Selector

The manager of the Center for Population Screening works for the Dutch RIVM. The center will ultimately be responsible for setting up and running the public screening campaign. The manager is mainly focused on the practical implementation of the screening program, especially the quality, safety, and accessibility thereof.

From this practical perspective, the manager has the preference to start with a small-scale pilot to assess risks and smoothen out the teething problems of the program before large scale implementation.

LQBio Shareholder (optional, shift for manager of the Ministry)

Enactor

The LQBio shareholder is an early investor in and a trustee of the company. As a patient himself, the shareholder has a direct relation to the subject. The shareholder has been involved in the meeting by the Ministry based on their economic expertise and financial resources to realise a screening campaign.

The shareholder has a list of conditions to his possible investment in the campaign and is convinced of the positive business prospects of LQBio.

Designed Tensions

Via the role descriptions of the characters, several tensions are implemented in the roleplay. Use this during the session to bring out topics and controversies that have to be discussed. Additionally, you can use this when designing the pressure cooker to identify tensions that have not been addressed but you would like to see emphasized.

Finances

The tests are currently too expensive to be covered by the insurance companies in full. Significant scale-up of operations is required to bring company costs down to an acceptable level [optional] or the LQBio shareholder has to be convinced to contribute financially.

Safety

Never before has a self-test-based home screening been organized, nor has such a device been produced and distributed in such large numbers. There is marginal experience from the COVID-19 pandemic and cervical cancer public screening campaign which offers home testing options, yet this testing procedure involves blood sampling and is therefore distinct from the aforementioned home tests. This creates situations in which the safety of the patient, the safety of the procedure and the safety of the environment might not be guaranteed, and possible (environmental) impact is unknown.

Accessibility

All people in the target group should be able to partake in the program (also elderly, people with physical and psychological disabilities, etc.). This has implications for the operational decisions of the campaign and requires dedicated attention.

Reliability

It is not certain whether test results will be as reliable in an uncontrolled home environment as they are in the preliminary results obtained from the laboratory.

Standardization

Validation of the intended test and standardization of the screening procedure must be completed. Standardization involves testing procedures on clarity, operability, and the dissemination of this procedure among relevant stakeholders. Alignment of the campaign with existing medical practices is an additional element of standardisation that requires attention. The pressure on healthcare may be increased due to the expected higher number of yearly diagnoses.

Responsibility

With a self-test-based implementation, the responsibility to take the test and to report the result shifts from the medical professional to the person who takes the test. This has implications for the role of the doctor and the effectiveness of the screening potentially.

Pressure cooker examples

Public unwillingness

If decision has been made to set up a home screening campaign during the first meeting:

- Implementation less smooth than expected,
 - There is no control about who is taking the test and a large group of people is not taking the test
 - Positive test results lead to anxiety among patients and it has been suggested that a few suicides in this age group were related
 - There exists a need for doctors to help patients who cannot take test alone
- The follow up for positive tests is not going smooth,
 - Patients are scared of confirmation of the outcome and therefore withhold from following up
 - There is an increased number of positive results due to over diagnosis and therefore much work for doctors, waiting lists are long

- There exists unclarity about which doctor to turn to, the GP, hospital, or oncologist directly

Competition

If pricing has been an issue during the first meeting, in addition to the outcomes of the pilot:

- A foreign company has developed a cheaper, yet less accurate test
- This company has convinced a high government official of its potential and the test delivery of LQBio is up for discussion

This is likely to lead to a discussion on cost-effectiveness of the campaign in relation to the accuracy of the test.

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Appendix 1: Moderator Cheat Sheet

See next page

Screening Moderator Cheat Sheet: Preparation

Duration (1h 45m)	Subject	Setting the scene		Warming up	 Checklist To bring
5 min	Introduction	<p>Introduction</p> <ul style="list-style-type: none"> • Method origin (TTA) • Outline of today • Goals of the session • The technology • Aim of stakeholder meeting • Introduce roles and impersonate briefly • Distribute roles <p>Goal of Meeting: Decide on (the conditions of) public prostate cancer screening at home</p> <p>Stakeholders: LQBio Ministry Doctors Patients RIVM Shareholder</p>	<ul style="list-style-type: none"> • Circle of emotions, sentence + emotion • Silent walk around in character • 1 min introduction as character • Cheerleading, hype each other up • Clapping, pass a clap around the circle 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Moderator Cheat Sheet 1x <input checked="" type="checkbox"/> Technology Description X number of attendees <input checked="" type="checkbox"/> Role Descriptions 5 or 6 (additional role) Observer Instructions <input checked="" type="checkbox"/> X number of non-players <input checked="" type="checkbox"/> Sturdy sheets of paper 6 or 7 (additional role) <input checked="" type="checkbox"/> Markers for writing the character names <input checked="" type="checkbox"/> Watch to keep time 	
10 min	Reading time				
10 min	Warming up				
20 min	Session 1 "CTA"				
15 min	Reflection 1				
15 min	Break and Prep pressure cooker		<p>Tips</p> <ul style="list-style-type: none"> • Be enthusiastic • Provide implicit assurance by acting • Play your own role • Fun and laughing allowed! 		
15 min	Session 2 "Pressure Cooker"				
15 min	Reflection 2, Theory, & Reflection assignment				

Screening Moderator Cheat Sheet: The Play

 Tensions In discussion	Kick off Session 1 Bring up in introduction	Pressure cooker design	Duration (1h 45m)	Subject
<p>Safety, The environment in which people will take self-tests is not controlled, people may be injured</p> <p>Wellbeing, The response of patients to results</p> <p>Reliability, The accuracy might be affected by lay-person conduct, people may not report results</p> <p>Accessibility, Especially participation of elderly and people with a disability</p> <p>Standardisation, Impact on medical practices and likely increased pressure</p> <p>Finances, Who bears the costs of the program?</p>	<p>The setting: Ministry of Health - The Hague</p> <p>Reason for meeting: Rise of prostate cancer related deaths</p> <p>Goal of the meeting: Decide on (the conditions of) implementing prostate cancer screening at home</p> <p>Initial risks: Ensuring safety of self-test environment Accessibility of test procedure Accuracy requirements of test Impact of measures on medical practice Responsibility of follow-up on self-test</p>	<p>Start with the outcome of the first session</p> <p>Imagine a situation 5 to 10 years in the future</p> <p>Base the scenario on</p> <ul style="list-style-type: none"> Desired changes in stakeholder dynamics Tensions that have remained unaddressed <p>Make it urgent</p> <p>Examples:</p> <p>Competition, A foreign company has developed a cheaper, less accurate test</p> <p>Public unwillingness, anxiety about test results is high, how to follow-up on results unclear, and people are generally unwilling to take the test</p>	<p>5 min</p> <p>10 min</p> <p>10 min</p> <p>20 min</p> <p>15 min</p> <p>15 min</p> <p>15 min</p> <p>15 min</p>	<p>Introduction</p> <p>Reading time</p> <p>Warming up</p> <p>Session 1 "CTA"</p> <p>Reflection 1</p> <p>Break and Prep pressure cooker</p> <p>Session 2 "Pressure Cooker"</p> <p>Reflection 2, Theory, & Reflection assignment</p>

Appendix 2: Technology description

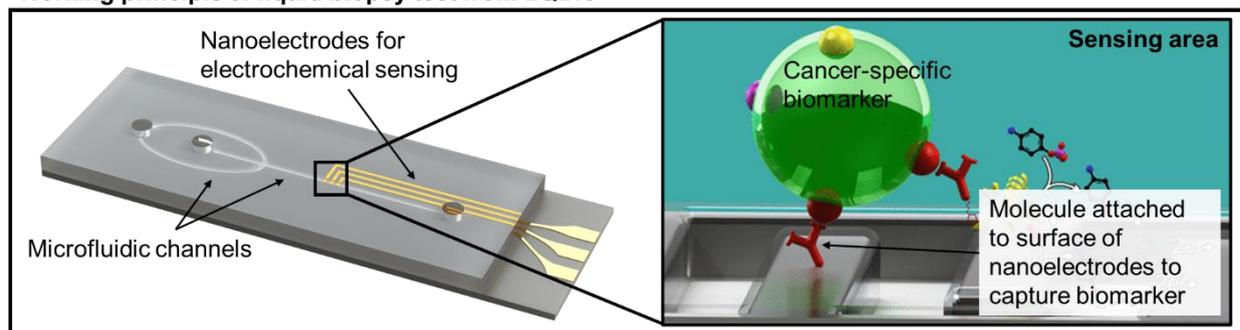
Nanofabricated liquid biopsy test for prostate cancer

Prostate cancer is the most common cancer among men above an age of 55. In the Netherlands, the number of prostate cancer related deaths exceeded 3000 in 2020 and is expected to increase with 32% in the upcoming 20 years.¹ To minimize deaths related to prostate cancer, early detection on a wider scale is considered crucial.

The early detection of cancer has been improved by recent developments in liquid biopsy tests – nanosensors which can detect cancer-specific biomarkers at low volumes in a drop of blood.² The NIPA technology (Nanoelectrodes for Individual Particle Analysis), as shown in the figure below, is especially promising.³ The binding of single cancer-specific biomarkers on nanoelectrodes results into a high specificity and sensitivity of the test.⁴ Because of this increased accuracy, the test significantly improves early-stage prostate cancer detection.

Large scale application of this test for early detection bears several risks. Over-diagnosis, due to the high accuracy of the liquid biopsy test, becomes a serious possibility. In this situation, cancers which would not develop symptoms or become a serious health threat are detected and could lead to unnecessary treatment, including its side-effects (also called over-treatment). Additional concerns have been raised about the impact of a screening program on the capacity of the health care system and the (environmental) risks and responsibilities of large-scale production and wide dissemination of the test.

Working principle of liquid biopsy test from LQBio



¹ [International agency for research on cancer](#), The Netherlands

² [Knuever et al.](#), *The use of circulating cell-free tumor DNA in routine diagnostics of metastatic melanoma patients*, Nature, 2020

³ [Mathew et al.](#), *Electrochemical Detection of Tumor-Derived Extracellular Vesicles on Nanointerdigitated Electrodes*, NanoLetters, 2020

⁴ *Specificity* concerns the ability of a test to indicate one (group of) diseases without returning a positive result at the presence of other molecules. *Sensitivity* is the ability of a sensor to indicate low concentrations of the target molecule.

Appendix 3: Role Descriptions

Chief Executive Officer of LQBio

As the Chief Executive Officer of LQBio you lead an ambitious private start-up that developed a nanofabricated electrochemical sensor to detect prostate cancer. The start-up is a spin-off from your PhD research, which you concluded three years ago. Alongside your academic expertise, early investors have been providing you with expert business advice. The company consists of you and three colleagues and is financed in full by private investments since half a year. This has been an exciting step for your company but comes with the responsibility of delivering growth.

The reproducibility and reliability of your test have been perfected in a home test for COVID-19. Now, you reached a stage where the liquid biopsy test only requires certification and procedural standardization to allow for its uniform implementation throughout the medical practices. Your product can be delivered in bench-top form, to be operated by medical professionals, and in the form of self-tests.

By promoting the liquid biopsy test to be part of a large, nation-wide screening program you are hoping to secure your first large scale implementation in the medical sector. This would enable further growth of your company in the long term, with the aim of increasing expected revenue and thereby the value of the company at the request of private investors. You are looking for partners to realize this ambition.

Interests: Entering the medical market, improve lifespan of men/reducing deaths by prostate cancer through early detection, increasing revenue.

Irritated by: Lack of ambition, bureaucratic processes, competitors such as large companies who have an interest in building a similar screening test.

Habits: No-nonsense attitude, tough negotiator, very convinced of own developments, visibly annoyed when irritated by others.

Factsheet

Pre-clinical testing has shown that the liquid biopsy test is 99% accurate, which is comparable to other technologies such as glucose sensors for diabetes patients or tests used in the screening program for cervical cancer. (Reliability)

The price of the home-test is expected to reduce by 30% after initial production optimization. For the price to reduce by 40% large scale operations over multiple provinces are required. (Finance)

The bench-top systems are rather expensive (around 25.000 € per system, including a contract for regular maintenance and cassettes of 20,- a piece for testing) which would provide you with much revenue in the short term. Home tests are cheaper (currently around 50 € per test) and generate higher revenue more steadily for the duration of the screening program.

The home test kit includes the liquid biopsy test, a disposable blood lancet and a manual on how to carry out the test. First, a drop of blood is obtained with the blood lancet from a fingertip. The sample is introduced in the device by pressing the fingertip on a dedicated area of the test. The result can be read from the test window after a few minutes. There are no concerns for the reliability of the test when conducted by a lay person. (Context)

Manager of the Public Health division of the Ministry of Health, Welfare and Sport

As a manager of the Public Health division at the Ministry of Health, Welfare and Sport (VWS) you represent the political decision maker. You are responsible to take executive decisions of the division and present policy proposals to the Minister that promote the goals of your division. The overall goal is to promote the wellbeing of the population, prevent illness, and establish an adequate infrastructure to provide health care while minimizing socio-economic health differences.

You closely cooperate with the RIVM, general practitioners, local governments, insurance companies, and the Minister of VWS to ensure political and operational implementation of policies. On urgent matters regarding public health, healthcare research and public screening programs you are advised by the health council, an independent scientific advisory body.

The expected rise of 32% of prostate cancer related deaths has caught the full attention of your department. Public screening is seen as one of the few ways to combat this rise. Self-testing has the risk of misinterpreting results, inducing anxiety, or not reporting results at all. This makes you skeptical about home-testing procedures. While on the other hand, home testing has shown to increase willingness of citizens to take a test, as showcased during the COVID-19 pandemic.

Interests: Being seen as a catalyst, establishing reliable health infrastructure, wide support of involved stakeholders.

Irritated by: Plans that cause unrest among politicians, cost-ineffective projects, shifting and unclarity regarding interests of involved stakeholders, negative stance towards government involvement.

Habits: Aims for consensus but can play a political power game; tries to be nice to others but gets formal and stand-offish when irritated.

Factsheet

In the case of the well-established screening program for cervical cancer, the program has been based on a mixture of testing at the GPs office and home-testing.⁵ (Responsibility)

To aid the public commitment to the minimization of socio-economic health differences, there is a small budget available to increase accessibility of medical treatment that has proven to be effective. (Finance - accessibility)

Insurance companies have indicated willingness to contribute financially, yet indicate that the price of the test needs to drop by 40% for them to include full coverage of test costs. (Finance)

The health council assesses the risk and benefit of a screening program, based on the Criteria of Wilson and Jungner: 'All screening programs do harm; some do good as well, and, of these, some do more good than harm at reasonable cost.'

⁵ [Zelfafnameset | RIVM](#)

Chairperson of the Royal Dutch Medical Association (KNMG)

As chair of the KNMG you are the spokesperson of the Royal Dutch Medical Association and responsible for promoting the field of medicine. The KNMG is the national lobbying organization for all doctors and medical students and has over a hundred employees. You regularly organize local meetups with the eight sectoral associations, the General Assembly, to discuss relevant topics.

You are dedicated to realize high quality health care which enables citizens to be as healthy as possible. You have taken up this role to ensure that the voice of medical staff is heard. The association is critical of large-scale check-ups on diseases when the test is not extremely accurate and effective.

Aside from being critical on the effectiveness, you hold several operational concerns: Who will conduct the test? What are procedures for home-testing? What if people are unable to carry out the home-test themselves? Ultimately, you expect the introduction of a large-scale screening program to affect the capacity of health care services. If such a screening program is introduced, this additional pressure on the health care sector has to be taken into account.

Interests: Safe, accessible, effective forms of prevention, satisfaction of members, maintaining a reliable reputation.

Irritated by: Negative attention for doctors, increasing procedural scrutiny, reducing significance of doctors in society.

Habits: Authoritative attitude, can make derogatory comments to others when irritated.

Factsheet
General practitioners have reported difficulties comprehending the descriptions of self-test procedures for COVID-19 among elderly. (Accessibility)
Member organizations have showed large interest in the liquid biopsy test if the accuracy of the test remains as high as indicated in the early trials after scaling up production. (Reliability)
Member organizations are worried about whether individuals will report the outcomes of the self-tests to their general practitioner and the subsequent ability of the General Practitioner to ensure the health of his/her patients. (Responsibility)
Member organizations have expressed worries about the ability of individuals to conduct a self-test on their own in which blood is required. Many people have a fear of blood, which is a frequent problem doctors must deal with. (Accessibility)
Men who are diagnosed with a benign form of prostate cancer are directed to a monitoring program coordinated by hospitals autonomously. (Responsibility)

Chairperson of the Prostate Cancer Foundation

As the chairperson of the Prostate Cancer Foundation, you are the main voice for men who have, had, or passed away due to prostate cancer. Your foundation actively supports men who have prostate cancer, runs information campaigns, and promotes interests of men with prostate cancer in local and national media.

Early detection of cancer is high on the priority list of the foundation, and you make a continuous effort to inform men about the possibility of taking a PSA-test at the general practitioner office – currently the state-of-the-art test for prostate cancer although with a relatively low reliability. You find the individual choice for an early test extremely important since there exists a trade-off between the early detection of cancer and the loss of ‘quality of life’. The loss of quality of life is considered to be the adverse health effects of the related treatment and the anxiety that can be caused by the diagnosis with prostate cancer without being actively treated against it.⁶

It is important to your association that early detection is improved. However, you are weary of false positive diagnosis and possible over-treatment since that unnecessarily decreases the quality of life of those involved. You would welcome an effort to support those who want to take a test and make liquid biopsy home tests widely available.

Interests: Promoting early diagnosis; being a voice for every patient; reliable, accessible and affordable screening.

Irritated by: Disregard of impact on the patient, unclarity about effectiveness of available tests, limited or incorrect information about technology.

Habits: Constructivist attitude, not afraid to speak up, can be slightly activist. Gets agitated when being marginalized.

Factsheet

A European study found a lower risk of death from prostate cancer for men who underwent early screening (done about once every 4 years). The researchers estimated that about 781 men would need to be screened (and 27 cancers detected) to prevent one death from prostate cancer.⁷ (Large scale impact)

A recent workgroup of the foundation has indicated that a low threshold test on prostate cancer is important for men to have themselves tested. They have indicated the fact that these tests are not pro-actively offered to men over 55 as a reason for the limited testing that currently takes place. (Accessibility)

Men who are diagnosed with a benign form of prostate cancer are directed to a monitoring program coordinated by hospitals separately. Several men have indicated the stress that this induces. “A subject (N1) on regular testing: “It’s not that I don’t want to go there, I know I have to go, and I’m going. But it does create some anxiety because of the uncertainty, yeah there is some of that definitely. I’m sure it can’t be avoided actually.”¹⁰ (Responsibility - impact)

⁶ [Prostaatankerstichting](#), Individueel vroegonderzoek en expertdiagnostiek

⁷ [Schröder et al.](#), *Screening and prostate cancer mortality: results of the European Randomised Study of Screening for Prostate Cancer (ERSPC) at 13 years of follow-up*, The Lancet, 2014

Manager of the Center for Population Screening

As manager of the Center for Population Screening you are part of the RIVM and an important advisor to the Ministry of Health, Welfare, and Sports regarding the operability of a potential public screening program.⁸ It is the task of the RIVM to research how a program can be implemented and, at a later stage, to implement the program. Your unit coordinates the collective effort of all involved stakeholders to successfully provide a public screening program.

The goal of your unit is to improve public health through high quality, accessible and affordable public screening programs. High quality in your eyes means an effective, public request-driven, safely standardized, and innovative public screening program. Accessibility implies a local presence, timely execution, and free choice for those involved whereas affordability requires oversight of involved costs and a (cost-)effective implementation.

You are mostly concerned about the safety and the environmental impact of the wide dissemination of a large number of tests among the population, the safety of the test itself, and the establishment of a safe and reliable test environment by the test subject. Another important requirement is that the screening program must be implemented in accordance with EU and national law and regulations related to e.g. procurement, privacy, data protection, medical devices.

Interests: Maintaining the reputation as being highly reliable, independent, and legitimate in the eye of the public; feasibility of screening programs.

Irritated by: Cutting corners, high uncertainty, ignoring environmental impact and safety of technology.

Habits: Procedure focused, sticks to role, insistent on concerns, hard to convince, plays with glasses or pen when irritated.

Factsheet

Questions have been raised in your center about the effects of large-scale production on work safety and environmental sustainability. It is also still unclear whether the elements of the test-kit can be recycled and used for another application or whether elements can be harmful when handled incorrectly. (Safety)

The center usually starts with small scale implementations (~10.000 participants spread across different locations) to develop the standard and test the influence of relevant variables, before a standard is implemented widely. (Standardization)

Currently, the well-established screening program for cervical cancer involves self-testing upon request (as an alternative to the test at the GP's office). (Reliability)

You are concerned about the accessibility of a self-testing program for those who might not understand the test procedures and those who are physically unable to conduct the test themselves. (Accessibility)

⁸ [RIVM](#), Wie voeren het bevolkingsonderzoek uit?

LQBio Shareholder

As an early investor in LQBio, you have followed the development of the company closely. Now, LQBio is invited to a public stakeholder meeting by the Ministry of Health, Welfare and Sport and has requested you to join them to provide your economic expertise and be able to make financial decisions on the spot.

This position is well-known to you, you have backed several start-ups before and guided them in their developmental process. Your motivation for this issue lies close to yourself, five years ago you have been diagnosed with benign prostate cancer. At the moment, you are in a program to monitor the cancer and have a biyearly check-up with at the doctor's office. This monitoring provides you with confidence and lowers your anxiety about the cancer. You have indicated to the Ministry that you would be willing to financially contribute to a public program regarding prostate cancer if your conditions are met.

Your most important conditions are:

- LQBio has to be the sole supplier of test equipment;
- The national program has to include all men over 50 in the Netherlands;
- The program has to be accessible for the physically and mentally impaired;
- The program has to include an information campaign to raise awareness of the severity of prostate cancer;
- The program has to be specific, dependable, and supported by the actors at the table.

Interests: Contributing to a healthy and inclusive society, enabling LQBio to become an established actor in the market, enabling initiatives for the public good, ensuring return on investment.

Irritated by: Lack of ambition, lack of specific planning, indecisiveness.

Habits: Can be denigrating when people think in problems, tends to whisper during meetings to give strategic pointers.

Factsheet

You are willing to support the pilot financially by paying 30% of the test costs. This can evolve into a continuous sale of the product when a public screening is implemented. Additionally, if a public screening program were to be implemented you would be interested in funding a widespread information campaign to increase awareness of the threat of prostate cancer and the test of LQBio (additional 10.000€).

Pre-clinical testing has shown that the liquid biopsy test is 99% accurate, which is comparable to other technologies such as glucose sensors for diabetes patients or tests used in the screening program for cervical cancer. (Reliability)

LQBio has received solely positive attention from other investors and their development of the product has lived up to your expectations. Recently, LQBio has been winning several prestigious grants, confirming the potential you see in the company.

Appendix 4: Observer description

Your task is to carefully observe the discussion, identify the dynamics and conflicts between the different stakeholders, and find important tensions relevant for the development of the technology. You can take notes during the discussion of interesting behavior you see. The following questions might help you during your observation:

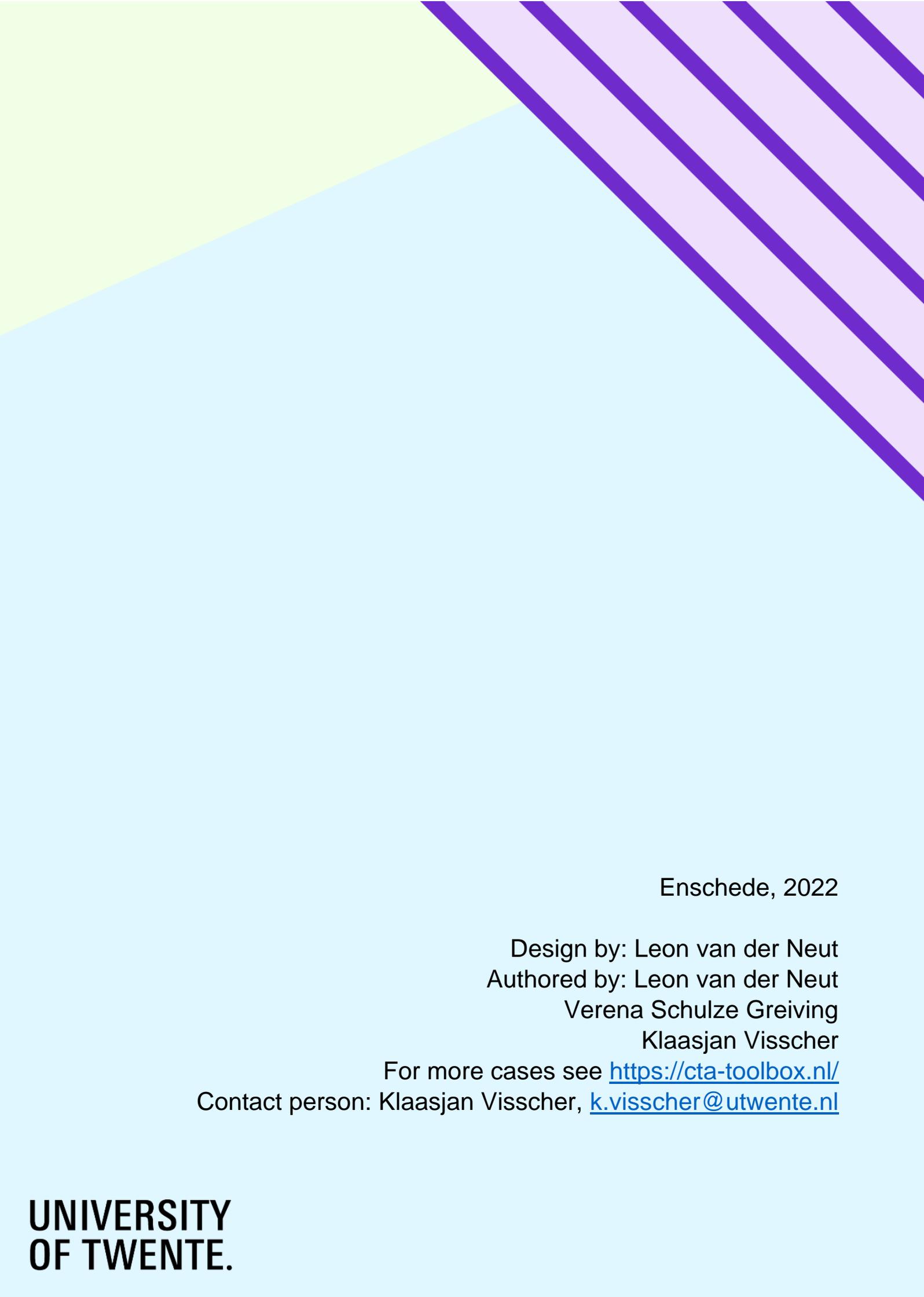
- Which stakeholder is dominant in the discussion and who is rather weak?
- Which conflicts and tensions come up during the discussion? How do the stakeholders react upon these issues?
- Who formed alliances? Who oppose each other?
- Which tensions, concerns or risks of the technology become visible during the discussion? How do the stakeholders react to this?

After the first discussion round we move to the ‘pressure cooker’ – a scene in the future in which the same stakeholders need to discuss action points for the technology. To help design this focus on these questions:

- From the earlier discussion, which points would be interesting to follow up on?
- Where do you see tensions in the future?
- Which event could be a gamechanger for the technology or for the stakeholders involved?

During the second discussion round you focus on these questions:

- What does the outcome of the discussion mean for the development of the technology?
- Which design adaptations could be made in the technology / implementation in order to prevent some of the discussed problems?
- How do the proceedings of the first session affect the current discussion?



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