Co-Creative Workshop

Methodology Handbook

The goal of the methodology is to bring together LSP partners, stakeholders and end-users to co-create solutions in a couple of hours. The Co-Creative Workshop Toolkit enables experts to empathise with the needs of end-users, whilst end-users are enabled to communicate on an expert level. Ideally this increases empathy within design and development teams, leading to more meaningful IoT-solutions. Four co-creative phases: Co-analysis, Co-design, Co-evaluation and Co-implementation are explained in this handbook together with practical information on how to organise, facilitate, analyse and document a Co-Creative Workshop. U4IoT supports the LSP projects to implement the Co-Creative Workshop Methodology into their projects and provides LSP partners with support to organise and facilitate Co-Creative Workshops.

Besides the Co-Creative Workshop Methodology, U4IoT provides numerous other end-user engagement tools and support services to actively engage end-users in the LSP projects of the European IoT-LSP programme.

DISCLAIMER

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Contents

Foreword

This handbook offers a hands-on methodology to co-create solutions with multi-disciplinary stakeholders. This Section briefly introduces the Co-Creative Workshop Methodology by answering the following questions:

For whom are these Co-Creative Workshops? The Co-Creative Workshop Methodology is especially designed by the Coordination and Support Action (CSA) User Engagement for Large Scale Pilots in the Internet of Things (U4IoT)[1] for **partners participating in European Large Scale Pilot (LSP) Programme**[2] with a focus on the Internet of Things (IoT) and contains materials for five topics corresponding to the context of the five LSP projects - Smart Mobility (AutoPilot), Smart Entertainment (MONICA), Smart Agriculture (IOF2020), Smart Cities (SynchroniCity) and Smart Health (ActivAge).

What is the goal of the Co-Creative Workshop Methodology? The goal of the methodology is to bring together LSP partners, stakeholders and end-users to co-create solutions in a couple of hours. The toolkit enables experts to empathise with the needs of end-users, whilst end-users are enabled to communicate on an expert level. Ideally this increases empathy within design and development teams, leading to more meaningful IoT-solutions.

When can I best utilise Co-Creative Workshops in my project? The workshops can be beneficial during the full length of a project. However, in most cases, its impact at the beginning of a project is the greatest, since inviting stakeholders and end-users at the beginning of a project to participate in the co-creation of use cases can provide them with a sense of ownership. This will make it easier to involve them throughout the whole length of the project.

Where should I host a Co-Creative Workshop? The location of a workshop can vary and depends on: the location of the lead partner in terms of end-user engagement, the location of a use case pilot or the location of end-users and other stakeholders. To stimulate participation, it is recommended to 'bring' the workshop to the end-users and stakeholders envisioned to participate in the workshops.

Why is it worth the time and the energy to organise a Co-Creative Workshop? Preparing, facilitating and documenting a Co-Creative Workshop can be quite time and energy consuming. Yet, the insights a workshop provides, help researchers and developers to empathise with stakeholders and end-users. These insights can be directly converted into requirements for the system architecture and can kick-start your design and development processes.

How can I facilitate a Co-Creative workshop? The four co-creative phases: Co-analysis, Co-design, Co-evaluation and Co-implementation are explained in this handbook together with practical information on how to organise, facilitate, analyse and document a Co-Creative Workshop.

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1. **U4IoT** - www.u4iot.eu
2. **European LSP Programme** - www.european-iot-pilots.eu

History in a Nutshell

Participatory Design

Initial user-centred design practices were conducted from an 'expert perspective'. Users were given instructed tasks about product concepts that were generated by others, while experts were observing or interviewing them. This user-centred design approach (i.e. 'user as subject') is slowly evolving in an approach where the user is seen as an expert of his own experiences [1].

Design participation began to emerge in the early 1970s [2] and since then co-creation practices between end-users and experts are increasingly applied as a method to co-create monetary, experiential or societal value [3]. Where co-creation is defined as the act of any collective creativity that is experienced jointly by two or more people, with the intent to create something that is not known in advance [4].

Co-creation practices and tools enable end-users (i.e. 'users as experts') to become co-creators of their own experiences [5]. During the process of co-creation, where collaborators define a joined problem and collectively create a solution, latent collective knowledge becomes tangible in the form of potential solutions. Consequently, social needs and experiences can be identified from appended explanations, forming rich insights to develop requirements informing system architectures.

End-users however are not trained experts; their experiences are often inexplicit and can generally not be articulated on demand. The exploration and use of tools, materials and methods that put all the contributors on a common ground is needed [4].

Also, the organisation (e.g. invitation of a variety of relevant participants), facilitation (e.g. coordinating discussions), analysis (e.g. transcribing recordings, interpreting and find patterns), documentation (e.g. formulating requirements) and implementation (e.g. communicating insights) requires preparation and experience [5].

Co-Creative Workshop Methodology

Experts, i.e. Sanders and Stappers [1, 4, 5, 11, 17, 20], provided extensive research on co-creation. They provide us with numerous examples of co-creation practices in a variety of contexts with different end-users. Based on their research U4IoT consortium partner - Stembert Design[3], developed a multi-stakeholder Co-Creative Workshop Methodology especially designed for IoT related contexts.

This methodology was among others utilised in the SocIoTal project[4] [6]. The partners within SocIoTal did not have experience with the Co-Creative Workshop Methodology. After some initial consideration, the methodology was embraced and the partners wrote about and published the development of the toolkit and its iterations. Several workshops were organised on the pilot sites in Santander (Spain) and Novi Sad (Servia), also a workshop in Tunis (Tunisia) during the Level Up conference[5] was held. A variety of stakeholders and end-users participated in the workshops to identify meaningful use cases and to specify needs and requirements informing IoT-solutions designed and developed within the project.

Some of the partners are currently using co-creative methods within their IoT-related projects in order to engage end-users in their innovation processes.

Co-Creative Workshop Methodology Handbook

The Co-Creative Workshop Methodology described in this handbook is especially designed for partners participating in European Large Scale Pilot (LSP) Programme[6] with a focus on the Internet of Things (IoT) and contains materials for five topics corresponding to the context of the five LSP projects - Smart Mobility, Smart Entertainment, Smart Agriculture, Smart Cities and Smart Health. As a methodology, the Co-Creative Workshops are part of the Coordination and Support Action (CSA) User Engagement for Large Scale Pilots in the Internet of Things (U4IoT)[7]. As a CSA, U4IoT offers a variety of end-user engagement tools and support services to LSP projects participating in the European LSP Programme, to guide them to use these methodologies in their pilots' use cases.

The goal of the Co-Creative Workshop Methodology is to bring together multiple stakeholders to co-create solutions in a couple of hours. The Co-Creative Toolkit enables experts to empathise with the needs of end-users, whilst end-users are enabled to communicate on an expert level, leading to more meaningful IoT-solutions. The participants of the workshops are stakeholders

and end-users who are preselected based on the context of the LSP projects. It is important to invite a mixture of participants with different expertise fields and characters. Ideally also LSP partners participate in the workshops in order to empathise with the stakeholders and end-users who are eventually going to use the IoT-solutions created in the LSP projects.

Enabled by this handbook and the Co-Creative Toolkit, which consists of guidelines, templates, picture cards, actors, objects and sensors, LSP partners are enabled to autonomously organise, facilitate, analyse and document a Co-Creative Workshop. This handbook describes the guidelines for a co-creative cycle of four phases, the: Co-analysis, Co-design, Co-evaluation and Co-implementation phase, together with practical tips on how to facilitate a Co-Creative Workshop.

In the first phase, the Co-analysis phase participants are going to analyse the context to explore possibilities, define use cases and generate solution spaces. During the second phase, the Co-design phase, participants will give shape to the solution generated in the Co-analysis

phase by defining the main functionalities of the solution. The objective of the third phase, the Co-evaluation phase, is to evaluate the solution generated in the Co-design phase by means of stakeholder values. In the last phase, the Co-implementation phase, participants are going to define the implementation process, with the aim to identify the factors of influence on a decision to adopt the solution or to reject it. During the workshop, latent end-user needs can be uncovered, it is therefore recommended to follow the discussion carefully in order to distillate requirements.

During a Co-Creative Workshop, a large amount of data is generated. These data are qualitative and cannot be used to draw hard conclusions. The analysed data are meant to inform and inspire LSP partners with the aim to evoke empathy for the stakeholders and end-users involved. Communicating Co-Creative Workshop results ideally encourages collaboration between LSP partners, stakeholders and end-users, in order to further inform future design and development processes of the LSP projects.

3. Stembert Design - www.stembertdesign.com
4. SocIoTal - www.sociotal.eu
5. Level Up Conference -
6. European LSP Programme - www.european-iot-pilots.eu
7. U4IoT - www.u4iot.eu

Workshop Preparation

Defining the Objective

Before introducing the phases of the Co-Creative Workshop, we would like to provide you with some practical tips to prepare your workshop. In Appendix A, you can also find a template outlining the steps for preparation that are described in this Section.

Defining a clear objective for your workshop helps you to identify the participants you need to select, how much time you will have to allocate for one or more workshops and what materials and equipment you need. First, define the context you want to generate solutions for based on the topic of your LSP project. According to this topic you can select the Contextual Package for Smart Mobility, Smart Entertainment, Smart Agriculture, Smart Cities or Smart Health.

The Co-Creative Workshops can be utilised in different stages of your LSP project. Based on your objectives, you can start from a very open question or from a predefined design challenge. In the Co-analysis phase, it is possible to define different use cases and find a variety of ideas or to explore a predefined design challenge in more depth by analysing the context and its stakeholders. The Co-evaluation and Co-implementation phases can be utilised to assess newly co-created solutions or solutions that were already defined.

Based on your objective, design challenge and allocated time, you can decide to complete a full co-creative cycle or to make a selection from the

four phases; Co-analysis, Co-design, Co-evaluation or Co-implementation. The phases can be used in conjunction with - or autonomous from - each other. However, for an optimal result, it is recommended to go through all phases. This can help you to uncover new insights, get the most out of possible new participants, think out of the box or to find new solutions.

Facilitators

It is recommended to allocate a facilitator and a co-facilitator to facilitate a Co-Creative Workshop [7]. The facilitators ideally should be familiar with a creative process, have some in-depth knowledge of the subject and are able to manage participants.

According to Tassoul [8], there are three conditions to make a good facilitator: 1) there is an implicit understanding between the facilitator and the group that has granted the facilitators' role, 2) the facilitator is able to oversee the whole process and will leave enough space for

creativity whilst keeping an eye on the objective, and 3) a facilitator should be neutral and free of conflicting interests.

A maximum of four sub groups can be facilitated simultaneously by two experienced facilitators. For less experienced facilitators it is highly recommended to host only one group or a maximum of two groups per workshop session. The best results arise when focussed solely at one group at a time. The facilitator takes on a leading role to facilitate the participant groups by guiding them through the workshop steps, clarifying critical moments and enabling breakthroughs. The booklet with 'Guidelines for Participants', a paper script, assists the facilitator in guiding the participants through the workshop steps. With every step the facilitator explains the participants what is expected from them, whilst simultaneously leaving the guidelines open enough for interpretation. When a group gets 'stuck' in the process, the facilitator tries to intervene by asking questions or by presenting the group with examples [8]. During the full length of the workshop a facilitator tries to stimulate creative

thinking, by avoiding criticism and time-boxing each of the tasks [9]. Moreover, the facilitator makes sure all participants will be provided with an equal amount of time to express themselves and will manage possible more 'dominant' participants [10].

The co-facilitator assists the facilitator in guiding the groups through the workshop process, moreover the co-facilitator makes sure all materials are in place and data elicited through the workshop is captured. It is the co-facilitator who has most insight in the elicited data, the co-facilitator therefore often leads the analysis of the Co-Creative Workshop results [11].

Participants

A group of participants consists of five to six participants, since this group size enables group discussions, whilst all participants are still able to contribute individually [11]. The participants of the workshops are ideally stakeholders and end-users who are preselected based on the

context of your LSP project. Depending on the objective, participants can be targeted directly (e.g. for a predefined design challenge) or a broader selection (e.g. to find new use cases) can be made. In either case, it is however important to invite a mixture of participants with different expertise fields (i.e. users as experts of their own experiences [11] and characters (e.g. realist, innovator, creator, etc. [8])). When selecting end-users and stakeholders to form a group of workshop participants, it is important to anticipate on the group dynamics by taking local political issues or sensitivities into account [8]. Ideally also members of your organisation (e.g. researchers and developers) participate in the workshops in order to empathise with the stakeholders and end-users who are eventually going to use the solutions created in the LSP projects.

Preparing the participants on forehand can be useful to establish a shared mind-set among the participants in the group or to quickly 'break the ice' [12]. There are multiple methods to prepare participants for a workshop. Cultural Probes [13], in e.g. the form of a diary study, can be given to
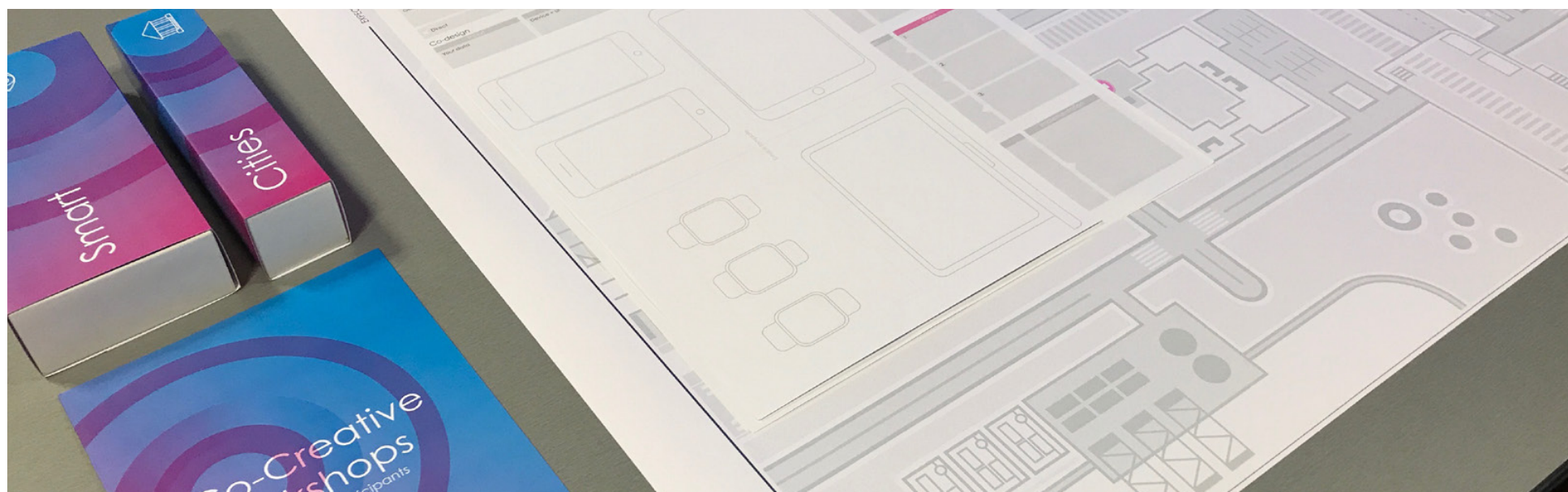

Figure 1: Preparing the workshop room by arranging the workshop materials on the table(s).

the participants in advance of the workshop. An assignment of which the results can also be beneficial to eventually put the workshop results into context. On the U4IoT website, the End-user Engagement Toolkit also offers a number of methods that can be used in conjunction with the Co-Creative Workshop Methodology.

Ideally participants will be able to participate also in later phases of the project. Engaging participants throughout the project can provide participants with a sense of ownership, possibly becoming ambassadors of the co-created solutions. Ambassadors can help to increase acceptance of solutions and ease implementation [14, 15].

Planning

A workshop planning defines the workshop activities and the duration of each of the activities, it helps coordinating the organisation and facilitation of a Co-Creative Workshop. The planning of a workshop mostly depends on the objective, number of groups and the selected phases. On the 'Preparation Template' (Appendix A) you can find a planning example, which can be adjusted according to your needs.

It can be helpful to pilot the workshop with members of your team, in order to estimate if the timing in the planning is correct, so you can make

changes accordingly before actually organising the workshop with participants. Remember that the timing is an estimation, it can differ per group how long the participants will need to complete each of the phases. Try to find the right balance, stimulating fruitful discussions whilst encouraging the group to finish within the set time.

Space

To stimulate creativity, it is important to make participants feel at ease, an informal environment can help to accomplish this [11]. Providing participants with food and something to drink before, during and after the workshop session can help to break the ice, refresh and stimulate participants to start a conversation with one another.

The size of the room depends on the number of groups you want to facilitate. The workshop table(s) in the room should be large enough for a group of participants to sit around and lay out the workshop materials, yet small enough to enable all participants to reach the workshop materials and have a group discussion. An example of a workshop room and table set-up is visualized in figure 2. The set-up in figure 2, visualizes a room with one table. A similar set-up can be made for two, three or four tables, according to the number of groups you want to host.

The facilitator should be able to move freely between the tables and the co-facilitator has to be able to capture data in the form of video, audio and pictures. Besides the table(s) to host the participants on, an extra table to put e.g. the

(co-)facilitators materials and equipment, but also the food and drinks on can be beneficial to maintain overview.

Data Capturing & Consent

During a Co-Creative Workshop, a large amount of information is generated. It is often difficult to capture all this information by taking notes. Intermediate results can be noted by the participants themselves on the 'Location- and Stakeholder Templates'. Capturing the data of the workshop through video, audio and pictures is therefore evident to replay footage of the workshop and analyse results. The co-facilitator ensures the workshop process of all groups is recorded and that all results are photographed at the end of the workshop. If possible allocate a Dictaphone and a video camera on a tripod to each table, ask the co-facilitator to walk around with a camera to capture additional footage. It is evident that all the workshop results are captured to be able to communicate the results to members of your organisation, LSP partners or other LSP projects.

Take notice that you need consent from the people participating in the workshop to record them and to use the data generated in the workshop. An example letter of consent can be found in Appendix B. If possible inform the participants beforehand, print the letter of consent and ask each participant to sign it before the workshop starts.
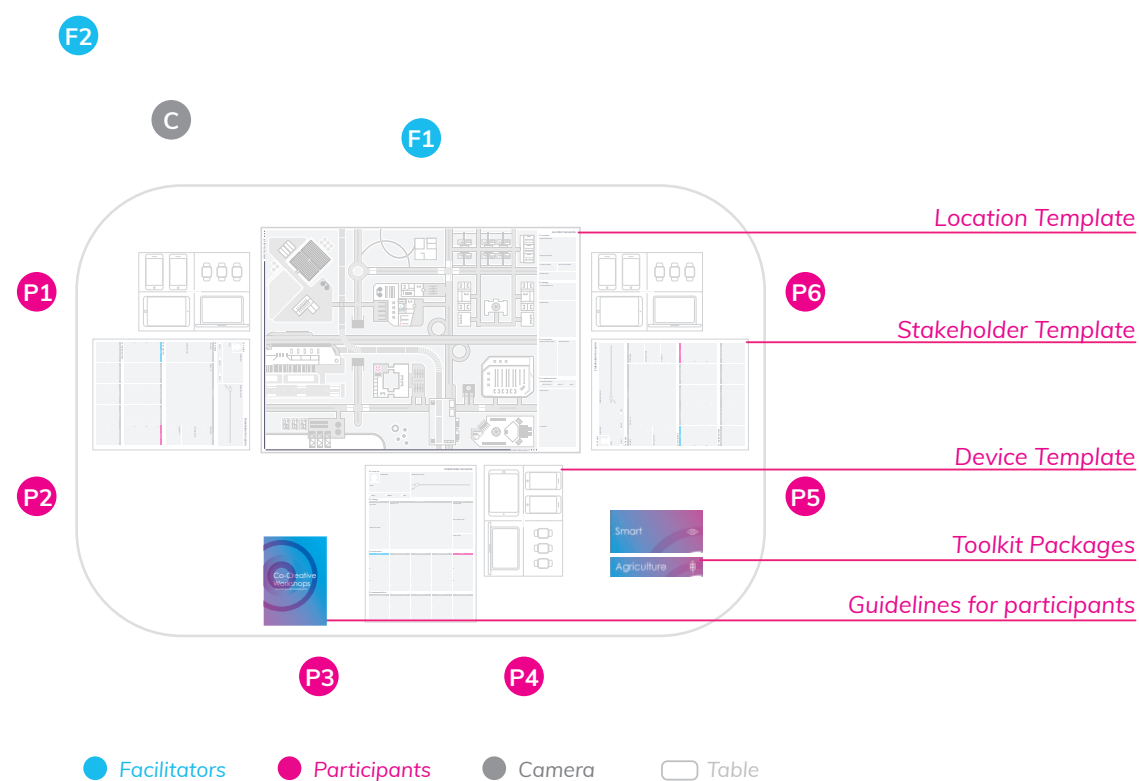

Location Template

Stakeholder Template

Device Template

Toolkit Packages

Guidelines for participants

● Facilitators   ● Participants   ● Camera   ▢ Table

Figure 2: Example workshop room and table set-up.

Chapter 3

Co-Creative Toolkit & Methodology

Co-Creative Workshop Toolkit

This Section describes the materials in the Co-Creative Workshop Toolkit. A full overview of the content in the toolkit can be found in Appendix D, along with the Co-Creative Workshop Templates that are displayed in Appendix E of this handbook - the 'Handbook for Facilitators'. This handbook, together with the 'Guidelines for Participants' can be downloaded online on the U4IoT website[8]. The 'Co-Creative Toolkit' can be provided by the U4IoT consortium on request. Figure 3 displays all the elements of the Co-Creative Workshop Toolkit. The toolkit consists of Guidelines, Templates and Toolkit Packages.

The materials (number 1-6) that are visualized in figure 3, are briefly described on page 21. Where moreover information is provided on the context in which the materials can be used and the number of items that are needed per workshop group.

In figure 1 & 2 is visualised how the Co-Creative Workshop templates are set-up on a workshop table and where the facilitators and participants are allocated around the table. Moreover, there is displayed where to put a video camera to capture the workshop process. Make sure you also record the workshop process of each table by means of a Dictaphone.

When preparing the workshop tables, the 'Smart- and Contextual Workshop Packages' can be already made available on the table(s). Also provide the participants of each group with ballpoint pens (one per participant pair – three in total) to document their findings on the 'Location- and Stakeholder Templates', a black non-permanent marker (one per table) to draw the data-flows on the 'Location Template' and a white chalkboard marker (one per multiple tables) to draw their own icons or sensors if necessary.

1. Guideline Booklet
2. Location Template
3. Device Templates
4. Stakeholder Template
5. Smart Package
   A. Actors
   B. Smart Objects
   C. Sensor Rings
   D. Sensors
6. Contextual Packages
   E. Picture Cards
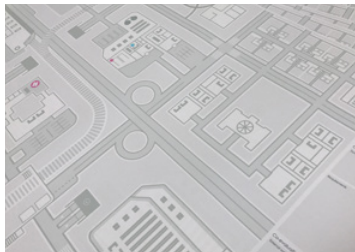   F. Contextual Objects

Figure 3: Co-Creative Workshop Toolkit.

All contexts, one item per group

Guideline Booklet for participants

Booklet with guidelines for participants, containing a more concise description of the steps described in the next Section to provide participants with guidance during the workshop and assist the facilitator.

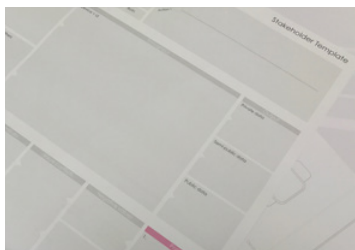**All contexts, one item per group**

Location Template

Template that functions as a placeholder for each of the contexts. The 'Location Template' will be used throughout each of the phases.

All contexts, three items per group

Device Templates

Template with the outline of different devices to assist participants to draw user interfaces during the Co-design phase.

All contexts, three items per group

Stakeholder Template

Template on which participants can map stakeholder profiles. The 'Stakeholder Template' will be used throughout each of the phases.

All contexts, one item per group

Smart Package: General Objects, Actors, Sensor Rings, Sensors

Package with General Objects, Actors, Sensor Rings and Sensors that can be used for each of the contexts and is needed mainly for the Co-analysis and Co-design phase.

Five different packages (one for each context), one item per group

Contextual Package: Picture cards, Contextual Objects

Package with Picture Cards for the Co-analysis phase and Contextual Objects for the Co-design phase. Select the package, i.e.: Mobility, Entertainment, Agriculture, Cities or Health that fits your LSP context.

Co-Creative Workshop Methodology - 4 Phases

A co-creative process can consist of many different phases. With each phase, another form of value creation can be accomplished [16]. Enabled by this handbook and the 'Co-Creative Workshop Toolkit', a facilitator can assist participants to complete a four step co-creative cycle.

In the first phase, the Co-analysis phase participants are going to analyse the context to explore possibilities, define use cases and generate solution spaces. During the second phase, the Co-design phase, participants will give shape to the solution generated in the Co-analysis phase by defining the main functionalities of the solution. The objective of the third phase, the Co-evaluation phase, is to evaluate the solution generated in the Co-design phase by means of stakeholder values. In the last phase, the Co-implementation phase, participants are going to define the implementation process, with the aim to identify the factors of influence on a decision to adopt the solution or to reject it. When all the phases are completed the workshop results in a variety of use cases and a co-created solution including requirements that inform the future design and development phases of your LSP project.

This section contains the guidelines for each of these four phases, accompanied with an introduction, checklist, tips for facilitation and an example. The phases are in conjunction with the guidelines in the more concise booklet with 'Guidelines for Participants'. With each of the phases a time indication is provided. Note, this is an indication and can differ per workshop group.

The checklist indicates what workshop materials are needed per phase. The guidelines are described in concise steps that are meant to help the facilitator to guide the participants through the workshop process. After each step is indicated whether it is an individual-, pair- or plenary step. The tips are specified per phase and offer practical attention points that are useful for facilitation of the respective phase. The phases are concluded with an example in the form of pictures and a description to illustrate the outcome of each phase.

The co-creation process that is taken as an example was focussed on the topic 'Smart Cities' and was part of a by U4IoT facilitated workshop that took place during the IoT Week 2017 in Geneva[9].

8. U4IoT - www.u4iot.eu
9. IoT Week 2017 Geneva - www.iot-week.eu/iot-week-2017

Phase 1

Co-Analysis

Duration: 30 - 45 minutes

Figure 4a: Associating with 'Picture Cards' and sharing ideas.

INTRODUCTION

In this first phase, the Co-analysis phase, partici-pants are going to analyse the context by means of 'Picture Cards'. Pictures elicit emotions and memories and carry many different layers of meaning and associations [17]. 'Picture Cards' are therefore ideal to explore possibilities, define use cases and generate solution spaces. Based on the selected solution space participants will formulate a design challenge, identify the stakeholders involved, define the scenario and visualise the stakeholder journey for the selected stakeholders. The preliminary solution that is generated in this phase forms the main input for the next phase - the Co-design phase.

If you already defined a design challenge, but did not yet define the idea completely, then try to gather ideas based on this challenge with or without using the 'Picture Cards'. A set of pre-defined cards is provided. If you need more specific cards to associate solutions for a more specific design challenge you can look for pictures online and add them to the toolkit yourself.

CHECKLIST FOR THIS PHASE

☐ Smart Package: Actors

☐ Contextual Package: Picture Cards

☐ Location Template (Co-analysis)

☐ Stakeholder Template (Co-analysis)

GUIDELINES*

1. Introduce the Co-analysis phase and describe the context, then ask the partici-pants to each grab five 'Picture Cards'. Help them to associate and to generate an idea for one or several of the cards. The ideas can still be general and can even just be the starting point for a new use case. [Individ-ually]

2. Keep an eye on the time, ask if all participants are ready. Let them share the generated ideas with each other by presenting them one by one, make a complete round, until everyone presented their ideas. Map the ideas on the 'Location Template' according

to the scale indicating feasibility (left side) and impact (at the bottom). Point out that the ideas in the top right corner are probably most interesting and ask the participants to collectively choose the most promising idea by each casting a vote. [Plenary]

3. Help the participants to formulate a (more specific*) design challenge and ask them to write the design challenge down on the right side of the 'Location Template'. Based on this challenge ask the participants to build out the scenario in terms of stakeholders involved (who), objective (what), location (where), time of day / month / year (when) and benefits (why). [Plenary]

4. Ask the participants who are the most important stakeholders to take into account and ask them to choose a maximum of three direct / indirect stakeholders. Divide the participants in pairs of two and ask each pair to represent one stakeholder. Use the 'Stakeholder Templates' to identify the stakeholders, describe their goals and map

their actions on the time line. This stake-holder journey map forms the main input for the Co-design phase. [Pairs]

FACILITATION TIPS

• Make participants feel at ease, let them introduce themselves to each other.

• Emphasise that the participants are the experts in their domain and that they can express themselves freely.

• Introduce the Co-analysis phase and encourage out-of-the-box thinking.

• Make sure all participants are enabled to contribute.

• Appoint participant pairs to represent the selected stakeholders and ask them to take notes on the 'Stakeholder Templates'.

• Try to form multi-disciplinary partici-pant pairs (e.g. an end-user to represent

Figure 4b: Co-analysis phase in the Guidelines for Participants Booklet, associating individually with the 'Picture Cards'.

the selected stakeholder and a member of your organisation to empathise with the end-user).

EXAMPLE

Co-analysis on the 'Location Template'

Due to food- and parcel delivery, traffic in the city centre has increased especially during rush hours and pollution rates have gone up. Package suppliers have more and more trouble to enter the city centre, consequently reducing their delivery speed and costing them revenue. For the topic Smart Cities, a solution for the 'Delivery of Small Packages' was therefore Co-analysed.

By means of the 'Picture Cards' and especially triggered by the card with the delivery bike on it [Step 1 & 2 - (figure 4a, b & c)], the following design challenge was formulated during the Co-analysis phase: "How can the delivery system of small packages be optimised (what) in order to reduce traffic and pollution in the city centre (where) during rush hours (when)". The stakeholders (who) of this use case are compa-

nies, suppliers, the municipality, post offices and citizens (end-users / consumers). The main benefits (why) for these stakeholders are increased delivery speed, flexibility of delivery processes, less traffic and consequently less pollution (sustainability) [Step 3 - (figure 4d)].

After finishing the use case documentation on the 'Location Template' the Smart Cities team among others chose to elaborate on the Supply Companies as a stakeholder.

Co-analysis on the 'Stakeholder Template'

As a supplier, I'm a direct stakeholder and I would like to have a more efficient delivery system to reduce my costs (goal(s)). My journey is as follows: (1) I stop the vehicle in an external parking lot and unload the packages, (2) I use the application to select the next transportation vehicle, (3) I make a match between the post office, vehicle and address, and (4) finally I monitor if the package is delivered [Step 4 - (figure 4e)].
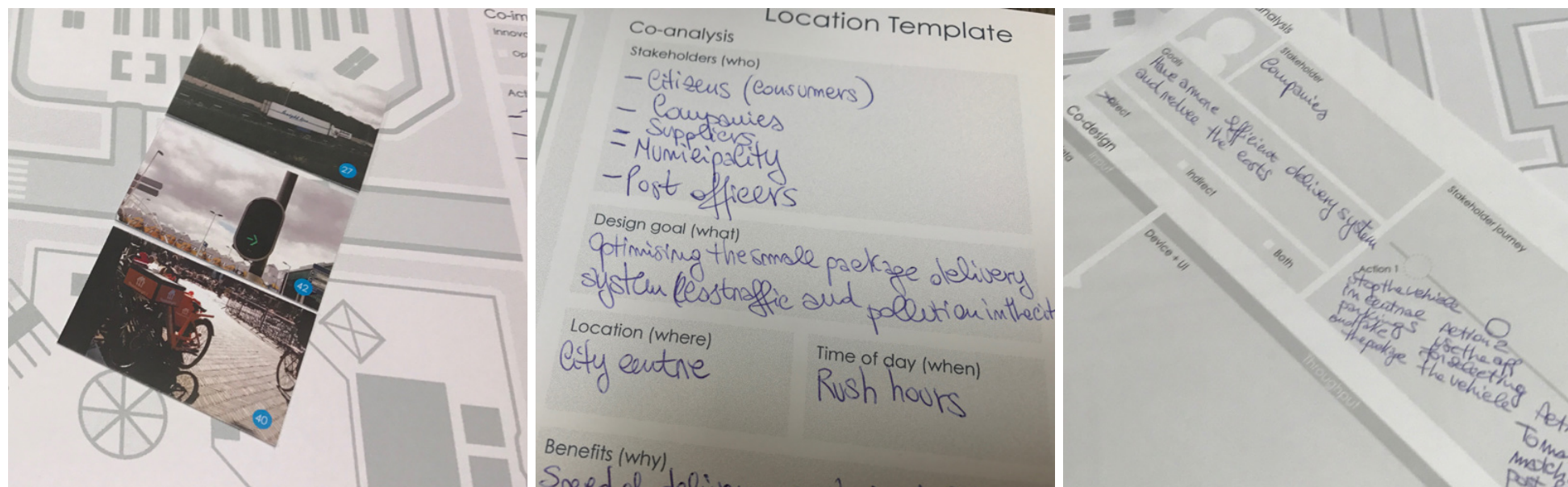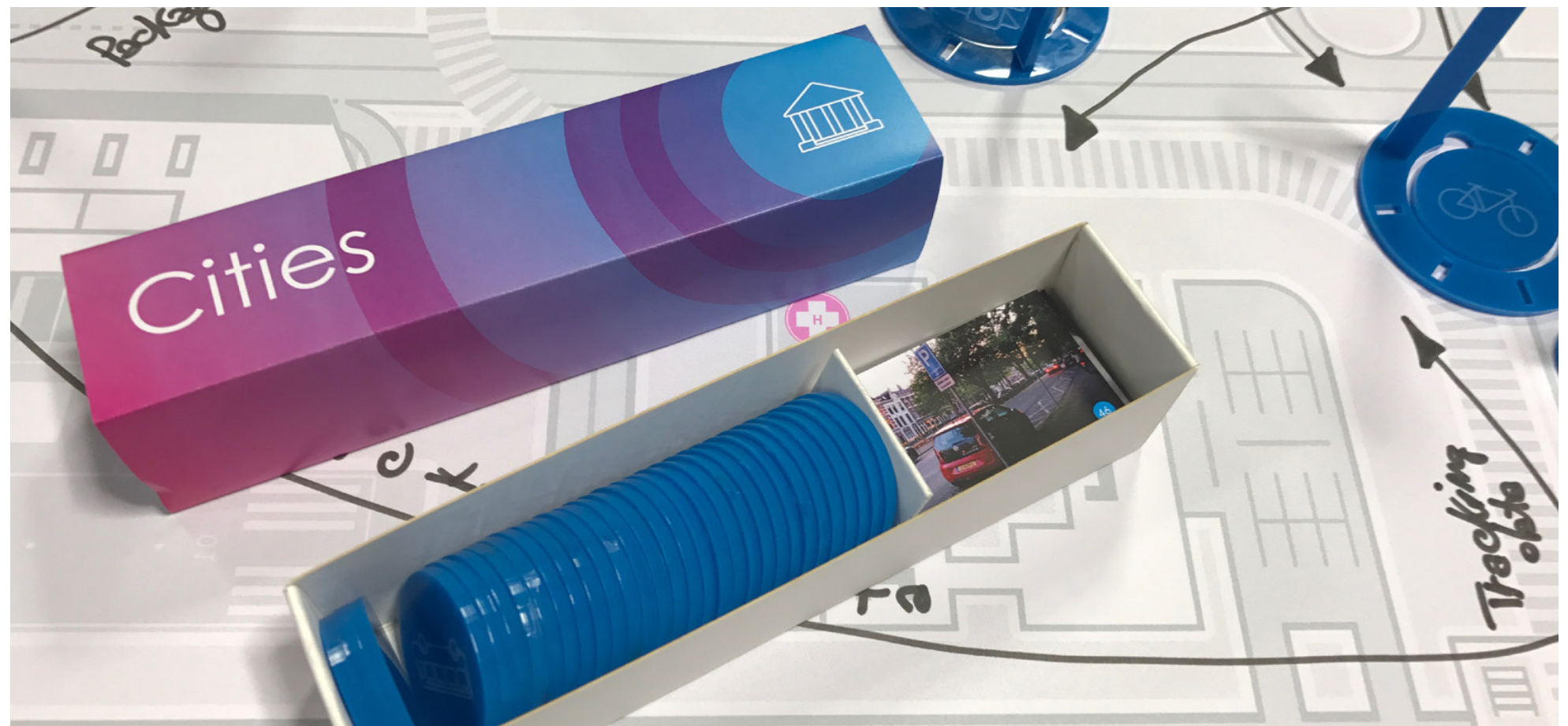

Figure 4 (left to right): c) 'Picture Card' selection, d) Documentation on the 'Location Template' & e) Documentation on the 'Stakeholder Template'.

Phase 2

Co-Design

Duration: 30 - 45 minutes

Figure 5a: Contextual Package for the Co-design phase and the context of Smart Cities.

INTRODUCTION

During this second phase, the Co-design phase, the participants will give shape to the solution generated in the Co-analysis phase. By means of generative tools [17], participants are going to co-design a solution based on the perspectives of different stakeholders. Based on the actions of the different stakeholders, the main functionalities of the solution will be defined. With these functionalities in mind the participants will pin-point the location of the interaction, define the (smart) objects and sensors involved and visualise the network by mapping out the data-flows. For each stakeholder the input data, user interface and data settings will be defined. By presenting the co-designed solutions, latent needs can be uncovered, follow the discussion carefully to distillate requirements.

CHECKLIST FOR THIS PHASE

- ☐ Smart Package: Sensor Rings and Sensors
- ☐ Contextual Package: Objects
- ☐ Stakeholder Template (Co-design)
- ☐ Location Template (Co-design)
- ☐ Device Template

GUIDELINES

1. Ask the participants to put the 'Location Template' in the centre of the table, make sure everybody can reach it. If the desired location isn't available on the template, invite the participants to fold the right-side column, flip the template and draw their own map on the back of the template. Refer to the scenario that was built in the Co-analysis phase. Try to move from idea to solution by specifying the functionalities the solution should contain (how). [Plenary]

2. Provide participants with the 'Smart and Contextual Packages' and ask them to define which objects are relevant for the solution. If the objects needed are not available in the toolkit, invite participants to draw their own objects on the back of the object tokens with a white chalk board marker. Appoint them to the 'Location Template' and ask them to define the locations were interaction with the solution takes place. Let them then put the selected objects on the specified locations. [Plenary]

3. Explain the participants how to make the respective objects smart by placing a 'Sensor Ring' around them. The toolkit holds metaphorical sensors, these representations of the human senses indicate a sensor for sight, scent, sound, touch and taste. Moreover, the brain symbolises data storage, two blank sensors are added to draw on with a white chalk board marker, so participants can define their own sensors if needed. Ask the participants to select the relevant 'Sensors' from the toolkit and place them in a 'Sensor Ring' around an object. Let them

build the necessary hubs for their solution. [Plenary]

4. The hubs can be connected by drawing the data flows on the 'Location Template'. Ask the participants to define what kind of data is transmitted and write the data type next to the respective data flow. [Plenary]

5. Ask the participants to return to the participant they partnered up with in the previous phase. Ask them which devices are relevant for the interaction, encourage them to imagine what device the stakeholder they represent would use in this situation. If the preferred device isn't available on the 'Device Template', ask them to draw their own device on the 'Stakeholder Template'. Let them define the input data, draw the user interface on a 'Device Template' and ask them to define if the generated output data should be public, semi-public or closed. [Pairs]

6. When all participant pairs are ready, ask

Figure 5b: Co-design phase in the Guidelines for Participants booklet.

them to present and discuss the drawn user interfaces. Ask the participants why they chose to keep their data private or share it freely. When they chose to make their data semi-public, ask them with whom they share this data and what the sharing conditions are. Stimulate them to make changes according to the discussion and to document requirements on the 'Location Template'. This step forms the conclusion of this phase and will prelude the Co-evaluation phase. [Plenary]

FACILITATION TIPS

- Introduce the Co-design phase and stimulate creative thinking.
- Intervene during critical situations, ask questions or provide participants with examples if they can't immediately think of relevant functionalities.
- Ask the group to think out loud when building the solution.

- Ask the group to present the designed system to understand their considerations.
- Emphasise that the materials are available to be used freely. If you notice a participant is hesitant to write on the materials, e.g. the 'Location Template', make a first start by drawing or writing something on the template yourself.
- If needed 'borrow' objects from other 'Contextual Packages'.
- Provide participants with a white chalk board marker to draw their own sensors or objects if they are not available in the toolkit.

EXAMPLE

Co-design on the 'Location Template'

Post offices are not working the whole shift hours anymore due to the decreased usage of letters. The co-created solution therefore uses the post offices and their knowledge to distribute packages more efficiently to the city centre. The packages will be dropped off at a bike sharing

parking outside the city centre, close to the post offices. The bikers and the post offices will split the work to deliver the packages to both consumers and companies. The route of the bikers is optimised by sensors installed by the municipality in the city centre, e.g. on traffic lights. The sensor data is made accessible to all parties and can be shared and extracted for analysis, the sensors enable e.g. the municipality to monitor traffic streams (how) [Step 1 - (figure 5c)]. During the Co-design phase the solution was visualised by means of the 'Co-Creative Toolkit' [Step 2, 3 & 4 - (figure 5a & d)]. The IoT network was built with the 'Objects' and 'Sensors', and the data flows between the sensor hubs were drawn.

The following preliminary requirements [Step 6 - (figure 5c)] were formulated:

- The solution has to contain a tracking system, to keep track of the packages and share information between the stakeholders to coordinate delivery processes.
- The solution has to contain a platform to monitor the systems for data analysis and optimisation.

- The solution has to contain a fleet management system to control the vehicles used for the delivery processes.
- The city has to be equipped with sensors to optimise the routes of the delivery bikers.
- There has to be enough available parking space just outside the city centre near the postal offices.
- Human resources are needed to design, develop and implement the service.

Co-design on the 'Stakeholder Template'

In order to complete the actions in my journey I need to gather data on the type of packages and location of the respective packages. From others, I need tracking data to follow the complete journey of each of the packages. As a Supplier, I use my mobile phone to access the application, to manage and analyse the data I use my laptop or iPad. The phone application is also used by the end-consumers who order the packages and the bikers who deliver the packages. The municipality makes use of the laptop or iPad interface to monitor the sessions. [Step 5 - (figure 5e)].
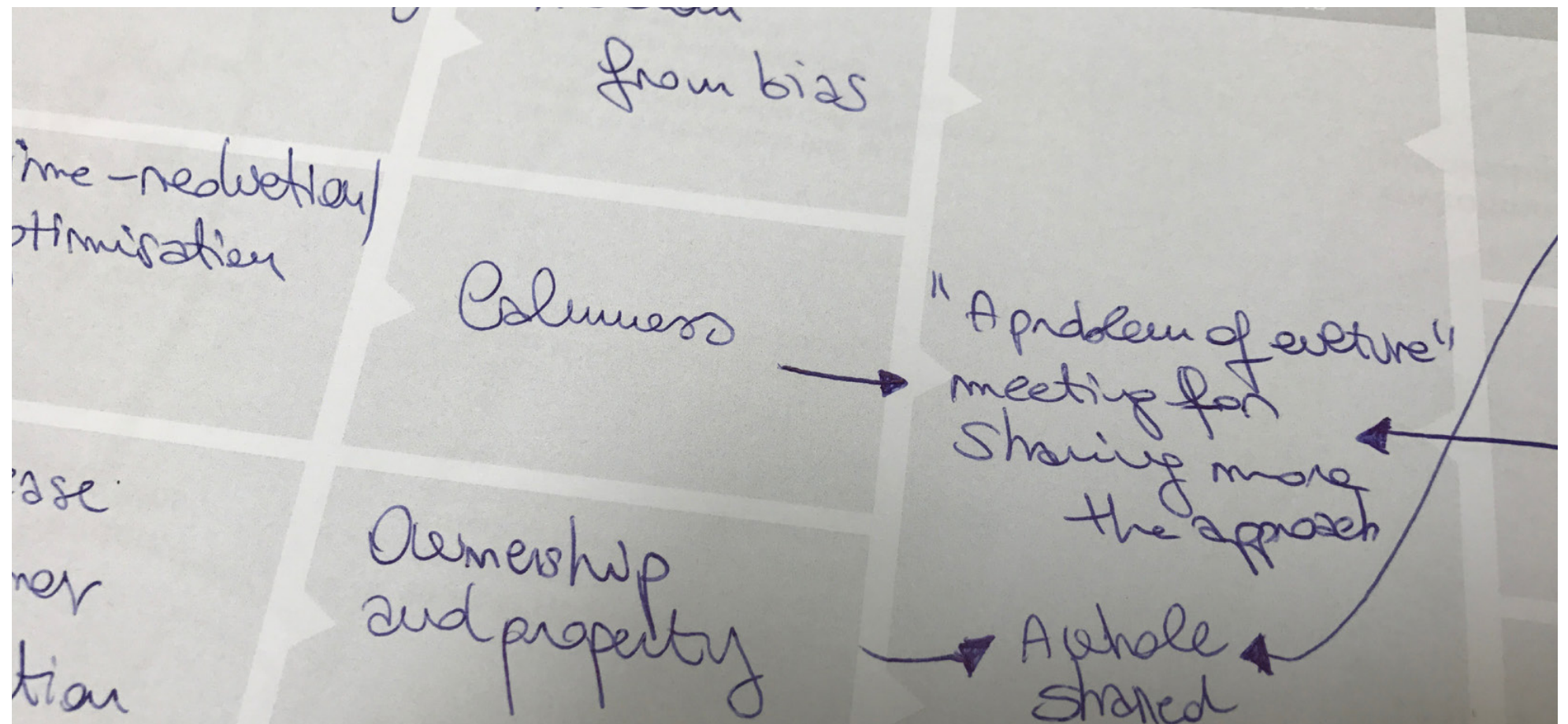

Figure 5 (left to right): c) Documentation on the 'Location Template', d) Building the solution and visualizing data flows & e) Interface design on the 'Stakeholder Template'.

Phase 3

Co-Evaluation

Duration: 30 - 45 minutes

Figure 6a: Value conflicts and trade-offs on the 'Stakeholder Templates'.

INTRODUCTION

The objective of this third phase, the Co-evaluation phase, is to evaluate the solution generated in the Co-design phase by means of stakeholder values. Internal stakeholder conflicts or external conflicts between different stakeholders can arise, e.g. safety vs. security [18]. When values are in conflict with each other, it is necessary to adjust your requirements by making trade-offs. Values are very important and influence stakeholders in their decision to adopt the solution or to reject it and this phase therefore forms the base for the Co-implementation phase.

CHECKLIST

- ☐ Stakeholder Template (Co-evaluation)
- ☐ Location Template (Co-evaluation)

GUIDELINES

1. Introduce the Co-evaluation phase and ask the participant pairs to use the 'Stakeholder Template' to map three gains (left side of the template) and three pains (right side of the template) they expect their stakeholder to experience when using the co-designed solution. [Pairs]

2. On the back of the 'Stakeholder Template' there can be found a list (figure 6b) with universal values [18]. Ask the participant pairs to read through the list and match the values with the pains and the gains listed earlier. Emphasise that the values are generally interpretable, let participants define them in more detail according to their needs or to define their own values. [Pairs]

3. Ask the participants to go through the listed positive and negative values, let them verify if there are values that are in conflict with each other. Ask them to map these internal value conflicts in the central column on the 'Stakeholder Template'. Ask them to decide which value is of more importance, by choosing one value over another. [Pairs]

4. Now let each participant pair one by one present their findings. After all pairs have presented, ask them what external value conflicts they could identify. Elicit discussion and encourage participants to determine contradictions. Let them define how they are going to choose between one value or another to make necessary trade-offs. Ask them to document the conflicting values and the trade-offs on the 'Location Template' by choosing one value over another. [Plenary]

FACILITATION TIPS

- Explain the values on the list, emphasise that they can be broadly interpreted.
- Ask participants to explain the values they have chosen, what do they mean for the stakeholder they represent?
- Elicit discussion between participants and listen carefully, why are certain trade-offs made?
- Stop the discussion if the group wonders off too far from the original topic.
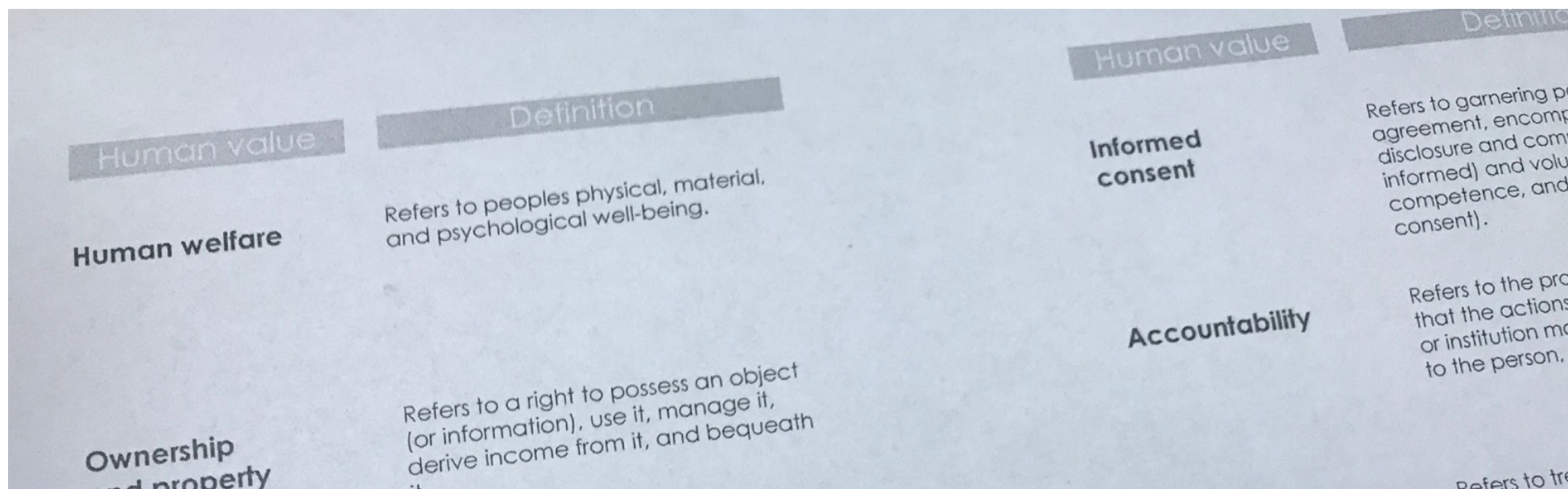
Figure 6b:. List of Universal Values [18] on the back of the 'Stakeholder Template'.

EXAMPLE

Co-evaluation on the 'Stakeholder Template'

Advantages of the service would be that it makes my delivery processes, as a Supplier, more cost-effective (matching the value: Freedom from Bias), since optimisation (matching the value: Calmness) of the delivery process reduces delivery times. Moreover, it can increase customer satisfaction (matching the value: Ownership and Property). Possible pains can include losing control (matching the value: Trust) of the full process, since an additional step is added in the middle of my initial process. Because of this, managing the whole process (matching the value: Accountability) and tracking the pack-ages (matching the value: Universal Usability) through the system could also become more difficult. Trade-offs between these internal value conflicts are necessary and should be incorpo-rated in the design of the service [Step 1, 2 & 3 - (figure 6a, b & c)].

Co-evaluation on the 'Location Template'

The Co-evaluation phase was concluded with the following discussion. There are multiple stakeholders involved in order to establish this service and to enable it to work. It is not a one layer process and therefore can be difficult to manage. Trust plays an important role. As a trade-off, clear agreements have to be made in terms of the Accountability of the different stakeholders and the ownership of the data generated [Step 4 - (figure 6d)].

Figure 6 (Left to right): c) Value conflicts and trade-offs on the 'Stakeholder Templates' & d) Value conflicts between different stakeholders on the 'Location Template'.

Phase 4

Co-Implementation

Duration: 30 - 45 minutes

Figure 7a: Overview and presentation of the co-created solution.

INTRODUCTION

During this fourth and last phase, the Co-implementation phase, the participant pairs are going to analyse the implementation process of the stakeholders they represent, with the aim to identify the factors of influence on a decision to adopt the solution or to reject it. The steps of impl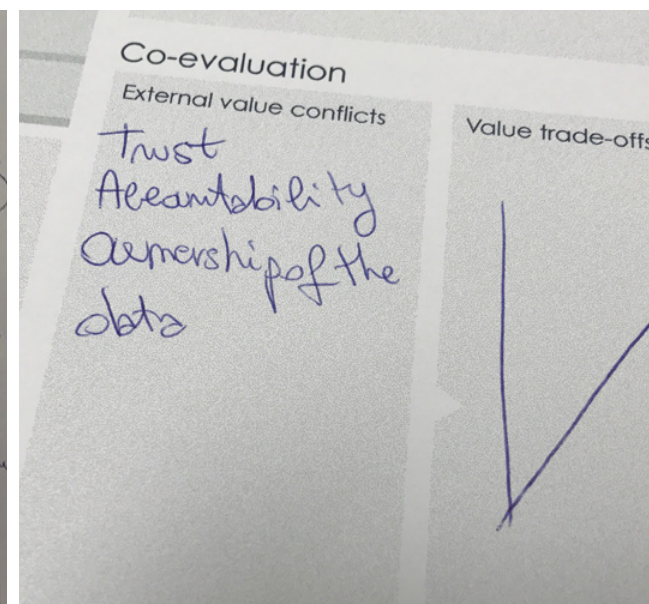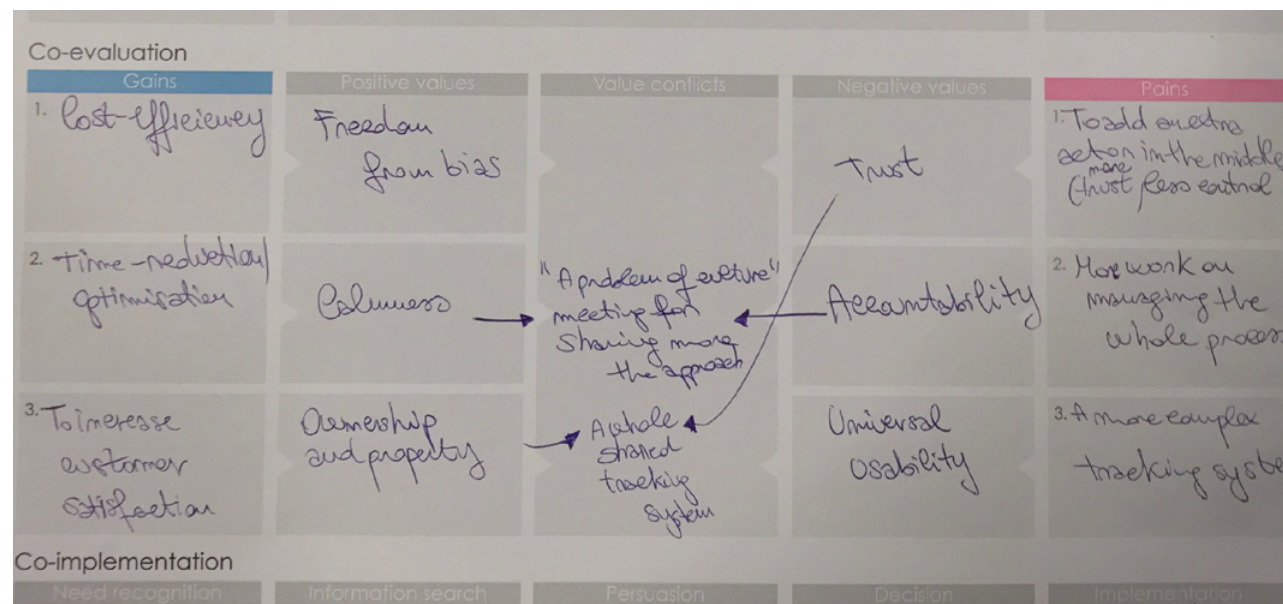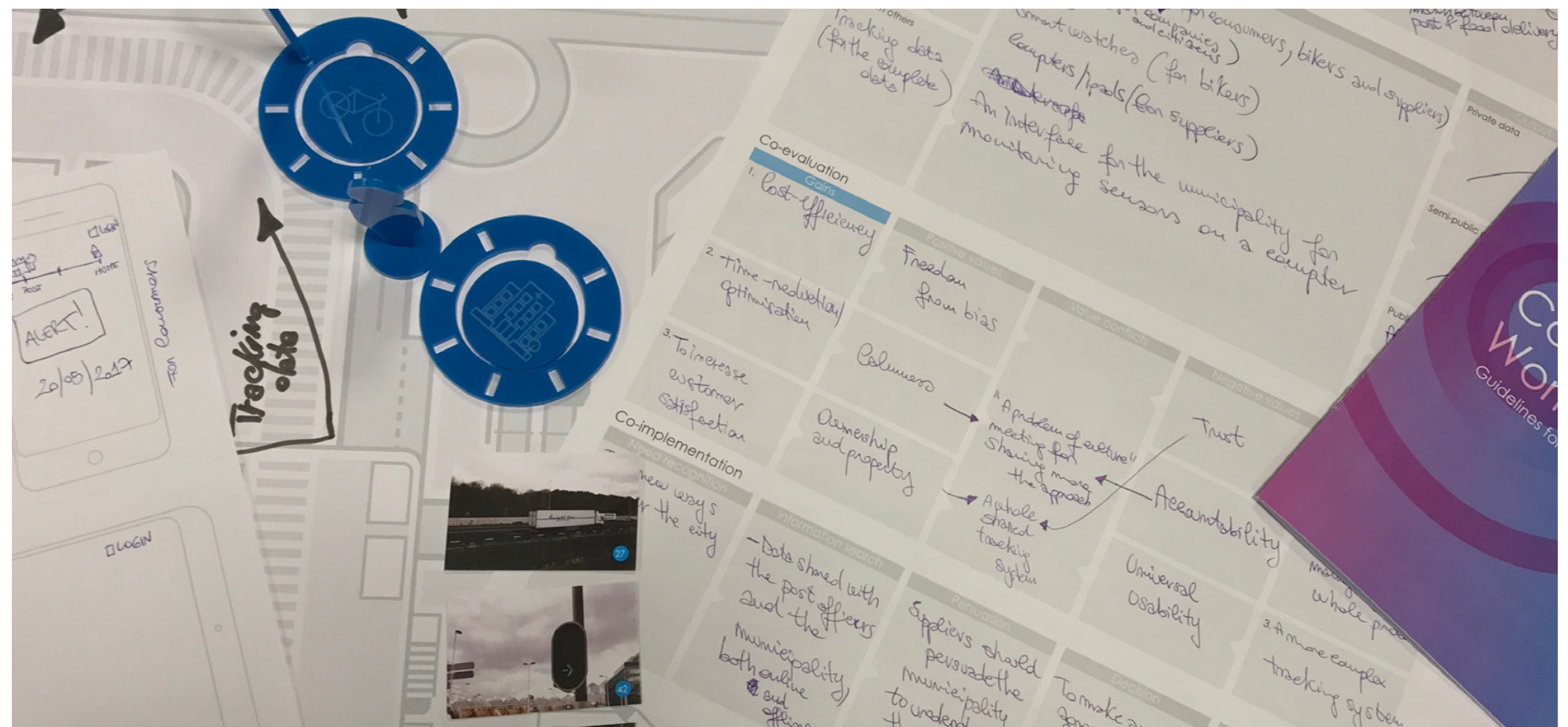ementation are derived from the Diffusion of Innovations model of Rogers [19]. Based on the implementation processes of the different stakeholders, concrete action points are formulated to form a roadmap to inform implementation of the solution on a broader scale. At the end of this phase, results are exchanged and the workshop is finalised with a discussion.

CHECKLIST FOR THIS PHASE

☐ Stakeholder Template (Co-implementation)

☐ Location Template (Co-implementation)

GUIDELINES

1. Introduce the Co-implementation phase. Ask the participants to discuss and determine whether the solution that was co-created during the Co-design phase is optional to implement as an individual, will be collectively driven and implemented or implementation will be driven by an authority. Ask them to later document the conclusion on the 'Location Template'. [Plenary]

2. Ask the participant pairs to return to the 'Stakeholder Template' and complete the five steps towards implementation.

   First, ask them to identify when the stakeholder they represent experiences an actual need for the co-created solution and if this is based on e.g. its character, social influences or a functional need (try to elicit if the stakeholders belong to the category of innovators, early adopters, early majority, late majority or laggards).

   Second, let them identify the online or offline information channels their stakeholder uses to gain information about the solution.

   Third, ask them to identify what is needed to persuade their stakeholder to adopt the solution, e.g. usefulness (trialability, advantage, etc.) or ease of use (service, complexity, compatibility, etc.).

   Fourth, let them define if their stakeholder would adopt or reject the solution and at last ask them what is needed to implement the solution in the stakeholder's daily life on the short-, mid- and long term (or in case of initial rejection to reconsider adoption). [Pairs]

3. When all pairs have completed the previous step, ask each pair to present their implementation process to the other pairs. Try to steer their discussion towards concrete action points needed to implement the solution on a broader scale. [Plenary]

4. Discuss the workshop results with the group, ask the participants to plenary reflect on the workshop and to write down their action points and conclusions on the 'Location Template'. In case of multiple groups, provide each group with the opportunity to prepare a short presentation and share the results of their table with the other groups. Close the workshop with a short recap, explain the follow-up process and thank the participants for their time and efforts. [Plenary]
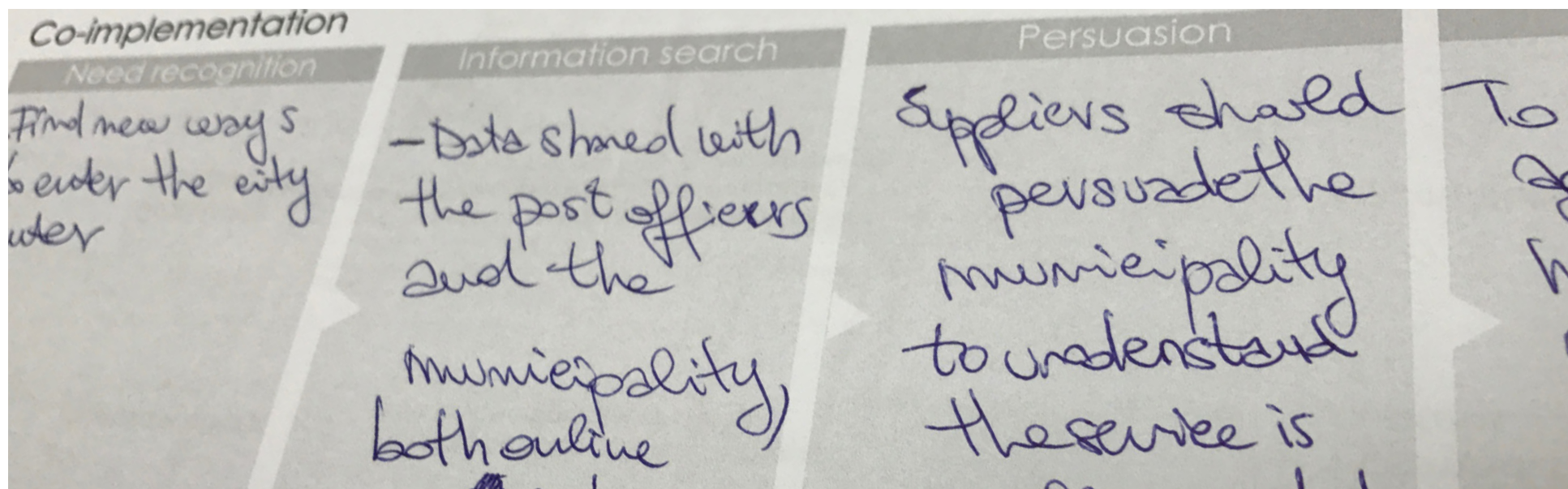

Figure 7b:
Implementation process on the 'Stakeholder Template'.

FACILITATION TIPS

- Emphasise that the implementation cycle on the 'Stakeholder Template' should specifically address the adoption behaviour of the represented stakeholder.

- If needed, support participants with examples of implementation processes in a similar context.

- Try to elicit information on the factors that influence the implementation process of the stakeholders.

- Link the insights to the Diffusion of Innovations model of Rogers [19] in order to understand the adoption process of each of the stakeholders.

- Thank participants for their time, inform them when the results of the workshop will be communicated.

EXAMPLE

Co-implementation on the 'Stakeholder Template

To implement the solution, as a Supplier, I first need to realise that I have to find new ways to enter the city centre to make my delivery processes more efficient. In order to gain information about the service to decide if it can be interesting for my company, I need to search for online / offline information about the data that can be shared with the post offices and the municipality. I then have to persuade the municipality that the service is really needed and that the sensors have to be installed in the city centre. When all three stakeholders agree on how to proceed, I can decide to adopt the service. In order to implement the service in my current delivery process, I need to build the infrastructure, tracking systems, sensors and have to teach the right skills to my employees to operate the system [Step 2 - (figure 7b)].

Co-implementation on the 'Location Template'

The choice to implement the service is collective [Step 1 - (figure 7c)], since the service is built on the principle of interdependency between the stakeholders. The following action points [Step 3 & 4 - (figure 7c)] were formulated:

- The stakeholders have to agree on an approach to realise the service.

- The infrastructure for the service has to be built, sensors have to be installed in the city centre and a tracking system has to be realised.

- A data sharing system has to be developed and made accessible to all stakeholders.

- The employees of the suppliers, post offices and municipality have to be educated to work with the service.

- End-users / consumers have to be invited to use the service to order their food or parcels (dissemination and production).

The participants in the Smart Cities workshop group concluded that it can be a hurdle to agree on an approach to realise the service. Moreover, the necessary change in culture of the employees can make adoption more difficult. In the long run, the service can however become very efficient and beneficial to optimise delivery processes in the city centre [Step 4 - (figure 7c)].

After completing all four workshop phases the participants of the Smart Cities group presented their co-created solution and findings to the other workshop groups [Step 4 - (figure 7a)].
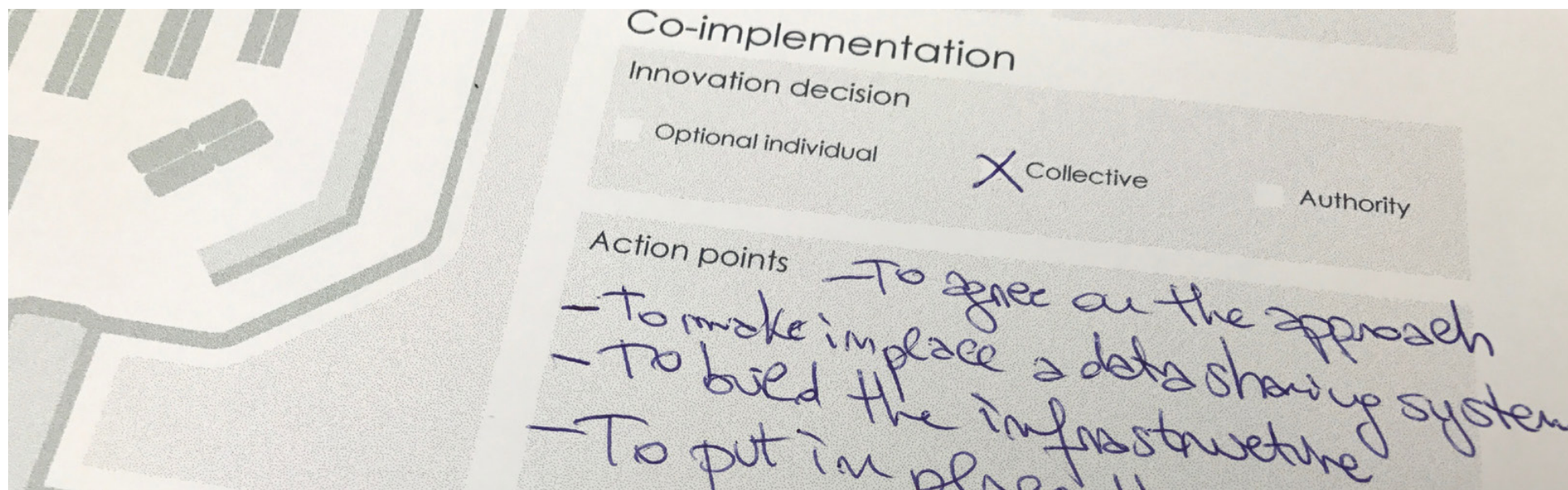
Figure 7c:
Implementation decision, and discussing the implementation processes of different stakeholders.

Workshop Analysis & Documentation

Co-Creative Workshop Analysis

Documenting the findings of a Co-Creative Workshop can be an overwhelming process. During the workshop solutions were generated, designed, evaluated and participants indicated how to implement the solution. Moreover, discussions were captured, notes and pictures were taken. All this data has to be analysed in order to gain insights in the needs of participants, find patterns and define requirements for the design and development phases. In this Section, we provide you with some practical tips to analyse the data that was generated during a Co-Creative Workshop and communicate insights.

The data gathered in a Co-Creative Workshop are qualitative and consist of anecdotes elicited in discussions, stakeholder profiles, visualised

solutions and drawn user interfaces. The co-facilitator observed the participants and followed discussions during the workshop. It is recommended that the co-facilitator documents these insights directly after the workshop finishes [11]. Moreover, also all co-created materials are ideally gathered and digitalised directly after the workshop by taking photographs. Do not leave behind any information that can be relevant.

Playing back the footage recorded during the workshop provides the facilitators who now become analysts with the opportunity to carefully analyse the workshop activities to gain insights in the needs of stakeholders and end-users. Especially the discussions between participants contain important information. It can therefore

be useful to transcribe the discussions, in order to highlight quotes, cluster reoccurring topics and identify patterns [20]. Highlighted quotes can then be written down on post-its and can be clustered into topics. The clustered information is now ready to be interpreted by the researchers and rephrased in order to communicate it to others.

There is no fixed method or rule to analyse the data [11]. The amount of data varies, according to the number of groups, and in case of a large number of groups the analysis phase can take up quite some time. In order to speed up the process a qualitative data software can be used to analyse large data sets. According to your objectives, the analysis phase can however be either less or more intense. Sometimes it is enough to be able to empathise with participants, whilst in other cases the objective can be to indicate specific requirements for the design and development phases.

Documentation & Communication

Remember that the data produced during the Co-Creative Workshops are qualitative and cannot be used to draw hard conclusions [11]. It is meant to inform and inspire LSP partners with the aim to evoke empathy for the stakeholders and end-users involved.

How you communicate the insights depends mostly on the audience and your objectives. Insights can be visualised through i.e. personas, customer journey maps, storyboards or sketches. It is however also possible to communicate quotes, use cases, written scenarios or requirements.

Share your insights not only with members of your organisation, LSP partners, other LSP projects,

but also with the people who participated in your workshop. Ask them if your interpretations are correct and invite them to think along in the next phases of your LSP project.

Communicating Co-Creative Workshop results ideally encourages collaboration between members of your organisation, stakeholders and end-users, in order to further inform future design and development processes of your LSP project. An example report, documenting the two workshops held during the IoT Week 2017 in Geneva, can be found alongside the workshop materials on the U4IoT Knowledge Base.
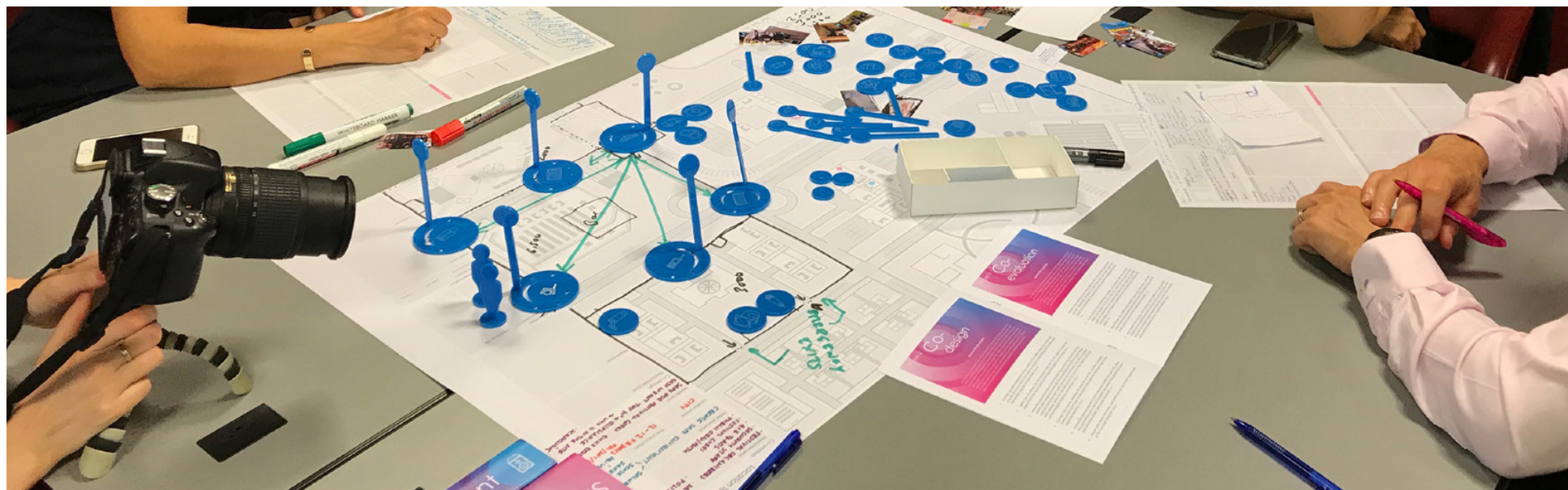
Figure 8: Capturing data during a Co-Creative Workshop to analyse the data and document the insights in the form of a report.

Thank you!

Thank you for your interest in the Co-Creative Workshop Methodology handbook. The handbook describing the Co-Creative Workshop Methodology that is especially produced by Stembert Design for the LSP projects in the European IoT Large-scale pilots programme, is part of the U4IoT support services. U4IoT moreover supports the LSP projects to implement the Co-Creative Workshop Methodology into their projects and provides LSP partners with support to organise and facilitate Co-Creative Workshops.

Besides the Co-Creative Workshop Methodology, U4IoT provides numerous other end-user engagement tools and support services. Please visit the U4IoT website (www.u4iot.eu) or contact us (contact@u4IoT.eu) for more information.

Nathalie Stembert (SD)

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Appendix A

Preparation Template

This 'Preparation Template' can be useful when organising a Co-Creative Workshop. Remember that this template can be adjusted according to your needs. After you filled-out the 'Preparation Template' and gathered all the Co-Creative Workshop materials from the Toolkit, it can be helpful to pilot the workshop with members of your team, so you can make changes accordingly before actually organising the workshop with participants.

CONTEXT

☐   Mobility

☐   Entertainment

☐   Agriculture

☐   Cities

☐   Health

OBJECTIVE

☐   Find new use cases and co-create solutions

☐   Start from a predefined use case with an open design challenge and co-create solutions

☐   Co-create solutions for a specific design challenge*

☐   Co-evaluate and/or co-implement an existing solution

DESIGN CHALLENGE (ONLY IF ALREADY DEFINED)*

....
....
....
....
....
....

*e.g. Make festivals safer by means of IoT or provide farmers with a sense of control over their data by means of IoT.

NUMBER OF WORKSHOPS

Number of workshops planned: ....

ALLOCATED TIME

☐ Half a day (4 hours)

☐ Full day (8 hours)

☐ Multiple days: # of days ...

PHASES

☐ Co-analysis

☐ Co-design

☐ Co-evaluation

☐ Co-implementation

FACILITATORS**

Number of (co-)facilitators: ....

***It is recommended to allocate a facilitator and a co-facilitator per group to facilitate the participants and capture all insights.*

A maximum of four groups can be facilitated by two experienced facilitators.

PARTICIPANTS (MAX 5-6 PER GROUP)

Number of groups: ....

Type of participants***	First name	Last name	Email	Telephone #
1				
2				
3				
4				
5				
6				

****e.g. Local citizens (2x), city planner from the municipality (1x), local SME owner (1x), researcher (1x), designer (1x) or farmer (2x),*

processor (1x), consumer (1x), researcher (1x), designer (1x).

PLANNING EXAMPLE

	Action	Duration	Time
1	Walk in and welcome	15 min	
2	Introduction facilitators and workshop	15 min	
3	Participant introduction per table	15 min	
4	Co-analysis phase	30-45 min	
5	Co-design phase	30-45 min	
6	Co-evaluation phase	30-45 min	
7	Co-implementation phase	30-45 min	
8	Plenary presentations	30 min	
9	Wrap up	15 min	
10	Gathering and documenting results	30 min	
Total		4 - 5 hrs	

YOUR PLANNING

	Action	Duration	Time
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Total			

Appendix B

Checklist

This checklist contains all materials needed to facilitate a co-creative cycle with one group of participants.

Facilitators and participants

☐ 2 (experienced) facilitators

☐ 5-6 Participants

General necessities

☐ Table & 5-6 chairs

☐ Preparation Template

☐ Handbook for facilitators

☐ Guidelines for Participants

☐ Consent form and registration

Equipment

☐ Video camera and tripod

☐ Dictaphone

☐ Materials to take notes (computer or pen/paper)

Co-analysis phase

☐ Picture Cards (Contextual Package)

☐ Actors (Smart Package)

☐ Stakeholder Template (Co-analysis)

☐ Location Template (Co-analysis)

Co-design phase

☐ Objects (Smart- and Contextual package)

☐ Sensor Rings (Smart Package)

☐ Sensors (Smart Package)

☐ Stakeholder Template (Co-design)

☐ Location Template (Co-design)

☐ Device Templates

Co-evaluation phase

☐ Stakeholder Template (Co-evaluation)

☐ Location Template (Co-evaluation)

Co-implementation phase

☐ Stakeholder Template (Co-implementation)

☐ Location Template (Co-implementation)

Appendix C

Letter of Consent

INTRODUCTION

Thank you for your interest to participate in this Co-Creative Workshop. If you decide to participate in this Co-Creative Workshop you will be asked to take part in a co-creative cycle of one or more of the four phases; Co-analysis, Co-design, Co-evaluation and Co-implementation. The workshop takes more or less .... [Duration of the workshop] hours and will take place at .... [Location] in collaboration with other participants.

CONFIDENTIALITY

We will take the following steps to keep information about you confidential, and to protect it from unauthorized disclosure, tampering, or damage: only partners of the .... [your LSP project] consortium will have access to the original data, the data will be described in general ways. The analysis of the audio files and notes will be related to .... [your LSP project] and its efforts, not on an individual level. Quotes might be used to highlight aspects of the workshops, but it will not reveal who expressed it.

Scientific publications will be made based on the data from a LSP perspective, not at an individual level. The notes, pictures, audio- and video recordings made during the workshop will be used for internal research, scientific publications and/or for .... [your LSP project] promotion purposes.

COPYRIGHT

The rights of the solutions co-created during this workshop are reserved to .... [your LSP project] and cannot be claimed by participants who took part in the co-creative process from which the solution originated.

RIGHTS OF PARTICIPANTS AND FACILITATORS

Participation in this study is voluntary. You have the right not to participate at all or to leave the workshop at any time. If you withdraw from the workshop, your data will be excluded from the workshop results.

The facilitators may stop the workshop or take you out of the workshop at any time if they judge it is in your best interest. They may also remove you from the workshop for various other reasons. They can do this without your consent.

CONTACT INFORMATION

Send an email to .... [your contact information] if you have questions about your participation in the Co-Creative Workshop.

CONSENT OF PARTICIPANT (OR LEGALLY AUTHORIZED REPRESENTATIVE)

By signing this consent form, I provide .... [your LSP project] with the consent to record (through notes, pictures, audio- and video recordings) my activities in the Co-Creative Workshop held on .... [workshop date]. Moreover, I declare that this data can be freely used by .... [your LSP project] for the full duration of the .... [your LSP project] and that the CSA U4IoT has the permission to add the results from this workshop to the U4IoT Knowledge Base.

Participant name: ....

Organisation (optional): ....

Contact details (email): ....

Signature: **Date**:

....

Appendix D

Content Co-Creative Workshop Toolkit

The table underneath displays a full overview of the content of the Co-Creative Toolkit. It shows the templates and the materials in the 'Smart- and Contextual Packages' that are needed to complete each of the four co-creative phases.

Co-creative Workshop Toolkit and Templates					
	Mobility	Entertainment	Agriculture	Cities	Health
Co-analysis					
Templates	Location Template	Location Template	Location Template	Location Template	Location Template
	Stakeholder Template	Stakeholder Template	Stakeholder Template	Stakeholder Template	Stakeholder Template
Contextual Packages	Picture Cards	Picture Cards	Picture Cards	Picture Cards	Picture Cards
Smart Package	Actors	Actors	Actors	Actors	Actors
Co-design					
Templates	Location Template	Location Template	Location Template	Location Template	Location Template
	Stakeholder Template	Stakeholder Template	Stakeholder Template	Stakeholder Template	Stakeholder Template
	Device Template	Device Template	Device Template	Device Template	Device Template
Smart Package	1x House	1x House	1x House	1x House	1x House
	1x Tree	1x Tree	1x Tree	1x Tree	1x Tree
	1x Car	1x Car	1x Car	1x Car	1x Car
	1x Police car	1x Police car	1x Police car	1x Police car	1x Police car
	1x Ambulance	1x Ambulance	1x Ambulance	1x Ambulance	1x Ambulance
	1x Wallet	1x Wallet	1x Wallet	1x Wallet	1x Wallet
	6x Sensor Ring	6x Sensor Ring	6x Sensor Ring	6x Sensor Ring	6x Sensor Ring
	6x Actors	6x Actors	6x Actors	6x Actors	6x Actors
	2x Sent Sensor	2x Sent Sensor	2x Sent Sensor	2x Sent Sensor	2x Sent Sensor
	2x Touch Sensor	2x Touch Sensor	2x Touch Sensor	2x Touch Sensor	2x Touch Sensor
	2x Taste Sensor	2x Taste Sensor	2x Taste Sensor	2x Taste Sensor	2x Taste Sensor
	2x Sight Sensor	2x Sight Sensor	2x Sight Sensor	2x Sight Sensor	2x Sight Sensor
	2x Sound Sensor	2x Sound Sensor	2x Sound Sensor	2x Sound Sensor	2x Sound Sensor
	2x Memory Sensor	2x Memory Sensor	2x Memory Sensor	2x Memory Sensor	2x Memory Sensor
	2x Blank Sensor	2x Blank Sensor	2x Blank Sensor	2x Blank Sensor	2x Blank Sensor
Contextual Packages	1x Stop sign	1x Ticket	1x Eggs	1x Flat	1x Bed
	1x Parking sign	1x Barrier	1x Meat	1x School	1x Staircase
	1x Hotel	1x Beer bottle	1x Storage box	1x Hotel	1x Cooker
	1x Toilet sign	1x Beer can	1x Drone	1x Airport	1x Stove
	1x Train	1x Knife	1x Pig	1x Train	1x Helicopter
	1x Coffee	1x Water bottle	1x Certificate	1x Factory	1x Pan
	1x Car	1x Stage light	1x Beehive	1x Oil platform	1x Book

Co-creative Workshop Toolkit and Templates					
Contextual Packages	1x Cab	1x Speaker	1x Billboard	1x Robot arm	1x Fishing rod
	1x Crossing	1x Camera	1x Scarecrow	1x Camera	1x Key
	1x Roadmap	1x Mixing panel	1x Cash register	1x Ticket machine	1x Clothes
	1x Truck	1x Stage	1x Grains	1x Windmill	1x Trailer
	1x Car key	1x Microphone	1x Fence	1x Fire truck	1x Glass
	1x Bridge	1x Festival tent	1x Milk/cheese	1x Hospital	1x Hospital
	1x Roadblock	1x Food stand	1x Animal food	1x Tram	1x Wine
	1x Charging point	1x Photo camera	1x Storage building	1x Government	1x Medical report
	1x Cone	1x Tent	1x Wine barrel	1x Airplane	1x Clock
	1x Bus	1x Flag	1x Tractor	1x Bus	1x Bus
	1x Road sign	1x Fire cracker	1x Milk truck	1x Flowers	1x Vase
	1x Gate	1x Hamburger	1x Silos	1x Boat	1x Medical kit
	1x Steering wheel	1x Backpack	1x Milk machine	1x Garbage truck	1x Money
	1x Mirror	1x VIP pass	1x Shop	1x Trashcan	1x Itinerary
	1x Advertisement	1x Toilet paper	1x Weather station	1x Weather station	1x Swimming pool
	1x Airbag	1x Screen	1x Cow	1x Sold sign	1x Fridge
	1x Dashboard	1x Taser	1x Windmill	1x Scooter	1x Halter
	1x Car battery	1x Dog	1x Shopping card	1x Terrace	1x Crutches
	1x Suitcase	1x Walkie-talkie	1x Barn	1x Suitcase	1x Television
	1x Traffic light	1x Drugs	1x Sprinkler	1x Traffic light	1x Lamp
	1x Road	1x Hand cuffs	1x Crops	1x Road	1x Stethoscope
	1x Insurance	1x Gun	1x Insect	1x Streetlight	1x Medicine
	1x Bicycle	1x Bomb	1x Shelves	1x Food truck	1x Bicycle
	1x Fork lift	1x Drone	1x Wine	1x Bicycle	1x Toothpaste
	1x Gas pump	1x Medical kit	1x Food truck	1x Parking	1x Shop
Co-evaluation					
Templates	Location Template	Location Template	Location Template	Location Template	Location Template
	Stakeholder Template	Stakeholder Template	Stakeholder Template	Stakeholder Template	Stakeholder Template
Co-implementation					
Templates	Location Template	Location Template	Location Template	Location Template	Location Template
	Stakeholder Template	Stakeholder Template	Stakeholder Template	Stakeholder Template	Stakeholder Template

Appendix E

Co-Creative Workshop Templates

The pictures underneath display the three templates that need to be provided to the participants in the Co-Creative Workshops. Per table of five to six participants, one 'Location Template', three 'Stakeholder Templates' and three 'Device Templates' are needed. Throughout all the four phases the 'Location Template' and the 'Stakeholder Templates' are used. The 'Device Template' is solely used during the Co-design phase.

LOCATION TEMPLATE
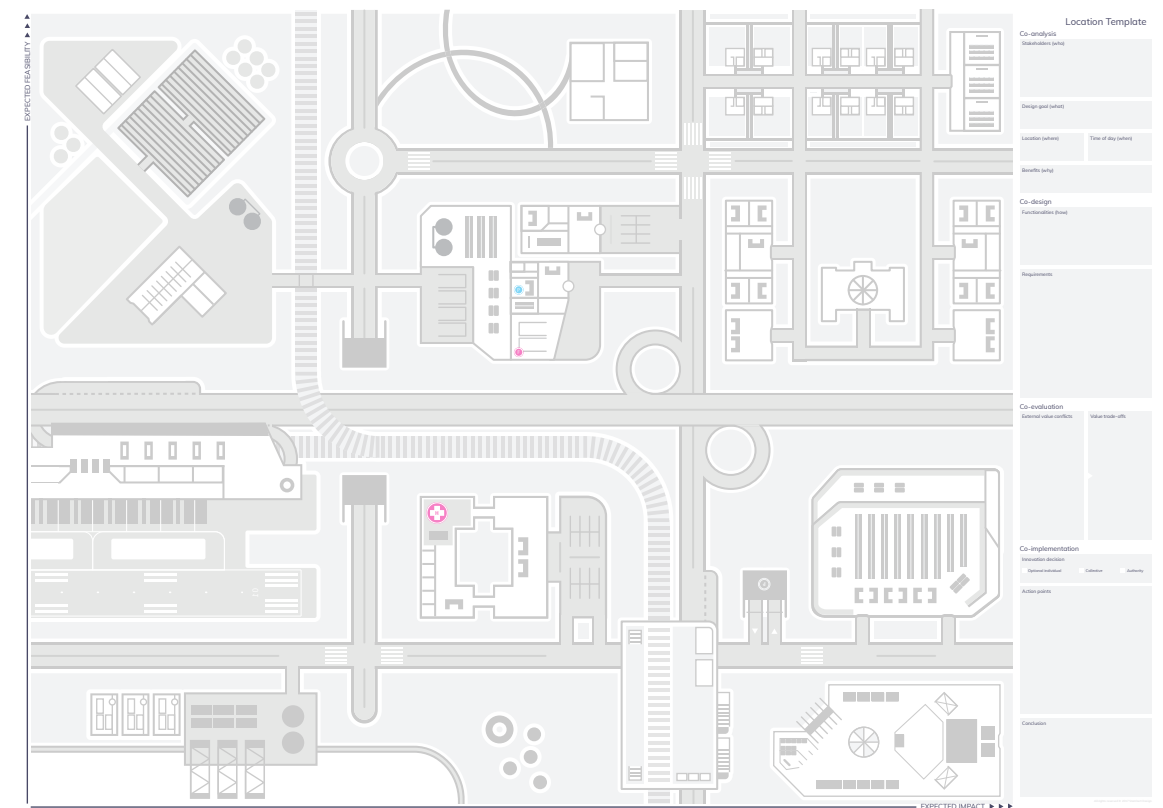
STAKEHOLDER TEMPLATE

Stakeholder Template

Co-analysis

Stakeholder

Goals

Stakeholder journey

Action 1

☐ Direct   ☐ Indirect   ☐ Both

Co-design

Input	Throughput	Output
Your data	Device + UI	Private data
Data from others		Semi-public data
		Public data

Co-evaluation

Gains	Positive values	Value conflicts	Negative values	Pains
1.				1.
2.				2.
3.				3.

Co-implementation

Need recognition	Information search	Persuasion	Decision	Implementation

DEVICE TEMPLATE

Device Template