Survey on Co-design Methodologies in Urban Design

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1.1	01.12.2017	All co-writers	D2.3 ready for co-writer review
1.2	22.12.2017	Katrina Heijne	D2.3 ready to share for U_CODE partner review
2.0	31.01.2018	Katrina Heijne	Final version: Ready to upload to EU

Executive Summary

This report originated from research project „*U_CODE: Urban Collective Design Environment: A New Tool for Enabling Expert Planners to Co-create and Communicate with Citizens in Urban Design"*, which is funded by the European Union.[1] Under the leadership of the *Technische Universität Dresden* Laboratory of Knowledge Architecture (Prof. Dr.-Ing. Jörg R. Noennig), the pan-European research project will develop methods and processes for the involvement of a broader public community in large Urban Design projects.

Deliverable 2.3, "*Survey on Co-design Methodologies in Urban Design"* is about:

1. establishing a deeper understanding of the dynamics of Co-creation processes;
2. reviewing existing community-based tools and methods with a special focus on game-based approaches;
3. providing insight in the impact of cultural differences and legal frameworks within different European countries.

This report (and its sub studies) cover this broad spectrum of topics and additionally aims to provide guidelines and requirements for the U_CODE designers and developers. Research methods and analysis include literature research, reviews, expert interviews, systematic internet research, case studies and discussions within the U_CODE team.

Ucodesign

Both in literature as well as in daily practice, the concepts of Public Participation and Co-design are not straightforward. Different disciplines and even different people within the same discipline use these concepts in different ways in different situations. Therefore, the first aim of this report was to develop a definition regarding these concepts to promote a shared understanding within the context of U_CODE. In order to develop the definitions, the stakeholder groups were simplified into two groups: Citizens and Professionals. Citizens are the end-users of the U_CODE tool and represent a broader group of stakeholders beyond citizens, i.e.: local authorities, interest groups and local business. Professionals are the people professionally involved in the project of Urban Planning, Urban Design and Architectural Design, e.g. urban planners, authorities, architects, etc. Three Professional-Citizen interaction types were distilled: User-Centered Design (UCD), Participatory Design (PD) and Co-Creation (CC). UCD is more on a consultation level, while the latter two (PD and CC) are on a collaboration level and therefore can be referred to as what we will call Ucodesign. The main difference between PD and CC is that in CC the Professionals and Citizens interact and collaborate in a mutual value creation process, while in PD the Citizens are 'only' actively involved by the Professionals.

[1] Horizon-2020-Programme „ICT 19: Technologies for creative industries, social media and convergence", Grant ID 688873 U_CODE. Further information at http://www.u-code.eu

The proposed definition for Co-Creation is "*the process of mutual Professional-Citizen value creation. This facilitated (creative) process generates an active form of interaction and sharing between Professionals and Citizens. (instead of the active Professional, passive Citizen interaction). One of the results of Co-Creation is that the contact between Professionals and Citizens moves away from transactional and becomes an experience."*

Ucodesign (PD and/or CC) has many benefits for Citizens as well as Professionals, both from an agency and project perspective. E.g. for citizens it results in a better experience and satisfaction with the public space and a more developed civil society. For projects, it improves the quality and fit of the end result, while reducing the risk of implementation which directly influences duration and costs of a project. Regarding agencies, it improves their credibility, trust and support; leads to better relations and cooperation internally and externally and it also helps them become more effective and human-centered.

However, these benefits only apply when the principles of Ucodesign are taken into account. Otherwise, it will only create mistrust, waste Professionals' and Citizens' time and money and can seriously undermine future Ucodesign attempts. Some examples of Ucodesign principles are: being clear on the purpose; having multiple solution directions still open; and providing feedback to the Citizens on how their inputs were used. Some principles that specifically apply to Co-Creation are that Professionals and Citizens should be working on an equal level, while an active form of interaction and sharing is ensured. Both should provide valuable input into the joint space of creation. The output should create value (of any kind) for both professionals and citizens. In addition, the three basic rules of Creative Facilitation should be applied: firstly, role clarity and rigidity (between Facilitator, Problem Owner and Resource Group); secondly, the golden rules for each state (diverging, reverging and converging); and thirdly, a clear problem statement (SPARK!).

Ucodesign on Mass-scale

When transplanting Ucodesign activities to the massive scale Urban Design context, some facets need to be considered thoughtfully. For example: how to keep citizens engaged in long term urban projects with fuzzy, complex and shifting goals? And how to deal with a shifting group of participants? To answer these questions a wide variety of topics was elaborated on, i.e. Selection Bias; Communication Channels; Boundary Objects; Gamification; and Acceptance Finding and Change.

Gamification

By implementing game elements in non-game contexts – in the present case matters of Urban Design – desired user actions can be fostered. These user actions comprise giving contributions in regard to the Urban Design process such as publishing ideas, opinions and comments and thereby ensure an intense discourse. That is why gamification is considered suitable for effectively supporting participation processes. Because an appropriate gameful design can be highly valuable for creating mutual collaboration between all stakeholders, gamified tools in the field of Urban Design have already been implemented in various ways. Especially crowdsourcing platforms intensely added game elements such as leaderboards, badges or so called missions to their

platforms in order to make participation more enjoyable and in that way, to also foster long-term motivation.

Nevertheless, this report will show that implementing game elements in a proper manner is a complex task and should not be underestimated. In some cases, a false implementation of game elements can cause reverse effects and lead to demotivation, for instance if new entrants of a participation platform realize their profiles on the bottom of a long-term leaderboard. Furthermore, gamification is no panacea as some participants may see the serious field of Urban Design inappropriate for being gamified. Though, current scientific research states an overall positive effect of gamification when it comes to user motivation and therefore is worth being investigated within this project.

Tools and Methods

A systematic review of Co-design and game-based tools and methods was conducted, mostly in the context of Urban Design, some in other contexts, e.g. Urban Planning and Product Service Systems. The methods were all collected in a database, called the MethodBank. The MethodBank covers a state-of-the-art research and as such contains methods that are useful in order to improve participation processes in the field of Urban Design. For reasons of clarity, the database presents the results by using three main categories that were examined by theoretical implications on the different stages of public participation: therefore, it was investigated whether a method improves the (1) *information* or the (2) *consultation* of the public as well as the (3) *collaboration* between citizens and other relevant stakeholders. UCD would be on the participation level of *consultation*. Within *collaboration* a distinction can be made between PD and CC. Additionally, the MethodBank provides several filtering options that e.g. locates a database entry in the stage of the Urban Design process or distinguishes whether it is to be used online or offline and. In that way, the database facilitates the further exploitation of the findings.

Methodologies, Mindsets and Culture

Tools and methods are never a stand-alone matter. Tools and methods are organized, clustered and approached through methodologies. But most critical is the mindset in which these tools and methodologies are used. This mindset depends again on the culture. Therefore this report pays special attention to the mindset which is needed to apply Ucodesign, e.g. how the mindset for diverging stages differs from converging stages. Cultural dimensions in different European countries were compared and it was concluded that some countries are culturally more predisposed towards using Ucodesign tools and methods. Besides cultural dimensions, countries also differ in how the legal framework is institutionalized. U_CODE should find a way to use those frameworks to her advantage. It must be noted that direct transplantation of a U_CODE tool into all European countries may be challenging.

Conclusion and Recommendations

All research, reviews, interviews, analysis, case studies and discussions finally led to a list of 40 requirements that the developers and designers should take forward in the development of the

U_CODE platform and tools. As part of *Work Package 7: Testbeds and Evaluation* this list will be translated into a testable checklist for assessing any U_CODE tool, before proceeding to usability testing.

Although D2.3 is the final version of the report "Survey on Co-design Methodologies in Urban Design", the U_CODE project itself is still in progress. This means that some activities within the scope of D2.3 should be continued beyond this deliverable, since it may affect or support the U_CODE project. Therefore, we will continue:

- Covering any upcoming significant developments in the fields of Co-design, Co-creation and Gamification;
- The search for emerging tools and methods relevant to Ucodesign;
- Extending and updating the MethodBank;
- Covering any changes in legislation in the EU that may affect the implementation of the U_CODE platform or tools;
- Investigating cultural differences. As part of *D7.2: "Cross-cultural comparison study"* we will proceed with this topic to better understand how the different tools can be implemented in the different countries and whether specific requirements are needed.

Table of Contents

1 Introduction

1.1 Setting the Stage

This D2.3 report about „Survey on Co-design methodologies in urban design“ is a revised version of D2.1 and aims at establishing a deeper understanding of the dynamics of Co-creation and Co-design processes in the Urban Planning context, and more specifically: in the urban design context. Urban design was chosen as the focus area or *zone of influence* for project U_CODE and is part of the broader Urban Planning process as can be seen in figure 1. To better understand the differences between Urban Planning, urban design and Architectural Design, find the definitions below.

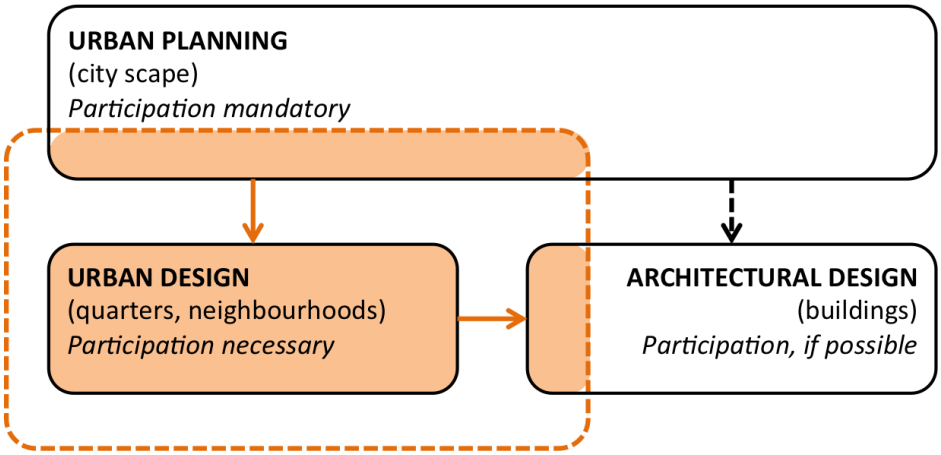


Figure 1. Zone of influence of U_CODE.

Urban Planning: Within the context of U_CODE Urban Planning describes the activity by which (professional) planners generate – on the basis of statistic, engineering and other methodologies – proposals for the development of the built urban and infrastructural environment. Urban Planning is codified to large extend and of legislative nature (instrument of urban governance) and as such producing complex schemes in the shape of strategic plans and models. Urban Planning is based on a planning methodology proceeding from abstract concept to concrete execution. In comparison to Urban Design, the time period for Urban Planning is relatively long (10-50 years). The scale of Urban Planning may extend well beyond individual urban quarter or neighborhood, and include complete cities and urban infrastructures.

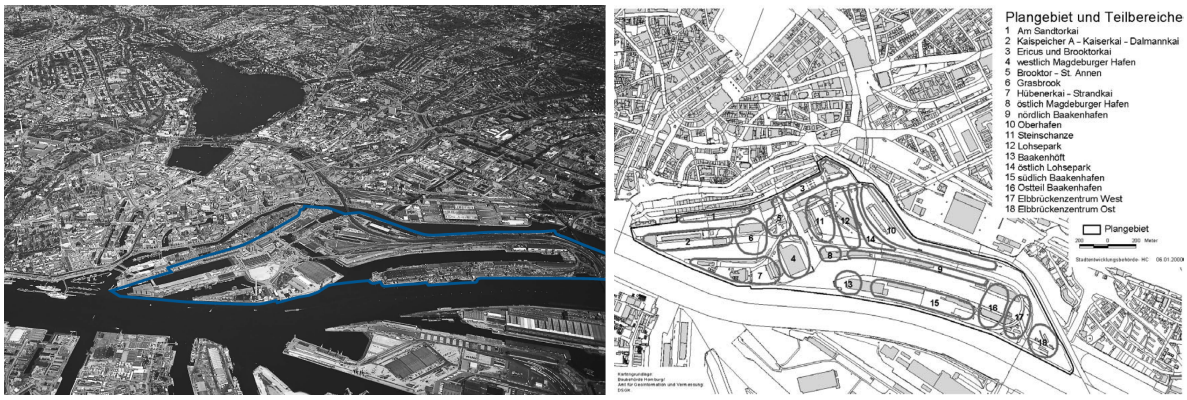


Figure 2. An example of the Urban Planning stage in the eastern HafenCity project in Hamburg, Germany.[2]

Urban Design: In the context of U_CODE, the term "Urban Design" describes the activity by which (professional) designers creatively generate – on the basis of a regular design methodology – proposals for the outlook of an urban area. As a design work it produces visual and easy-to-understand output in the shape of visualizations, models, and plans. Urban Design work is based on a design methodology proceeding from abstract concept to concrete execution. In comparison to Urban Planning and Urban Development, time period for Urban Design is relative short (5 – 10 years). The scale of Urban Design is limited to a number of buildings within a defined area (urban quarter, neighborhood, compound etc.).

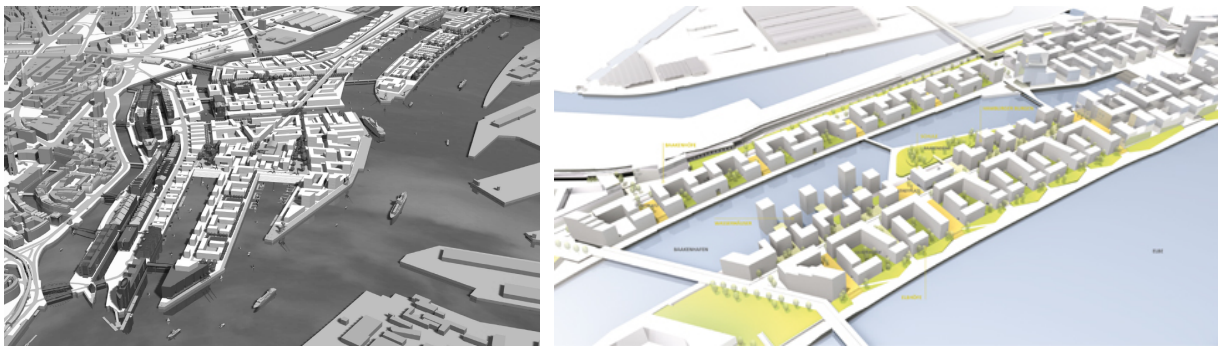


Figure 3. An example of the Urban Design stage in the eastern HafenCity project in Hamburg, Germany.[3]

Architectural Design: In the context of U_CODE, the term "Architectural Design" describes the activity by which architects are designing individual buildings or building complexes, integrating elements like construction, shape, form, materials and detailing. The Architectural Design process often starts with a competition (public or by invitation). within the context of U_CODE we understand Architectural Design as an activity determined and framed by Urban Design and planning constraints. The time period for Architectural Design is typically 2-5 years and involves a

[2] Pictures derived on 19 december 2017 from http://www.hafencity.com/upload/files/files/z_en_broschueren_19_Masterplan_end.pdf
[3] See above

wide variety of stakeholders like clients, landscape architects, engineers, constructors, construction authority and specific user groups.

Figure 4. an example of Architectural Design is the opera house in the HafenCity district in Hamburg: the Elbphilharmonie, by Herzog and de Meuron[4].

An essential first step in this report is to clarify the concepts of Co-creation and Co-design within the U_CODE glossary. Currently, the words are used in an ambiguous way and often interchanged. In order to build consistency, the first aim of this report will be to clarify key concepts, definitions and terminology associated with Co-design, Co-creation, Participatory design and Gamification.

Secondly, principles of Co-design and Co-creation are provided, followed by an investigation on how to implement these principles in the mass scale Urban Design context.

Thirdly, this report will provide an overview of Co-design approaches and respective tools for Urban Design with a special focus on game-based approaches. Since U_CODE is aiming at mass participation, this will be considered in particular. The overview of tools and methods will be used to identify a set of principles, success factors and challenges for the U_CODE platform.

Fourthly, special attention will be paid to the impact of cultural dimensions and national legal frameworks. U_CODE aims to roll out Europe-wide. Therefore, it should be taken into consideration that different countries have different cultures and legal frameworks, which may impact the applicability and effectiveness of the Co-design and/or Gamification approach.

Lastly, all findings will be summarized and merged into one big list of requirements for the U_CODE developers.

1.2 The Evolution of D2.3

In December 2016 D2.1 *"Survey on Co-design methodologies in urban design, initial version"* was submitted. Meanwhile new insights emerged which were incorporated in this revised version (D2.3). The input that was used to elaborate this version came from different sources, described below.

[4] *Pictures derived on 19 december 2017 from* https://www.herzogdemeuron.com

Discussions within the U_CODE team

Project U_CODE is evolving. A wide variety of activities were carried out by the different partners of U_CODE and together the scope was further narrowed, a Minimal Viable Process was defined and some first prototypes were developed. Indispensably, concretizing the project and its scope will result in new questions, challenges and insights. This report is made consistent with the current status of development within the U_CODE project.

Additional interviews with experts

Additional interviews with experts in the field of Urban Design, Co-design, Co-creation, Creative Facilitation and Gamification were conducted. The purpose of this new round of interviews were to deepen understanding and/or to assess our research insights and findings. This led to new insights, including tools and methods that were overlooked so far. Again, this was incorporated in D2.3. For a full overview of interviewees, see Appendix 1.

Additional literature review

During the writing of deliverable D2.1 new insights emerged, which required further investigation, such as 'reverging' and 'selection bias'. In addition, the search for relevant tools and methods continued. Moreover, this search for tools and methods will be continued beyond deliverable D2.3.

Feedback from EU reviewers

On March 3rd, 2017, the first formal EU review for project U_CODE was held in Delft, the Netherlands. The constructive feedback from the EU reviewers was captured and used amongst others as input for elaborating and sharpening this report. (Find more details in Appendix 6).

1.3 Objectives

The main objective of this report is providing an overview of currently used Co-design and Gamification tools and methods in the Urban Design context and clarifying the concept of Co-design and Co-creation in the U_CODE context.

The research questions regarding Co-design:

- What is Co-design and Co-creation?
- Which Co-design tools are currently used in Urban Design?
- What are guidelines for successful Co-design in Urban Design?
- What are challenges in applying Co-design in Urban Design?

The research questions regarding Gamification::

- What is Gamification?
- Which game-based approaches are currently used in Urban Design?
- What are guidelines for successful Gamification in Urban Design?

- What are the challenges in applying Gamification in Urban Design?

Research questions regarding methodology, mindsets and culture:

- Which cultural dimensions should be taken into account for the applicability and effectiveness of U_CODE?
- Which national legal frameworks should be taken into account for the applicability and effectiveness of U_CODE?

Once these topics are explored the aim is to summarize the findings into design requirements and desires for U_CODE.

1.4 Methodology

This report is built upon a wide variety of research activities and sub studies in order to find answers to the research questions.

Sub studies

A significant part of this report is based on and compiled from the following sub studies:

- Criollo Alvarez, N.P. (2016b) *Co-creation processes and ULLs: study cases based on sustainable initiatives - report for U_CODE.* Delft University of Technology and Leiden University, Delft and Leiden, The Netherlands. *(unpublished report - contact the authors to receive a PDF)*
- Kazil, K. (2017). *Localab: Participation in Urban Planning.* Delft University of Technology, Delft, The Netherlands. *(unpublished graduation thesis - contact the authors to receive a PDF)*
- De Koning, J.I.J.C, M.R.M. Crul and R. Wever (2016, May). *Models of co-creation*. Paper presented at ServDes.2016 - the fifth Service Design and Innovation conference, Copenhagen, Denmark.
- Münster, S., C. Georgia, K. Heijne, K. Klamert, J.R. Noennig, M. Pump, B. Stelzle, H. van der Meer (2017). How to involve inhabitants in urban design planning by using digital tools? An overview on a state of the art, key challenges and promising approaches. *Procedia Computer Science*, 112, 2391-2405.
- U_CODE proceedings and observations: cases, interviews, workshops and reports.

Exploratory and expert interviews

A wide variety of (international) experts in the field of Urban Design, Public Participation, Co-design, Co-creation, Creative Facilitation, and Gamification were interviewed (see Appendix 1 for the full list of interviewees.)

Literature research

Literature research was conducted with a focus on Co-design, Co-creation and Gamification in the context of Urban Design. Additionally, relevant topics addressed during the exploratory interviews were explored. Together, this will provide the theoretical background of this report.

Reviews

A database was built (and still expanding) with a large variety of Co-design and Gamification tools and methods found in literature, mentioned by experts or found in systematic Internet search. These methods were reviewed along defined criteria. The review of current tools and methods revealed the research of public participation in Urban Design to be very much interdisciplinary, e.g. reaching from the fields of architecture and urban and spatial planning to the spheres of political science and communication studies, engineering and media informatics or even computer sciences. Besides scientific literature and due to the rapid development in this field, some tools could be found by general internet research, for instance by reviewing expert blogs or platforms of service providers.

Out of this research, a so-called MethodBank was created that includes a wide variety of participation methods and which facilitates participation processes in Urban Design matters. Within the MethodBank, these instruments can be further investigated by the use of multiple filter options that e.g. locate a method in the stage of the Urban Design process or distinguish between an online or offline dimension. By that, the database is a useful way not only to get a good overview of the many different possibilities that can be used for participatory processes in the field of Urban Design but also for systematically filtering out suitable tools for every circumstance.

Analysis and Discussion

Topics which were not yet fully covered in literature or topics which are not yet mature concerning the context of Urban Design needed additional research. First, these knowledge gaps and challenges were defined. Next, these topics were deepened through discussions within the U_CODE team, additional literature research and by consulting external experts. As a result new insights were generated.

1.5 Structure Report

This report starts with a theoretical background on the concepts of Co-Design and Co-Creation. First in general, then, in the context of Urban Design. This section is wrapped up by compiling:

- A U_CODE definition for Co-Design, named Ucodesign
- A set of principles for Ucodesign
- The benefits of applying Ucodesign

In chapter 3, research is done on how Ucodesign is applied in small and medium sized groups. Focussing on:

- Creativity

- The methodology of Integrated Creative Problem Solving
- Principles of good Creative Facilitation

In chapter 4, implications are listed when transplanting the principles of Ucodesign into the mass scale Urban Design context. Topics that needed additional investigation due to this are:

- Selection Bias
- Communication Channels and Boundary Objects
- Acceptance Finding and Change
- Gamification

In chapter 5 existing tools and methods of Participatory Design and Co-Creation are reviewed and classified into three levels of Public Participation:

- Tools and methods labeled as “Information”
- Tools and methods labeled as “Consultation”
- Tools and methods labeled as “Collaboration”

In chapter 6, some broader themes beyond tools and methods are explored. Topics that will be discussed here are:

- Methodologies
- Mindsets (e.g. Poldering)
- Culture: comparison of Cultural Dimensions and Legal frameworks of Germany, France and the Netherlands

Chapter 7 will summarize all findings into:

- a list of 40 requirements.

The report is wrapped up with:

- Conclusion and Discussion (chapter 8)
- A Glossary (chapter 9)
- References (chapter 10)

2 Theoretical Background: towards a Shared Definition of Co-design

2.1 Introduction

The purpose of this report is working towards a list of requirements for the U_CODE designers with a focus on Co-design and Gamification in the context of Urban Design. In order to create that list and understand its principles, it is needed to explore the concepts of Co-design and Gamification extensively and come to a shared understanding and definition that can be used within the U_CODE team.

The first part of this chapter will be about exploring the concepts of Co-design and Co-creation in general and then, in the context of Urban Design. Thereafter, this will be merged and customized into a U_CODE definition. Next, the benefits of Co-design and some principles of Co-design, as found in literature, will be explained.

The second part of this chapter will focus on the concept of Gamification, again, first in general then in the context of Urban Design. For applying gamification a list of principles will be shared as well.

2.2 What is Co-design?

When looking at figure 5, you will see the word cloud of the terms we found in our literature review on product design and Urban Design. It is a collection of terms often used ambiguously and interchangeably. One of the most prominent words is Co-design. Co-design is a term that is nowadays used in different disciplines (a.o. computer sciences, product design, service design and Urban Planning), in different ways, by different people. For the U_CODE context, i.e. Urban Design context, we will need to clarify this term and come to one definition.

The literal meaning of Co-design according to the Cambridge Dictionary is to make or draw plans for something (design) together (co-). But who is collaborating with whom? What do they actually make? And is making the same as creating? Does that mean that Co-creation is the same as Co-design? To answer these questions first some tightly connected concepts will be explored, i.e. User-centered design and Participatory design. Then, the focus will be on Co-creation and Co-design.

2.2.1 User-centered design and Participatory design

In the world of product design it is common practice to put the end users in the center of the design process to better meet their needs and desires (Brown, 2008; Badke-Schaub et al., 2005; Holloway and Kurniawan, 2010; Brown and Wyatt, 2010; Maguire, 2001). This is called User-centered design (UCD) or Human-centered design (HCD).

Figure 5: Word cloud on Co-design related terminology

Building on the UCD approach (primarily a US-driven phenomenon) the Participatory design approach emerged in the 70s in Scandinavia, where joint decision-making and work practices started to receive attention. Also, based on the believe that "the ones who are affected by design should have a possibility to influence the design" (Mattelmäki and Sleeswijk-Visser, 2011). Figure 6 visualizes the difference between UCD, i.e. 'user as subject', and PD, i.e. 'user as partner'.

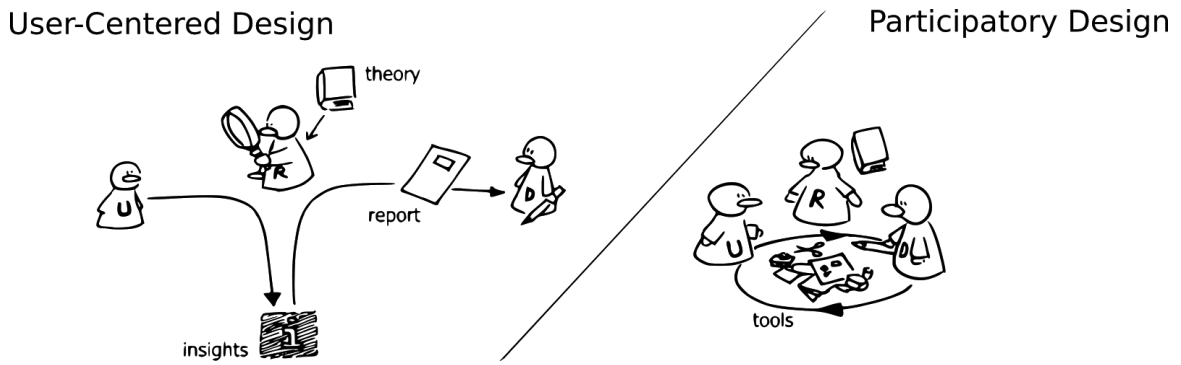


Figure 6: visual representations: UCD on the left and PD on the right (Sanders and Stappers, 2008)

The concept of 'user as partner' is typical for Co-design as well. Therefore, Participatory design and Co-design are often used as synonyms in the Nordic countries. According to Mattelmäki and Sleeswijk-Visser (2011) Co-design carries perhaps a bit lighter weight on the political attitude but builds on the same mindset and tools. Ehn (2008, p.93) describes Participatory design as design "with a special focus on people participating in the design process as co-designers", implying that Co-design is a process used in Participatory design.

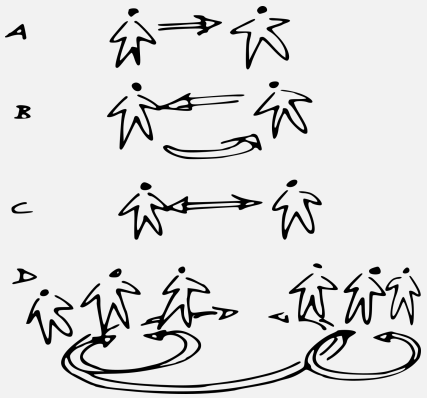
2.2.2 Co-design and Co-creation

Co-design does not always have the same meaning as Co-creation. Therefore, Mattelmäki and Sleeswijk-Visser (2011) dedicated a well cited paper to clarifying the relationship between Co-design and Co-creation in the context of design and design research. As noted already, these terms are intertwined and often interchanged. As an example: designers often see Co-creation as a subordinate to the Co-design process, while in other disciplines, e.g. marketing, Co-creation is seen as a larger trend of openness and creative mindset in which Co-design is one of the activities. In a more recent prize winning paper De Koning, Crul and Wever (2016) reviewed all in the literature and on the Internet available models of Co-creation.

In this report it is important to firstly get an insight on the purpose and principles of the different Co-design and Co-creation concepts and then, we can formulate a clear definition that suits U_CODE. To understand the concepts better, the 4 directions that Mattelmäki and Sleeswijk-Visser (2011) identified will be discussed. Then, the meta-models of Co-creation developed by De Koning, Crul and Wever (2016) will be discussed and 7 principles for Co-design will be derived from it. At a later stage these principles will be translated to the U_CODE context.

2.2.3 The four Directions of Co-design

In figure 7 the four directions of Co-design as identified by Mattelmäki and Sleeswijk-Visser (2011) are described. All directions assume that Co-design is a method, i.e. a combination of tools and techniques strategically put together to address defined goals, e.g. in a workshop. Co-creation is described as an activity and/or mindset within the Co-design process. Direction A is basically User-centered design and not so much Co-design. The reason why it is still included is because a lot of fields (also in Urban Design) are referring to User-centered design as being Co-design.



A) Emphasizing the role of the user following the traditions of User-centered design and Participatory design. Its main concern is that the users voice needs to be heard in the design process.

B) Focusing on methods and tools that support users to tell about their experiences and design ideas that can be interpreted and that inspire design.

C) Design collaboration in which users and designers and alike exchange ideas, envision in a collaborative creation process.

D) Designers and design researchers support and facilitate a collaborative process of various stakeholders, not just users. This direction does not put emphasis on the engagement of the users but invites a wide range of people to brainstorm and learn together.

Figure 7: the four Co-design directions. (Mattelmäki and Sleeswijk-Visser, 2011)

In direction B, users are actually designing ideas, but these are just used as inspiration for the designers, while in direction C the users and designers are collaboratively designing and exchanging

ideas. The final direction D goes beyond the user and is about inviting a wide range of people to brainstorm and learn together.

Some insights that can be drawn from these 4 directions are (and mentioned by Mattelmäki and Sleeswijk-Visser):

1. Co-design provides voice and tools to those who were not traditionally part of the design process.
2. Co-design is about engagement of potential users but also about stakeholder collaboration.
3. Co-creation is about exchange of ideas, experiences and expertise
4. Co-creation is temporary. It has specific parts within the (Co-)design process.

So Co-design and Co-creation seems a useful concept for U_CODE but what does the literature tell us about the models and principles used in Co-creation?

2.2.4 Four Meta-Models of Co-creation

In order to gain a clear definition of Co-creation, first it is needed to understand the principles of Co-creation. De Koning, Crul and Wever (2016) investigated 50 models of Co-creation and clustered those into 4 meta-models of Co-creation principles (see figure 8). The clusters are (0) the joint space of creation. This cluster was called the "0", since during the analysis it turned out to be an essential cluster next to the other pre-defined categories: (1) the Co-creation spectrum, (2) the Co-creation types, and (3) the Co-creation steps. This section will describe briefly the principles within these clusters. Later on, these derived principles should be translated to the U_CODE context.

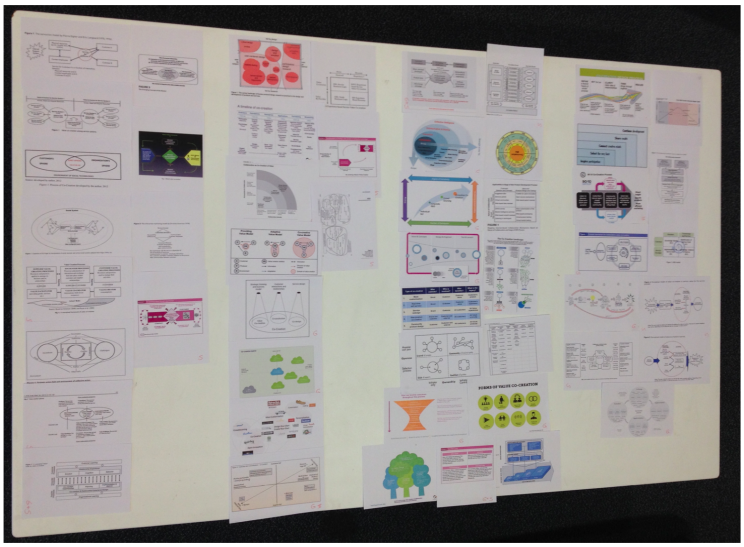


Figure 8: 50 models of Co-design, clustered into 4 groups. (De Koning, Crul and Wever, 2016)

First, we will discuss cluster "0". Co-creation takes place when two (or more) parties collaborate in the so-called 'joint space of creation' (see figure 9). The principles that can be drawn from this model are:

i) For Co-creation all parties need to provide some sort of (value) input into the joint space of creation.

ii) The output of the Co-creation activity should create value (of any kind) for all parties involved.

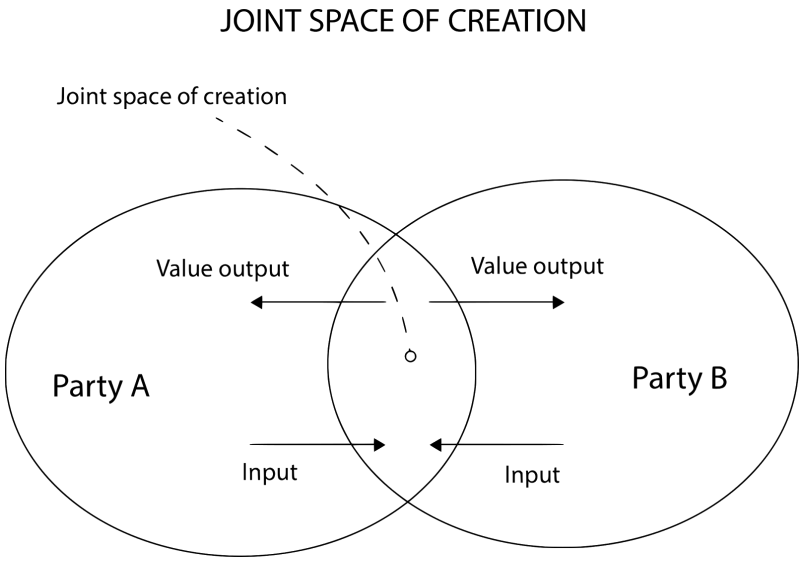


Figure 9: meta-model from cluster "0": the joint space of creation (De Koning, Crul and Wever, 2016)

Cluster 1, the spectrum of Co-creation, is about how Co-creation fits into the bigger picture. As mentioned before, Co-creation is often seen as part of other approaches and methodologies or overlaps with other movements and terms such as open innovation and Participatory design. In this meta-model De Koning, Crul and Wever (2016) note that there are two main movements: 1) Co-creation as an open innovation movement and 2) Co-creation as a Participatory design method. Traditional business approaches are depicted here as models with no collaboration and therefore no end-user influence on the output.

It can be concluded that models of Co-creation exist in different areas of the spectrum, however, the principles that can be drawn from this model are:

iii) The level of Co-creation depends on the level of collaboration

iv) The level of Co-creation depends on the influence of the involved parties (i.e. the end-user) on the output

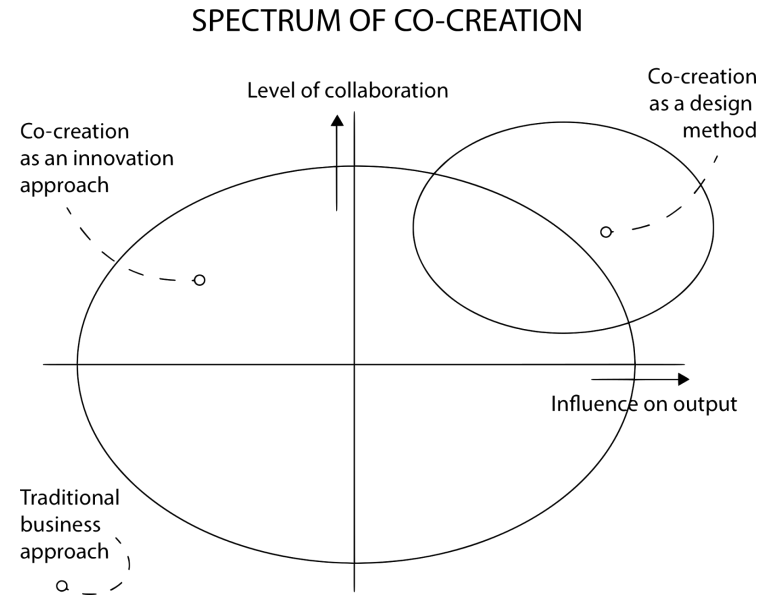


Figure 10: Meta-model from cluster 1: the spectrum of Co-creation (De Koning, Crul and Wever, 2016)

The next cluster (2) is about the types of Co-creation. The meta-model identified 5 types of Co-creation which are mapped out along 3 axes:

1) The moment the Co-creation takes place: at the beginning, middle or end of the design or innovation process, or even in use phase.

2) The amount of direct benefit or change is there for the co-creating end-user.

3) The level of collaboration between the two parties.

Cluster '0' showed already that there should be some kind of value output for the end-user. This model emphasizes the level of direct value for the end-user. Model '1' focused on the level of collaboration. This parameter is coming back in this model on the third axis.

Axis 1 - about the stage in the innovation process - is a critical element. The earlier people are involved, the more impact they can have on the final outcome of the project, since the project is still at a flexible stage and not yet concrete..

The principles that can be derived from this model are:

v) Actual Co-design can only take place in a stage of the innovation process where the issue under consideration is still addressable by multiple approaches or solutions. This is often the early stage of a project.

vi) Special attention should be paid to the end users' perception of the direct value created in Co-design.

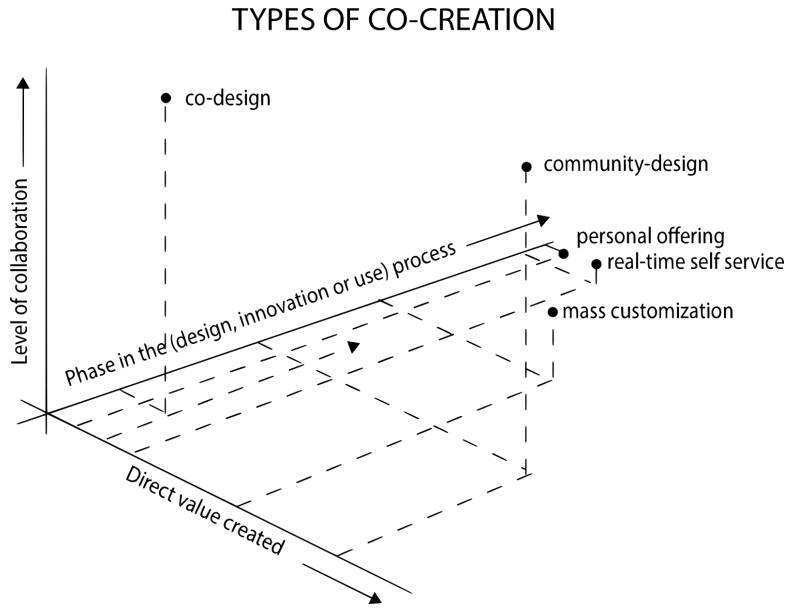


Figure 11: Meta-model from cluster 2: types of Co-creation (De Koning, Crul and Wever, 2016)

The final meta-model that was created was based on the models from cluster 3: the steps of a Co-creation process. Most Co-creation models that were reviewed by De Koning, Crul and Wever (2016) include four to six steps. The meta-model from cluster 1 - the spectrum of Co-creation – showed both Co-creation as a method and Co-creation as an innovation approach. A method is a combination of tools and techniques strategically put together to address defined goals. An approach describes the overall mindset needed to conduct a process. Because no consensus exists whether Co-creation is a method or an approach, this final meta-model includes both (see figure 12).

For U_CODE it will be important to build consensus about Co-creation being an open innovation movement or a Participatory design method.

The principle that can be drawn from this model are:

vii) There are many possible steps in the models found under the name of Co-creation. U_CODE should make an own model with steps that are appropriate for Co-creation in the domain of Urban Design.

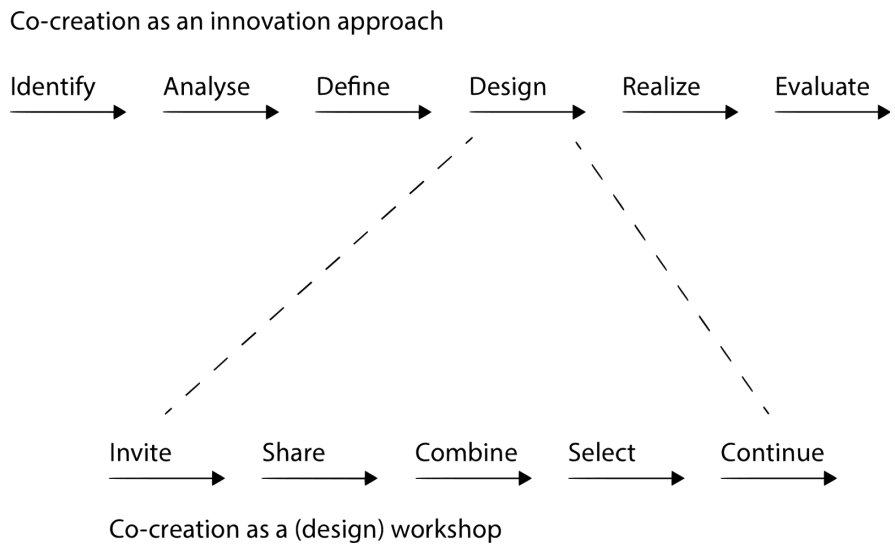


Figure 12: Meta-model from cluster 3: the steps of a Co-creation process (De Koning, Crul and Wever, 2016)

2.2.5 Conclusion

After reviewing all 50 models, and confirming that there is indeed unclarity about the Co-creation concept De Koning, Crul and Wever (2016) still dared to formulate a definition:

*"**Co-creation** is the process of mutual firm-customer value creation. This facilitated (creative) process generates an active form of interaction and sharing between firm and end consumer, instead of the active firm, passive consumer interaction. One of the results of Co-creation is that the contact between firm and customer moves away from transactional and becomes an experience."* (De Koning, Crul and Wever, 2016)

Mattelmäki and Sleeswijk-Visser (2011) did not formulate a definition, but they did conclude the following:

*"**Co-design** is a process and the planning, adjusting tools and facilitation is built on a mindset based on collaboration. Co-creation can take place within Co-design processes but focuses much more on the collective creativity of involved users and stakeholders."*

The rich insights from this section brings us closer to a definition for U_CODE, but cannot be finalized before taking the Urban Design context into account.

2.3 Public Participation in the Domain of U_CODE

In the previous section we have established an understanding of the concept of Co-design and Co-creation in the product, service and system design context. This section will focus on Public Participation and Co-design in the context of Urban Design.

Public participation can be defined as "any process that involves the public in problem-solving or decision-making and that uses public input to make better decisions" (IAP2, 2013). Public participation can be practiced at different levels of participation. Multiple scales or 'spectrums' are proposed in the literature to describe the different levels of participation, e.g. Arnstein (1969), Paul (1987), Wiedemann and Femers (1993), Tufte and Mefalopulos (2009), Bayerischer Städtetag (2012), IAP2 (2013), BMVBS (2013). However, in all models the different levels can be distinguished by looking at the following characteristics:

- The role of the citizens
- Decision-making power of the citizens
- 1-way and 2-way communication

The role of the citizens is often named as a distinguishing characteristic between different levels of participation, as mentioned by Paul (1987), IAP2 (2013), Hudson (2002), and Arnstein (1969). 'Passive' in this sense is explained as only being informed, or only being consulted on expert-generated alternatives. Active participation is explained as actively being involved in the generation of alternatives, similar to the 'joint space of creation' as mentioned by De Koning et al. (2016).

Decision-making power of citizens refers to the degree of influence participants have over final decision-making in a planning process (IAP2, 2013; Arnstein, 1969; and Paul, 1987).

Hudson (2002) distinguishes *1-way communication* (only informing citizens) and *2-way communication* (where citizens also have the possibility to share information with professionals). He mentions a 'communication barrier' between the two. Creighton (2005) argues that any process that is less than 2-way communication cannot really be called 'participation', as in that case citizens only have a passive role in a process and cannot influence it in any way.

For this report the participation spectrum of the International Association of Public Participation (IAP2, 2013) will be used to explain how Co-design relates to the different levels of participation. IAP2 describes 5 levels of participation: inform, consult, involve, collaborate and empower (see figure 13).

For U_CODE we have found that in order to create an optimal Urban Design process incorporating public participation, a set of tools is required, supporting activities from all levels of the participation spectrum. Continuous information is needed to provide the citizens with sufficient knowledge of the project and its challenges in order to participate in a meaningful way. Depending on the stage in the Urban Design process, a decision has to be made on whether an activity from

consulting, involving, or collaborating is most meaningful. Empowerment is a level of participation that is not envisioned within the scope of project U_CODE.

	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problems, alternatives and/or solutions.	To obtain public feedback on analysis, alternatives and/or decision.	To work directly with the public throughout the process to ensure that public issues and concerns are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and issues are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for direct advice and innovation in formulating solutions and incorporate your advise and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.
EXAMPLE TOOLS	• Fact sheets • Websites • Open houses	• Public comment • Focus groups • Surveys • Public meetings	• Workshops • Deliberate polling	• Citizen Advisory committees • Consensus-building • Participatory decision-making	• Citizen juries • Ballots • Delegated decisions

Figure 13: IAP2 public participation spectrum (2013), developed by the international association for public participation.[5]

When looking at the participation spectrum of IAP2, Co-design can be seen as an activity on the level of collaboration. Currently, many different tools and methods exist on the level of collaboration, which will be discussed in chapter 5.3.4. However, not all are classified as Co-design tools. To understand this tactile difference, it is needed to gain a deeper understanding of the role of the citizens in Co-design, the decision-making power of the citizens and the communication type (or interaction type, as we will call it). This will be discussed in the next chapter 2.4.

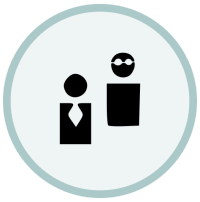
2.4 Ucodesign: a U_CODE Definition for Co-design

In this section all insights from this chapter will be combined and shaped into a U_CODE definition for Co-design in Urban Design, which we will call Ucodesign.

To avoid too much complexity at this stage the group of stakeholders was simplified to 2 groups:

[5] Retrieved on december 8th, 2017 from http://c.ymcdn.com/sites/www.iap2.org/resource/resmgr/files/iap-006_brochure_a3_internat.pdf

***Citizens**: The end-users of the U_CODE tool: mainly citizens, but can also be local authorities, interest groups, local businesses, etc.*



***Professionals**: The professionals can be any professional from Urban Planning, Urban Design and Architectural Design involved in the project, ranging from urban planners, to authorities, to architects, etc.*

For the specific U_CODE context three types of Professional-Citizen (P-C) interactions will be described: User-Centered Design; Participatory Design; and Co-Creation. The concept of Ucodesign will be described along those 3 P-C interactions.

User-Centered Design

The first professional-citizen interaction type is named User-Centered Design (UCD). In UCD citizens are seen as subjects, or reactive informers. Trained researchers observe participants, as they are instructed to perform tasks or give their opinions about concepts generated by experts themselves. The things they make or create will be translated by the researchers into needs, desires or design requirements for the professionals (e.g. architects). Typical examples of tools and methods that can be used in UCD are: design probes (Mattelmäki, 2006), design games (Brandt, 2006), collage-making and make tools (Sanders and Dandavate, 1999), usability testing, contextual inquiry, lead-user innovation and applied ethnography.

Participatory Design

The second professional-citizen interaction type is named Participatory Design (PD). In PD citizens are seen as humans with needs, opinions and (political) power to fulfill their demands. In PD professionals try to retrieve and influence both needs as well as opinions to find Urban Plans that are accepted by the citizens. The major goal of PD is to make solid decisions based on a shared vision. Typical examples of tools and methods that can be used in PD are: sentiment analysis, polls, (up)votings, rankings, referenda, campaigns, strategic-environs-management-tools like SOMSET.

Co-Creation

The last professional-citizen interaction type is named Co-Creation (CC). In CC citizens are seen as humans with needs, opinions, power and useful ideas to make Urban Plans. In CC professionals interact with citizens not only to fulfill their needs and to make accepted decisions but also to find good ideas for Urban Plans. The major goal of CC is to create the design of an Urban Plan in cooperation between professionals and citizens. Typical examples of tools and methods that can be used in CC are Living Labs (Criollo, 2016) and Future Centers (LEF, 2016). Moreover, platforms such as “NextHamburg”, “Community Circles” (Thiel, Lehner, Stürmer and Gospodarek, 2015), “Love your

City" (Stembert and Mulder, 2013) and "City I/O" show great potential in fostering intense collaborative participation between all stakeholders.

As found in our research so far both Co-creation as well as Co-design are terms used for the same phenomenon and in a rather broad diversity of definitions. Therefore we suggest for the U_CODE project to further on only use the word Ucodesign when referring to any kinds of Participatory Design and/or Co-Creation activities. And use the term "Co-Creation" only when referring to the purest form of Co-Creation as defined by De Koning, Crul and Wever (2016). To fit the domain of U_CODE the definition of Co-Creation was slightly adjusted from the original definition into:

***"Co-Creation** is the process of mutual Professional-Citizen value creation. This facilitated (creative) process generates an active form of interaction and sharing between Professionals and Citizens (instead of the active Professional, passive Citizen interaction). One of the results of Co-Creation is that the contact between Professionals and Citizens moves away from transactional and becomes an experience."*

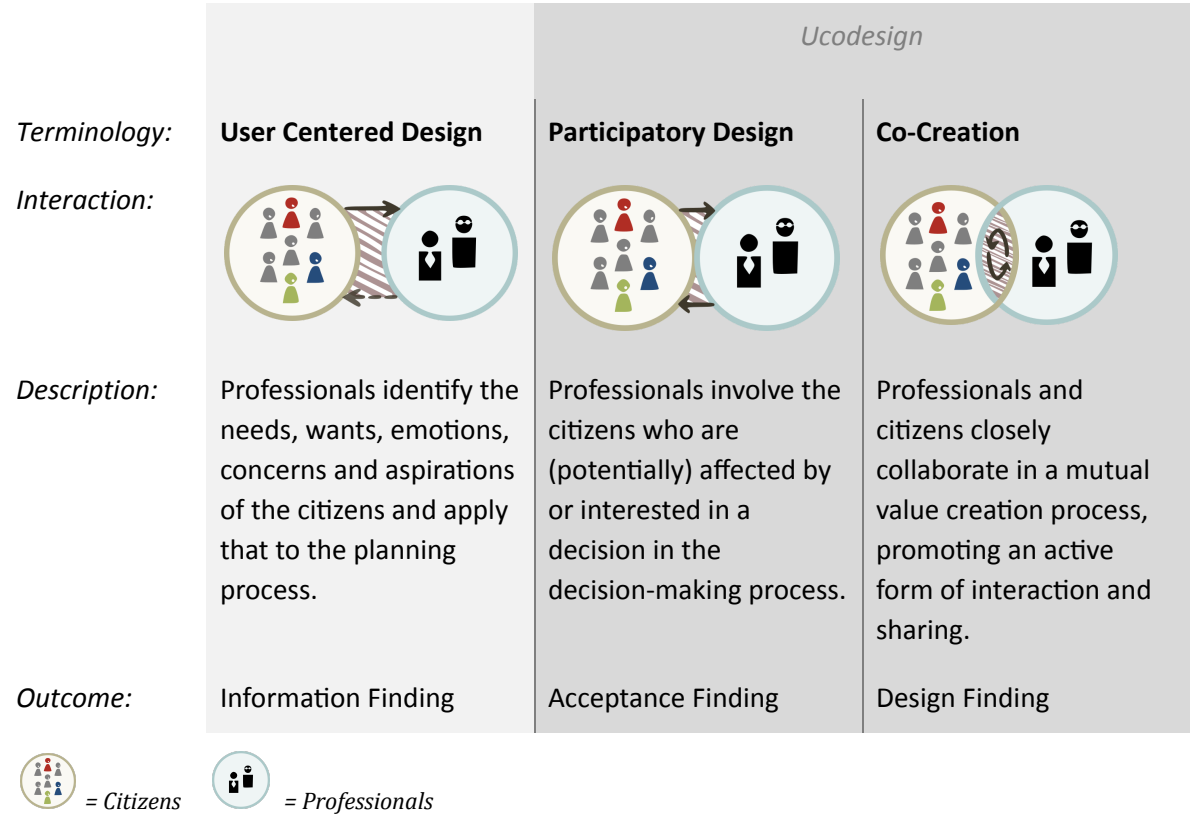


Figure 14. Three types of professional-citizen interaction.

For the Urban Design process in the U_CODE domain 3 phases were defined: "Pre-Design" (briefing, information, gathering, etc.); "Design Creation" (sketching, modelling, prototyping, etc.) and "Post Design" (presentations, reviews, judgements, etc.). Theoretically, all forms of Professional-Citizen interactions could take place in any of these 3 phases. However, in practice it seems that some interactions come more naturally in certain stages (see figure 15). For example pure Co-Creation is

most likely to take place in the design stage, where the actual embodiment of the design takes place. Participatory Design should be incorporated in the pre-design phase, once there is consensus about a high-level demand, problem and/or goal for a project. In the post-design phase Participatory Design can be used for evaluation and elaboration activities. User-Centered Design can and should be used along the whole project, since U_CODE envisions putting the citizens - who are the actual end-users - in the center of the design.

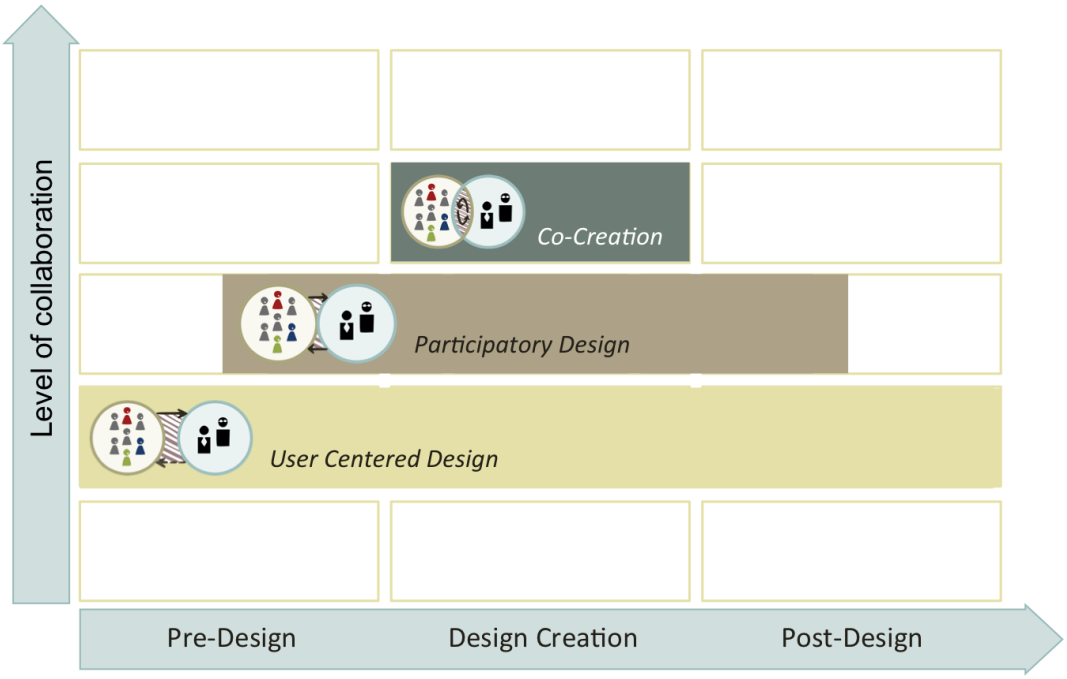


Figure 15. Three types of professional-citizen interaction mapped out along 'level of collaboration' and 'project phases'.

Ucodesign

In the previous section a definition for both Participatory Design and Co-Creation is provided. Both interaction types are a form of Ucodesign as can be understood from figure 14. Ucodesign is built on a mindset based on collaboration and always involves some form of two-way communication between Professional and Citizen. From here onwards, The term "Ucodesign" will refer to Participatory Design and/or Co-Creation in the U_CODE domain.

2.5 Applying Ucodesign Principles

In chapter 2.2.4 a meta analysis of 50 Co-creation models was done (de Koning, Crul and Wever, 2016), which led to 7 principles for Co-creation that we would like to take forward. Applying these 7 principles in the context of U_CODE lead to certain considerations which should be taken into account when designing Ucodesign tools. This chapter will provide an overview of the 7 principles

and the corresponding considerations. The first 4 principles are specifically for Co-Creation. The remaining 3 principles are about Ucodesign in general.

Principle 1: Value input of all participants

For applying Co-Creation all parties need to provide some sort of (value) input into the joint space of creation. For citizens this 'value input' is for example what is known as "local knowledge" or "knowing from within" (shotter, 1993). This is about the knowledge that citizens in a given community have developed over time and continue to develop. Citizens possess crucial information about existing conditions or how decisions should be implemented (Creighton, 2005). Local knowledge is:

- based on experience;
- often tested over centuries of use;
- adapted to the local culture and environment;
- embedded in community practices, institutions, relationships and rituals;
- held by individuals or communicates;
- dynamic and changing (FAO, 2006).

For Professionals the 'value input' is their expert view on the Urban Design project, but in addition it can be some background knowledge or other clarifying information for the involved citizens. A (practical) consideration is how to gain the valuable knowledge from both professional and citizen to the table and into the so-called joint space of creation. The "LocaLab" tool was developed to collect 'local knowledge' from the citizens, with a focus on the tacit knowledge (see Kazil, 2017).

Principle 2: Create value for all participants

The output of the Co-Creation activity should create value (of any kind) for all parties involved. The value output to the citizens is not necessarily related only to the content or design itself, but it can also be the experience of participating in the process. So, maybe the participants have learned something during the process about their neighbourhood, or they made new friends or connections. Gamification can also help on this matter: e.g. the participants may earn rewards through the gamification element of the process. The opportunities of gamification will be explored further in chapter 4.6.

Principle 3: The level of collaboration will determine the level of Co-Creation

The level of Co-Creation depends on the level of collaboration. In Co-Creation activities, professionals and citizens should be working on an equal level in a collaborative creation process. This means that both professionals and citizens should operate "ego-less" during the Co-Creation process. In more feminine cultures like the Dutch this "egoless" operation is easier to achieve than in more masculine cultures like the German [Hofstede, 2001]. Chapter 6.4 will provide a brief overview of additional culture differences.

During the Co-Creation activity an active form of interaction and sharing between professionals and citizens should be promoted. The ideas that are shared should be comprehensible for both parties

in order to build further on those ideas. So, the right means should be provided to create boundary objects which have the right balance between plasticity and robustness (see also chapter 4.4.3).

Principle 4: The level of influence will determine the level of Co-Creation

The level of Co-Creation depends on the influence of the involved parties (i.e. the end-user) on the output. In chapter 2.3 it was explained already that within urban participation different levels of influence exist. The participation ladder (IAP2, 2013) represents a range from just informing up till actual empowerment. Co-Creation activities may also vary in the level of perceived and actual influence of the involved parties. The way the input from citizens is used in the decision making process determines the actual influence of the citizens. Being clear upfront on how the output is being used is essential. It should be emphasized that conducting extensive Co-design activities, but disregarding the output will frustrate the participants.

The selected Co-design activity should be in line with the intended purpose of the Co-design process in order to generate the desired outcome. Using the wrong approach will lead to ineffective and irrelevant output and frustrate the effectiveness of the involved parties. In practice, a certain approach is often chosen for the wrong reasons: e.g. based on other considerations like costs or because it was used before, so the stakeholders are familiar with the process.

Principle 5: For Ucodesign there should be space to design

Actual Ucodesign can only take place in a stage of the Urban Design process where the issue under consideration is still addressable by multiple approaches or solutions. This is often the early stage of a project. The initiator or project leader of the Urban Design process may want to use the Ucodesign process as a tool for manipulating or steering a group to a predetermined solution or 'selling' a certain decision. Misusing the Ucodesign activity deliberately for such a purpose will undermine the credibility of Ucodesign. Therefore, it is important that the Ucodesign process is facilitated by an independent party. This also means that the professionals must let go of (some) control and follow through on the outcomes of the Ucodesign process.

The purpose and outcome of the Ucodesign activity should be made clear from the beginning to all parties involved. An example from the field research illustrates a situation in which the exact purpose is not clear to the citizens: a participatory activity was organised to involve citizens on how a new bridge should look like, but during the actual activity the discussion was about whether the bridge should be built at all: "Why not a tunnel?". In practice, it is very common that the citizens grasp the opportunity of directly talking to the authorities to make a point they want to make. Therefore, a specific goal should be clearly communicated.

Principle 6: All that matters is perception of direct value

Special attention should be paid to the end users' perception of the direct value created in Ucodesign. The actual created value for the citizens (see principle 2) is not the same as the directly perceived value by the citizens. When involving citizens on mass scale, it will be more difficult for the citizens to recognise their individual input in the process. Also, when the citizens are involved in an early stage of the process, it may take a long time (also due to politics and other factors) until the

project starts to take shape (take for example the 0-stage Testbed Description "Valkenburg", which has been in the exploratory stage for over 10 years now). Therefore, it is very important to provide feedback on a short term to the citizens on how their input was valued; how it influenced the decision-making process; and how it will be used in the next steps. Gamification will play a significant role in this feedback loop.

Principle 7: Consistency is obligatory and depends on a consistent (U_CODE) Model

The importance of developing a consistent U_CODE understanding of the concepts of Co-design and Co-creation is emphasised several times. That is why the term Ucodesign was introduced. Definitions are provided in the previous chapter (2.4). In addition, the Urban Design process was modeled into the so called the Minimal Viable Process of U_CODE (see figure 16).

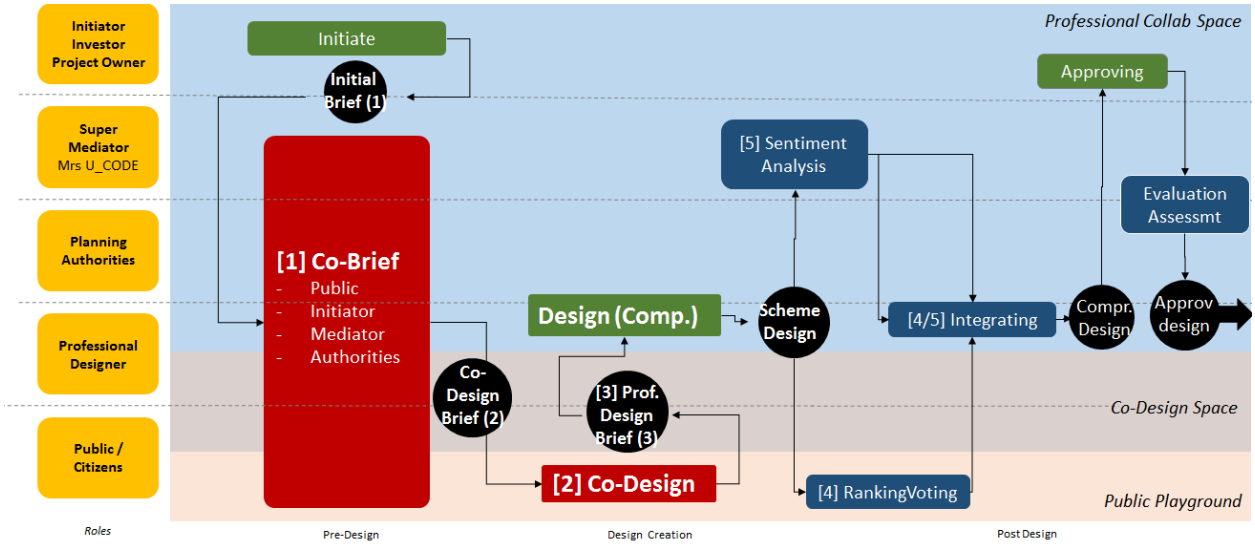


Figure 16. Overview of the U_CODE Minimal Viable Process (MVP) as defined in deliverable D2.2.

2.6 Benefits of Ucodesign

The goal of this section is highlighting the relevance of using Ucodesign in Urban Design projects, by giving an overview of the advantages. Having a good overview of the advantages is important for advocating their use towards different potential clients. This is especially important as many potential clients will still need to be convinced of the advantages associated with the use of (online) Ucodesign tools and methods (Involve, 2005).

The types of benefits of Ucodesign may appear to differ across different sectors such as commercial or not-for-profit sectors, especially when they use different wordings to indicate these benefits. As mentioned by Steen, Kuijt-Evers and Kloket (2007) however, the underlying concepts are very similar. This becomes apparent when comparing the literature for benefits of Participatory Design in service design versus Urban Design practices.

The basic framework of these benefits was adapted from a meta-study on the benefits of Participatory Design in service design projects by Steen et al (2007). The specifics of this adaptation can be found in the report of Kazil (2017). For each of these benefits, examples can be found from Urban Design cases that fit within them.

Next to these benefits, there are others that are indeed unique to public sector projects. This difference stems from the fact that governments are responsible for upholding their citizens' equal rights. As highlighted by Tampoe (1994) they cannot merely think of the population as 'clients', 'users' or 'customers'. For example, unlike the private sector where missing the input from certain target groups might only result in slightly lower sales, missing this input in the context of an urban development process directly impacts a group's potential to participate in a democratic way within a country. Regulations are needed to ensure equality before law, but these can also inhibit conducting pilots and experiments as highlighted by Bason (2010).

Figure 17 shows an overview of the benefits of Ucodesign for both Citizens and Professionals. In the next paragraphs, each benefit will be explained in more detail.

Figure 17. Benefits of Ucodesign. (Kazil, 2017)

2.6.1 Benefits of Ucodesign for Citizens

Using Ucodesign in Urban Design projects has benefits for citizens and future users. Apart from the fact that people enjoy being the co-producer or co-maker of public space, it results in a better experience and satisfaction with the public space and a more developed civil society.

Better experience and satisfaction with public space

When the built environment becomes more attuned to the local context and needs of the public, more people will have a better experience and satisfaction with this environment. High-quality

environments create many benefits for citizens, with Woolley et al. (2004) mentioning it creates economic value, improves physical and mental health, benefits children and young people, reduces crime and fear of crime, has social and community-strengthening effects, results in easier movement between places, and creates value from more biodiversity and nature

Strengthening civil society

Civil society is described by the Oxford Dictionary (2013) as "Society considered as a community of citizens linked by common interests and collective activity:" As a result of better educated, involved, and empowered citizens, civil society is strengthened.

Better educated citizens

First of all, Ucodesign practices result in better-educated citizens. As mentioned by Creighton (2005), through their involvement in a Participatory Design process, the public also learns about the subject matter and how the government makes decisions. The Bundesministerium für Verkehr, Bau- und Wohnungswesen (2014) mentions how a high standard of building culture requires better public understanding of the opportunities and problems presented by the built environment.

Increased equality and empowerment

Secondly, Ucodesign leads to increased equality and empowerment. As mentioned in Leading Cities (2015), Participatory Design processes provide an opportunity for public, private, non-profit and academic sectors to serve on an equal level. Furthermore, citizens are empowered to be heard, exercise rights and influence policy decisions. Creighton (2005) mentions how a Participatory Design process gives the public a sense of ownership over problems, which not only has the possibility of leading to more support for a decision, but also can lead to them organizing themselves and actively assisting in the effort. Ucodesign has a Hierarchy-flattening effect, as the distinction between consumers and producers, users and designers, bureaucrats and citizens is blurred or transcended as mentioned by Lusch and Vargo (2006). The EIPP (2009) mentions the proposition that democracy would be healthier if it involved more people in its day-to-day processes.

2.6.2 Benefits of Ucodesign for Professionals from a Project Perspective

Using Ucodesign in Urban Design has benefits for the success of a project itself. It improves the quality and fit of the end result, while also reducing cost, time and risk of implementation.

Improved risk management (resulting in cost- and time reduction)

This is perhaps the most important 'selling point' to prospective clients for applying Ucodesign, and also the most misunderstood. Involve (2005) mentions that using Participatory Design practices can be perceived as inefficient by experts and decision-makers as they can be costly in terms of time and money. Creighton (2005) counters this argument by mentioning that this cost increase is only true initially in the decision-making stages, and that the decrease in risk of political controversy and legal action by individual parties in the implementation phase often result in overall time- and cost savings which compensate for this initial increase in cost (see figure 18). Other sources indicate a

correlation between using Participatory Design and faster implementation as well: one of the expert interviewees mentions the main reason for Dutch politicians and experts to push for greater use of participative programs, was the need for faster implementation of Urban Design projects.

U_CODE proposes to integrate the public opinion already in an early stage of the Urban Design process, to enable early sensing of the risk of negative reaction and public resistance at later stages. U_CODE aims to prevent delay and budget overruns in large Urban Projects, eventually summing up to large scale planning disasters. If a project can be stopped or altered already in the early stage as a result of Public Participation, 90% or more of complete design and construction costs might be saved or better invested. With many large-scale Urban Planning projects costing over €100 million, and with many of such projects being developed across the EU, potential cost savings can be enormous. This holds especially true compared to the cost of Ucodesign programs.

Two underlying causes are mentioned in the literature as adding to this benefit.

Sense of ownership with the public

As mentioned by Creighton (2005), Ucodesign gives people a sense of ownership for that decision, which results in that they want to see it work. People might even actively assist in the effort. Philosopher Lao Tzu already knew that "good leadership was the kind where leaders empowered others to feel a sense of ownership over their successes".

Public can voice needs and concerns

Secondly, the public is given an opportunity to be heard, even when a decision might be very unpopular with them. As mentioned by Creighton (2005) Participatory Planning provides an early opportunity for parties to express their needs and concerns, without having to be adversarial. Both Merry (2013) and Peet (2016) mention the importance of giving people the feeling they are being heard, even, or especially when they want to rant. They both mention the difficulty of going into any kind of strategic conversation about plans before having given people the space to speak their mind. Merry (2013) mentions the importance of telling people they were heard, listing all the things they said, even when these things cannot be incorporated in a plan because of constraints..

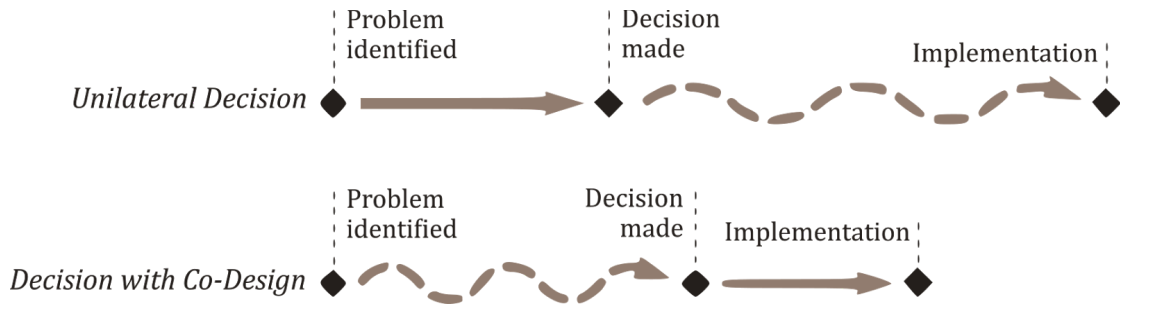


Figure 18. Comparison of project duration: unilateral decisions vs Ucodesign (free after Creighton, 2005)

Improved quality, performance and fit of end result

As a result of Ucodesign, i.e. improved idea generation and improved knowledge of user needs and local knowledge, the end result will be better in terms of quality, performance, in addressing the needs of the public and future users, and fit within a local context. Resulting in environments that people love to live, work and play in.

Higher quality and quantity of ideas

Ucodesign can lead to improvements in the creative process (Steen et al., 2007). Idea generation can get a boost due to the diversity of people involved (citizens, local entrepreneurs, etc.) leading to ideas with high originality and user value. The crowd wisdom appears to be very powerful in generating solutions, often beyond those of a panel of expert planners (Brabham, 2009). Furthermore, as mentioned by Creighton (2005), a dialogue with the public will often clarify objectives and requirements of a project. EIPP (2009) mentions how empirical research has shown that exposing political decision-making to the collective wisdom of ordinary citizens can benefit even complex, technical policies, such as energy and transport (Renn et al. 1993; Surowiecki, 2004). However, it must be noted that professional designers are commonly sceptical about the increased quality of ideas through (U)co-design. There is a prevalent notion that professionals' expertise is mainly about being able to identify quality ideas. Hence, the value proposition towards professionals must be very carefully made, which regards a lengthy learning process and transformation of professional culture.

Incorporation of local knowledge into decision-making

In line with the previous point, Ucodesign leads to an improved focus on user needs and local knowledge. The notion is that the more expert planners and decision makers value the needs and concerns of citizens, the more appropriate their designs will be for the users concerned (Crewe, 2001). Creighton (2005) mentions how incorporating these insights can make the difference between a successful and an unsuccessful program. He also mentions how a better focus on users will help a team to define the actual problem at hand.

2.6.3 Benefits of Ucodesign for Professionals from an Agency Perspective

Using Ucodesign in Urban Design projects has benefits for agencies involved in them. It improves their credibility, trust and support. It also helps them become more effective and human-centered. Finally, it also leads to them developing better relations and cooperation internally and externally.

Improved credibility, trust and support

As can be seen in the trends, there is a growing disaffection with politicians and political processes. Merry (2013) highlights how one of the main reasons for decision makers to employ a Participatory Design process is that they come out of it more popular. As a result of better visibility, transparency, informed public, no 'forced' implementations, agencies gain improved credibility, trust and support from the public. Ucodesign improves the trust of citizens in the political system (Lukensmeyer and

Torres, 2006). As mentioned by Accordino (2013), trust is important for the success of a wide range of public policies that depend on behavioural responses from the public.

Becoming a more effective and human-centered organisation

Through a better focus on users and the resulting rethinking of hidden assumptions and approaches, an organization has the opportunity to become more effective in delivering human-centered projects.

As mentioned by Creighton (2005), confrontations with the outcomes of Participatory Planning programs can force the rethinking of hidden assumptions and timeworn approaches within an organization. The organization will become more aware and familiar with the public's concerns. Not only will this improve the outcomes of the project in question, but also it can positively transform the entire narrative of an organization towards one that is better suited for generating effective and relevant solutions.

Better relations and cooperation internally and externally

Creighton (2005) mentions Participatory Design programs can create long-term agreements and commitment between parties that might otherwise be divergent. Steen et al. (2007) identifies a benefit for organisations where using Ucodesign can result in better co-operation between people or organizations and across disciplines.

2.7 Conclusion

Three Professional-Citizen interaction types were distilled: User-Centered Design (UCD), Participatory Design (PD) and Co-Creation (CC). The latter two (PD and CC) can actually be referred to as a form of Ucodesign. The main difference between PD and CC is that in CC the Professionals and Citizens interact and collaborate in a mutual value creation process, while in PD the Citizen is only involved and consulted by the Professional.

The proposed definition of Co-Creation is: *"the process of mutual Professional-Citizen value creation. This facilitated (creative) process generates an active form of interaction and sharing between Professionals and Citizens. (instead of the active Professional, passive Citizen interaction). One of the results of Co-Creation is that the contact between Professionals and Citizens moves away from transactional and becomes an experience."*

When applied correctly, Ucodesign can lead to many advantages for professionals (both from a project and an agency perspective) and citizens. These advantages should make a strong argument for 'selling' the use of Ucodesign to any audience. Be it project leaders, agencies involved, or citizens and future users, there are gains to be made for all stakeholders involved. In order to develop tools for Ucodesign, the 7 key principles should be lived up to.

Specifically for Co-Creation:
Principle 1: Value input of all participants
Principle 2: Create value for all participants

Principle 3: The level of collaboration will determine the level of Co-Creation
Principle 4: The level of influence will determine the level of Co-Creation

Specifically for Ucodesign:
Principle 5: There should be space to design
Principle 6: All that matters is perception of direct value
Principle 7: Consistency is obligatory and depends on a consistent (U_CODE) Model

These principles were used to develop the following requirements.

Requirements for the U_CODE platform and tools based on the 7 Ucodesign principles.

Within Co-Creation activities...:

1. both professionals and citizens should provide valuable input into the joint space of creation.
2. the output should create value (of any kind) for both professionals and citizens.
3. professionals and citizens are partners and working on an equal level.
4. ensure an active form of interaction and sharing between professionals and citizens.

Within Ucodesign activities...:

5. Always provide feedback on how citizens' input is used in the decision-making process.
6. Ensure that the issue under consideration is still addressable by multiple approaches or solutions.

Requirement 5 about providing feedback requires some additional explanation. In Ucodesign principle 4 and 6 the importance of informing the citizens on how their input is used is addressed and also Ucodesign principle 2 touches upon this subject. However, the necessity of providing feedback pops up more often throughout this report. For example, it is one of the requirements for a positive experience by Csikszentmihalyi (see chapter 3). Also in chapter 4 this will be addressed multiple times, i.e. regarding Gamification. And in the deep-dive on Acceptance Finding and Change it is mentioned as one of the success factors for change. The repetition of this subject should stretch the importance of this requirement.

3 Ucodesign in Small and Medium-sized Groups

3.1 Introduction

In the previous chapter Ucodesign was defined as “a process built on a mindset based on collaboration and refers to Participatory Design (PD) and/or Co-Creation (CC)”. One of the key ingredients of PD and CC is applying the principles of deliberate creativity in (multidisciplinary) groups. Leading this creative process is called “Creative Facilitation”. This chapter will be about gaining a deeper understanding of Creative Facilitation by giving a condensed introduction to its principles.

This is done in the following order. First some history is given followed by a working definition of creativity. Then the text makes a major leap by presenting the Delft adjustment to the classical Creative Problem Solving (CPS) model. The text ends here with the three basic rules for good facilitation.

Good facilitation is embedded in creativity techniques. There are thousands of such techniques. In this text we only can cover the golden rules that lie behind these techniques and give a very first introduction on the most well-known technique for the divergent stage called *Brainstorming*. The text will end with some challenges for the developers of U_CODE tools coming from this very short version of theory in the field of Creative Facilitation. Since the U_CODE platform aims at minimizing the complex and resource-consuming role of an actual creative facilitator and rather focuses on providing tools, embedding the golden rules in the design of the U_CODE tools will be essential.

3.2 Historical Overview of Creativity

Creativity is a complex and complicated phenomenon (for an overview see Runco, 2011) . It has to do with talent and traits of people, it has to do with surprising new solutions, it has to do with specific actions people take, and it has to do with circumstances and situations. It is value based: robbing a bank without ever being caught can be considered to be a creative act, but we do not want to teach our readers that. And of course it is time bound. What was new hundred years ago, is now common practice. It is also context bound: what is new in one domain, can be normal in another domain.

Within the domain of creativity and creative problem solving the 4P theory of Mel Rhodes (1961) is used to distinguish all these different aspects. Mel Rhodes (1916 – 1976) was an assistant professor of Education at the University of Arizona. He divided the creativity domain into four specific aspects. Because all aspects have a label beginning with a P this is why it was called the *4P theory: Person, Process, Press and Product*. In more details:

- *Person*, this “covers information about personality, intellect, temperament, physique, traits, habits, attitudes, self-concept, value systems, defense mechanisms, and behavior.”

- *Process*, this "applies to motivation, perception, learning, thinking and communication…..What are the stages of the thinking process."

- *Press* "refers to the relationship between human beings and their environment." In the research for U_CODE we found in the practice at LEF Future Centre (see Appendix 5) a strong example of how "environment" can be "manipulated" to facilitate the creative process.

- *Product*. Rhodes makes a distinction between idea and product. "The word idea refers to a thought which has been communicated to other people in the form of words, paint, clay, metal, stone, fabric or other material. When an idea becomes embodied into tangible form it is called a product".

Since in practice we only find the Process and Press part useful when we design tools we will continue our journey on the theory of creativity along this path and use the working definition of Theresa Amabile (most cited author on creativity and her definition is also the most used one in the field)

*"Creativity is **the process** that leads to novel and useful solutions to given problems."* (Amabile, 1996)

Not all types of problems can be covered by this approach. Usually two types of problems are distinguished: close-ended and open-ended problems. Tudor Rickards (1974) has summarized the differences between these two types (table 1).

Open	**Closed**
Boundaries may change during problem-solving	Boundaries are fixed during problem solving
Process of solving often involves production of novel and unexpected ideas	Process marked by predictability of final solution
Process may involve creative thinking of an uncontrollable kind	Process usually conscious, controllable and logically reconstructable
Solutions often outside the bounds of logic - can neither be proved nor disproved	Solutions often provable, logically correct
Direct (conscious) efforts at stimulation of creative process to solve problems is difficult	Procedures are known which directly aid problem-solving (algorithms or heuristics)

Table 1. Characteristics of open and closed problem situations (Rickards, 1974, page 10).

From now on we will focus on open problems only, which will lead to our working definition of creativity:

"Creativity is the process that leads to novel and useful solutions to given open problems."

One of the oldest descriptions of the creative process has been given by Graham Wallas (1858 – 1932). He distinguishes four stages:

1. Preparation,
2. Incubation,
3. Illumination,
4. Verification. (Wallas 1926)

In the first stage the problem is "investigated ...in all directions". In the second stage the problem solver is not consciously thinking about the problem. In the third stage suddenly the "happy idea" appears. And in stage four the idea is checked for its proper value. Wallas distinguishes four *separate* stages, which by no means *equal* stages. Not equal in objectives, nor in size. Preparation can take years, incubation months or also years, illumination can be in a flash of a second (the famous "*Eureka-moment*" or "*Aha Erlebnis*"), and verification can again take a long or a short period. His process view gives a nice insight in the creative process an individual goes through, but it also previews what groups with a creative task have to do.

The research in creativity made a major leap in 1950 when J.P. Guilford (1897 - 1987), a psychology professor at the University of Southern California, in delivering his acceptance speech as the new president of the American Psychological Association made thinking about creativity and creative problem solving a respectable thing to do. In his thinking he makes a separation in the diverging and converging capacity of the brain. Since then stimulating creativity and helping people with creative problem solving (CPS) started as an explicit academic and professional domain.

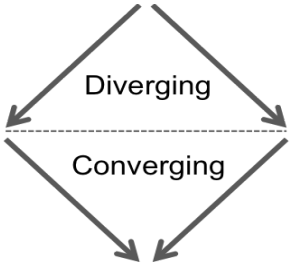


Figure 19. Modeling the sequence of diverging and converging thinking in the form of the "Creative Diamond". Horizontal the number of ideas, vertical the time. Based on Guilford's ideas.

Diverging is at the heart of the CPS-domain (CPS = Creative Problem Solving). Getting many ideas in order to get one or two good ideas into implementation is the basic line of reasoning. The idea generating technique Brainstorming developed by Alex Osborn in the early 1940's (Osborn, 1953) made this way of thinking popular. Postpone judgement during diverging is the core message of this technique. The consequences of diverging is that you also have to converge. If you produce many ideas, you have to select a couple of good ideas, because you cannot implement all generated ideas without a quality check. This sequence of divergence and convergence led to the well-known "creative diamond". An expanding diverging phase followed by a narrowing converging phase. See figure 19.

In those early days of creativity research the emphasis was on diverging: if you could produce many ideas you were a creative potential. Paul Torrance (1915 - 2003), professor in Educational Psychology at the University of Georgia, developed different tests to measure people's ability to diverge. The TTCT: Torrance Tests of Creative Thinking (Torrance, 1974) is the best known. The three main aspects to judge divergence are according to Torrance:

- fluency (the number of ideas per time unit)
- originality (the degree of newness of the ideas)
- flexibility (the number of categories the ideas are based on or fit in)

Another important aspect of CPS is that it is always intended to be a group activity. Small groups of people execute the CPS-process. It is their joint effort to come up with interesting solutions for the original stated problems.

Part of this group process is the particular task or role of the so-called Facilitator. This person is responsible for organizing and managing the CPS-group process. Both elements work together: the group and the "leader" want to get the expected results. But this leader has a very special role. This leader is responsible for guarding and facilitating the CPS-*process*. The group, the participants in the CPS-process are responsible for the *content*. They are going to solve the problem at hand. The leader or Facilitator helps them in achieving that. There is consensus among the academics and practitioners in the field of CPS the ideal size of a resource group should be 5 – 8 persons to work effectively under the guidance of one facilitator. Larger groups should be split up an thus need more facilitators (Isaksen, Dorval and Treffinger, 2010).

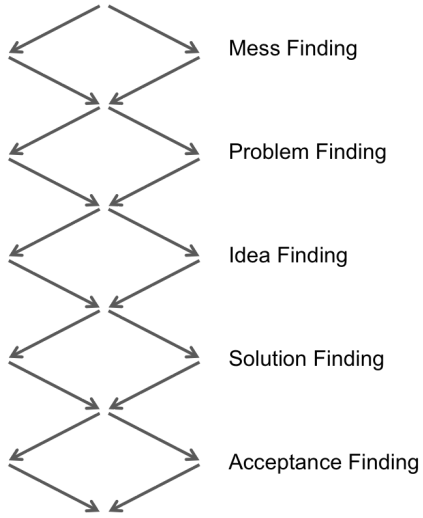


Figure 20. The five Buffalo CPS-stages based on Parnes, 1967

In the American Buffalo CPSI (= Creative Problem Solving Institute) -tradition (Parnes, 1967) the creative diamond is not limited to one single step but is part of a sequential series of five separate diamond shaped steps, which are listed in figure 20.

3.3 iCPS: Delft's Expansion of the Classical CPS-approach

As shown above the roots of C(reative) P(roblem) S(olving) can be found in the USA back in the fifties of the past century. So, rather USA culture biased and rather classical, the original CPS approach is a challenge for European CPS practitioners in our days. Integrated Creative Problem Solving (iCPS) is the attempt of the Delft University of Technology to cope with these challenges (Buijs and van der Meer, 2013).

The main characteristics of iCPS are summarized in table 2 on the next page and will be explained in more detail in the upcoming paragraphs.

3.3.1 Four Interdependent Sub-processes

Project Management: the Basis

During executing creative problem solving sessions we discovered over the many years that knowledge about the different steps in the process, the role of divergence and convergence nor the knowledge of the different creativity techniques are enough to run and organise successful creative sessions. The session itself is a challenging endeavor. As a facilitator you first have to convince the Problem Owner that a creative session could help to solve his problem. Secondly you have to agree on which people both of you want invite to become members of the Resource Group. And thirdly to have to organise and manage all the mundane stuff like setting a date, hiring facilities, finding the right resources and of course the budget and the deadlines. These practical aspects of organising and running a creative session are mostly ignored by the traditional CPS-schools. Coming from a practical engineering and design school we found it necessary to incorporate these project management aspects into our overall iCPS-approach. So we introduced the Project Management process as one of the sub processes of our approach. This is our first addition.

Acceptance Finding: a Separate and a Main Activity

In the classical Buffalo tradition of CPS Acceptance Finding is the last step in their five step approach (Parnes, 1967). Again in our own practices we discovered that Acceptance Finding is not the last step in the process but often the first step in the row. As soon as you start talking to the Problem Owner about the composition of the Resource Group you are already busy with the Acceptance Finding. We, as the creative facilitators, put a lot of effort in finding out who are the relevant stakeholders of the to be solved problem. Both upstream as well as downstream of the problem. Inviting the relevant stakeholders to become members of the Resource Group influences the acceptance of the solution immensely.

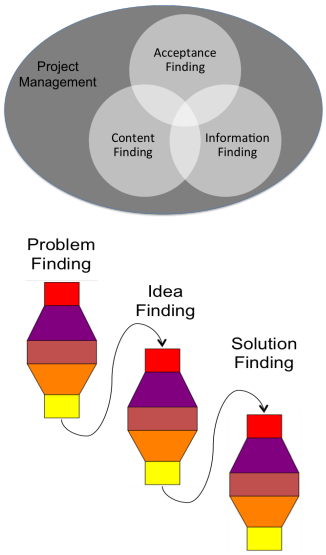
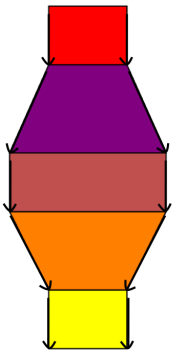
1)  	**Four interdependent sub-processes** *(see 2.7.3.1)* Instead of concentrating on the Content Finding process only *iCPS* consist of the four interdependent sub-processes of *Project Management, Acceptance Finding, Information Finding* and *Content Finding*. Within the Content Finding sub-process three iCPS Basic Modules (the former creative diamonds) can be distinguished. 1) *Problem Finding:* about defining the problem 2) *Idea finding:* about idea generation and selection *3) Solution finding:* about idea improvement
2) 	**The iCPS Basic Module:** *(see 2.7.3.2)* The classical Creative Diamond (consisting of diverging and converging) was evolved into the iCPS Basic Module by adding: • a step of *Clustering*[6] in the classical Creative Diamond that only consists of a Divergent and Convergent step. • a step called *Task Appraisal* prior to the divergence step. • a *Reflection* step after the convergence step. Thus, the *iCPS Basic Module* consists of five steps: (1) Task Appraisal – (2) Divergence – (3) Clustering[7] – (4) Convergence – (5) Reflection.
3) 	**Clear roles and responsibilities (and the active role of the Creative Facilitator)** *(see 2.7.3.4)* The roles and responsibilities of Problem Owner, Creative Facilitator, Resource Group and "others" should be clearly divided. Within this role division we want to emphasize the active role of the Creative Facilitator and the need of content knowledge to be a good leader in the creative process.

Table 2. The main characteristics of iCPS.

[6] Originally this step was called "clustering" by Tassoul and Buijs (2007). However, later on in this report this step will be referred to as "reverging".
[7] Reverging

We see Acceptance Finding as a form of Co-Creation. You Co-Create the solution together with the future users of the solution. It is a form of early user/stakeholder involvement. Of course there are also content related aspects to the acceptance of the solution, but we found out that this organizational aspect is much more of importance. That is the reason we separated the step Acceptance Finding from the overall CPS process and promoted it to become a separate, interdependent sub process alongside the earlier Project Management sub process. Chapter 4.5 will dive deeper into the topic of Acceptance Finding.

Content Finding: divided into three iCPS Basic Modules

To distinguish our new process without the *Mess* and *Acceptance Finding* from the traditional five step CPS process we gave it a new name: Content Finding. Due to our European practice we limited this Content Finding sub process to three successive iCPS Basic Modules (the former 'creative diamonds').

1. Defining the Problem (or Problem Finding)
2. Generating and selecting Ideas (or Idea Finding)
3. Improving the Ideas (or Solution Finding)

In the first iCPS Basic Module the Resource Group explores and reframes the problem. In the second module they generate and select promising ideas. In the third module they make the transition from this promising idea to implementation into the real world. This Content Finding sub-process is typically executed within a creative session, in which a Creative Facilitator guides a Recourse Group through the creative process of the consecutive iCPS Basic Modules.

Information Finding: continuous 'reality check'

Also based on our practices is that a creative session is often a part of a much longer creative trajectory. In its simplest form there is (1) a preparatory part before a session takes place, there is (2) the session itself, followed by (3) a communication part to bring the ideas from the session to the real world. The (4) real implementation is the last part of the trajectory.

However the real word is not as simple as this. The preparatory part has many faces and has its own problems. It can take weeks to get started. The session is seldom one single session. Usually we run a series of sessions. Sometimes with the same Resource Group, sometimes with different ones. Sometimes brilliant ideas come up in between sessions, or after participants come home and talk to their loved ones or when they are walking the dog. This should also be included in the total creative project.

This brings us to the next addition. During a creative session the participants are relying on their own knowledge, skills and experiences, stored into their brains. Sometimes they just say something without really knowing the truth or the value of what is being said. Sometimes they say wrong or even non-sense things. Often without realizing it. So there is a need to check ideas on their realistic

qualities. For instance if you are participating in a session which is looking for new ways to make "openings", someone could say "do it like Woody Woodpecker". But if nobody in the group knows anything about how woodpeckers make holes this saying is a kind of non-information. Although it could lead to other animals making holes, which could lead to a new idea. Checking this kind of information during the session is non productive. It will change the working climate from generating to analyzing and will stop the production of new options. Therefore we introduced the extra sub process of *Information Finding*. Information Finding is an action carried out outside the creative session to check whether certain ideas are realistic and feasible. Sometimes just a short *Google* session is needed, sometimes a telephone call to a specialist, but it could also take months or even years to check certain ideas. Because of this special nature of Information Finding we also raised this sub process on the same level as Project Management, Acceptance Finding and Content Finding.

Summarizing the basic integrated Creative Problem Solving approach
The basic iCPS approach is a coherent set of four interdependent sub-processes:

- The Project Management sub-process (each creative session is a kind of a project), including facilitation;
- The Acceptance Finding sub-process (the results of a creative session have to be shared with others and probably more and different others will be needed to implement those results);
- The Information Finding sub-process (you have to check in the outside world (outside means here outside of the session) whether what has been said before, during and after the session on the content of the session has some real value. A kind of reality check on the ideas that have been generated;
- The Content Finding sub-process (that is solving the problem at hand). This runs from investigating the problem and its stakeholders to detailing the suggested solutions and dealing with the implementation.

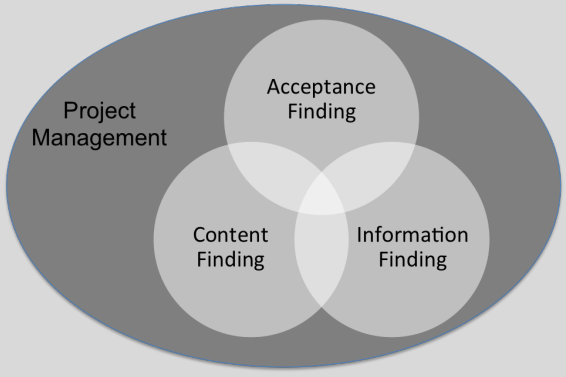


Figure 21. The basic principle of the iCPS approach: 4 interdependent sub-processes.

The four sub-processes have no fixed order in which they should be handled. Although we always suggest to start with the *Project Management* sub-process. Because as soon as there is a deal between the Problem Owner and the professional Creative Facilitator to start a creative problem solving process the project has been started. The other three sub-processes will, dependent on the situation and the content on that moment in time, have different sequences.

3.3.2 The iCPS Basic Module

In the Content Finding sub process we were talking about iCPS Basic Modules. The iCPS Basic Module is an expansion of the Creative Diamond. Below the evolvement of the Creative Diamond is explained in more detail.

From Creative Diamond to Creative Diamond 2.0

Based on the Guilford notion of the early fifties the creative diamond consists of two sub steps: one for diverging (getting as many options as possible) and one for converging (selecting the most promising options out of that many options) (Guilford, 1950). In our practices an in-between step has been developed. If the Resource Group has generated many options, say more than 100, the group and the facilitator is losing the overview of this many options. So we introduced a kind of mental pause in which we asked the participants to look to all the options and to produce a systematic overview in the form of five to seven clusters of groups of comparable options. There will always be a rest category of a small number of options that have no similarities with any of the other options. So we end up with this in-between step with an overview of five to seven categories based on the content of the options and one Rest category of non-related options. Because we do not generate new options, neither do we throw out options this in-between step is neither divergence nor convergence. So we decided to enlarge the creative diamond with this extra in-between step. The new three-step creative diamond was named "Creative Diamond 2.0". Tassoul and Buijs (2007) called the extra sub step "*Clustering"*, after the main creative technique which is used in this sub step.

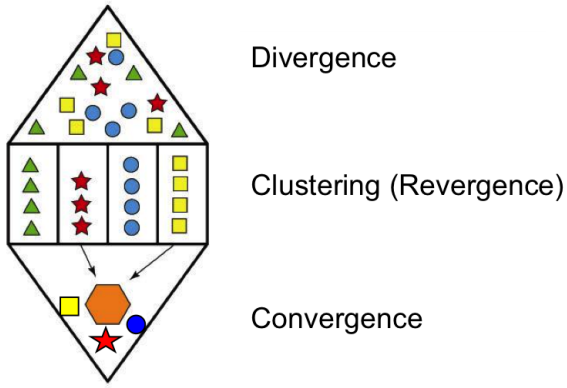


Figure 22. The Creative Diamond 2.0

An interesting side effect occurred during many clustering actions. The first thing the group notices is that not all clusters or categories are evenly filled with options. This often leads to go a step back

to the earlier divergence stage to generate new options for the clusters with fewer options. And of course that will also generate options for the other clusters as well. So this leads to an iteration of the earlier divergence stage.

Another thing that happens often is that due to the categorisation the group discovers that there are also other categories possible they completely missed. This is once again a reason to back and generate new categories and within those categories they are generating new options. This process is encouraged if the group gives the original categories intriguing names or labels. These labels are the stepping-stones for finding new categories.

The third thing that often happens is that in the next convergence stage the categories are used for selecting the promising options. For instance: allow each participant to select three options per category for all categories.

So, the Clustering in-between stage has value for its own, as it can help to improve both the divergence as well as the convergence stage. Besides the technique "clustering" there are other creative techniques available for use in this sub-step. That is why the term "Clustering" for this sub-step is confusing and we decided to coin a new name for this sub step: "Reverging", to which we will dedicate a whole section (3.3.3) later on in this report.

From Creative Diamond 2.0 to the iCPS Basic Module

A creative session is not always carried out in the predetermined set of three creative diamonds 2.0 and sometimes there is more than one creative session needed as part of the overall creative project. Hence, there is a need to manage each creative diamond 2.0 as a separate independent organizational element. In order to do so you have to expand the creative diamond 2.0 with two extra steps. One at the beginning and one at the end. In the beginning there is the need for finding out what this next diamond is all about. Is it for defining the problem (the first diamond), is it for improving the ideas (the third diamond) or is it for getting ideas (the second diamond)? This first extra step we call *Task Appraisal*. The resource group including the facilitator has to find out and agree on what this next task is.

After executing the content related divergence, clustering (revergence) and convergence steps for this specific diamond the group has to decide at the end whether they are happy with the results of their execution. If yes, they can step over to another creative diamond, if no they can decide to re-do this diamond (iteration) or make a step back to an earlier diamond. This is done in the *Reflection* step. The group reflects on what has happened in the execution of this diamond. Both on content as well as on process. Based on this reflection they can make the next move. We owe credit to Horst Geschka for this addition (Geschka and Lantelme, 2005).

So, for managing the different diamonds we expanded the creative diamond 2.0 into the *iCPS Basic Module* with five sub-steps as can be seen in figure 23.

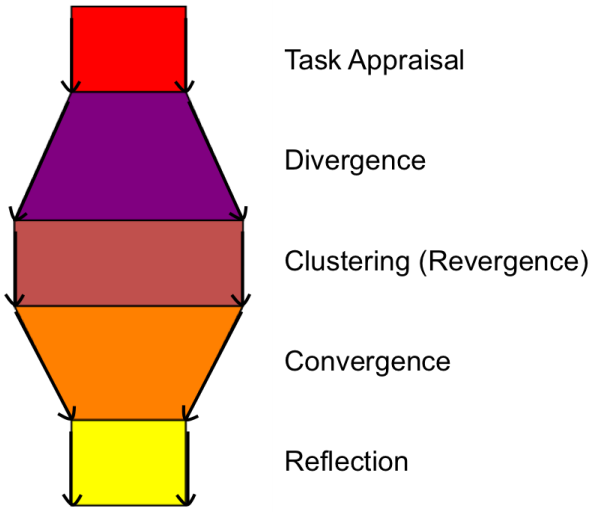


Figure 23. The iCPS Basic Module

3.3.3 Clear Role and Task Division

Role division

There is, besides the process side, also an organizational side to iCPS. We distinguish at least four different roles:

- *The Problem Owner (PO)*. That is the person who has an open problem and is or feels responsible for solving it. He or she is seeking for professional help to get it solved.
- *The Creative Facilitator (CF)*. That is the professional organiser and leader of the session. He or she is an expert on the four sub-processes and knows the relevant creativity techniques.The Creative Facilitator is the prime responsible person for organising and running the creative session. Including all preparatory and logistic actions.
- *The Resource Group (RG)*, the professional participants of the session. They are willing and ready to use their knowledge, experiences and skills to help to solve the problem of the Problem Owner. They are, together with the Problem Owner responsible for the content of the problem solving process.
- *The "Others".* Not all stakeholders of the problem will be able to join the session, but later on in the implementation stage they will have to live with the consequences. Sometimes it is only later in time that all stakeholders will be known. So this group of "others" can be a constantly changing group of people. These "Others" play an important role in the *Acceptance Finding* sub process.

Sometimes we distinguish a fifth element:

- *The Outsiders, the Extra's or the Add-ons.* People with special qualities in relation to the problem, who might be interesting to ask to contribute to the creative session. In most cases it is about their content knowledge, like their knowledge of the same or analogue problems or situations.

  Sometimes we use them also for their process knowledge. For instance in the role of "buddy" for the facilitator. As a kind of sounding board and sparring partner. Sometimes we gave them the role of "standard-layman" within the Resource Group. In this situation they do not need to have specific knowledge about the problem at hand, but they have many experiences of participating in creative sessions. They are a kind of "secret agent" of the facilitator; able to support and help the facilitator from within the Resource Group. For instance to pose "strange" questions or to produce extreme ideas, which can help to open up the box for the other participants. They are part of the Resource Group and are introduced due to other qualities than being a "buddy" for the facilitator.

It is important to differentiate those roles and to manage them. Do not get them mixed up.

The role of the Creative Facilitator

The last aspect we like to talk about is facilitation. We consider facilitation as a part of the Project Management sub process. The creative facilitator is the project manager of the total overall creative project, including the running of all the sessions. Within U_CODE this would be part of the role description of the SuperModerator. In his task as the professional organizer and manager of the total creative process it is his or her duty to manage the process and the group of participants to the maximum to get the optimal results. S/he is not just the "pencil" of the group. S/he manages and steers the group to get the most out of them. In order to do so the creative facilitator has the need for content knowledge. In the Buffalo traditions the facilitator has no interests in the content. It is true that the Resource Group is primarily responsible for solving the problem and that the facilitator is primarily responsible for the process. But in order to do so s/he needs to understand the problem. If you do not know what the group is discussing about you cannot interfere and steer the group in another direction. If you do not know what the box is how can you help them think outside-of-the-box? Analogies are great for helping a group. To know which analogy could be of help you should understand the original problem. This is content. So we stimulate facilitators to be very active, both in process as in content. Content knowledge not for solving the problem, but for being the better process consultant.

3.4 Three Basic Principles for Good Facilitation

Now the basic iCPS approach is explained, we will zoom into the actual creative session. A creative session is defined here as a formally organized professional meeting according to an iCPS way of working to get new and useful ideas for a given open problem. A creative session is the main chunk of the Content Finding sub-process, supplemented by some activities from the Information and

Acceptance Finding sub-process and of course the overarching Project Management. Three basic principles for a good facilitated creative session can be derived from the iCPS approach.

3 basic principles of good facilitation:

1. Role rigidity
2. Clear problem statement
3. Golden rules for each sub step of the iCPS Basic Module

3.4.1 Role Rigidity

The four (or sometimes five) roles were already discussed in the previous section, i.e: Creative Facilitator; Problem Owner; Resource Group; the "Others" and the Outsiders. The basic rule *Role rigidity* is about ensuring that the role division and corresponding responsibilities are very clear to everyone [Treffinger, Isaksen and Dorval, 2006; Isaksen et al., 2010]. The main reason why a person should not take up two roles at the same time is because one role is enough for one person to handle at a time. However, in reality the role of the Creative Facilitator is often carried out by the Problem Owner for supposedly "practical reasons". The risk of this approach is that the Problem Owner might (consciously or unconsciously) steer the Resource Group into a desired direction, which will limit the creativity. Also, the Resource Group may feel limited in their 'freewheeling' for emotional reasons (e.g. because they want to help the problem owner too badly or because the Problem Owner is also their boss and they are afraid of sharing "wrong" ideas.).

3.4.2 Clear Problem Statement

The formulation of a problem influences the approaches people adopt to solve the problem and consequently their success in solving the problem [Ward, 2004]. Ineke Walravens [1997], compares a problem statement with the negative of a photograph: when the negative is blurred, the photo itself will never be sharp. As mentioned already in §2.7.1 the problem statement should always be open-ended. Some guidelines for formulating an initial problem statement is to let it *SPARK* (Heijne, 2011):

- **Specific** (the essence in one question, one concrete objective)
- **Positive** (no denials, no criteria)
- **Ambitious** (energizing, immersive)
- **Relevant** (feasible, dedicated problem owner)
- **Keep it simple** (to the point, easy to understand, no jargon)

So, a creative session should start with a clear and *SPARKling* problem statement, however, it is also recommended to redefine the problem statement during the session. This way all participants will be engaged in the problem formulation, which will increase the quality and originality of problem solutions [Mumford, Reiter-Palmon and Redmond, 1994].

3.4.3 Golden Rules for each Sub-step of the iCPS Basic Module

Fun fosters open-minded and creative thinking. For that reason it is important that people enjoy the creative process. Additionally, a positive experience or feeling makes that people want to put more effort and energy in a project. Conditions that fosters a positive experience when performing a (creative) task are summarized in figure 24. An optimal experience is when individuals are getting into a flow and forget about time and daily issues.

Figure 24. 8 conditions to foster a positive experience when performing a (creative) task (Csikszentmihalyi, 1990).

Next to these 8 general conditions, there are specific rules per sub step in a creative session which form the base of good facilitation. As explained earlier a creative session consists of (three) consecutive iCPS Basic Modules. And an iCPS Basic Module consists of 1) task appraisal, 2) divergence, 3) clustering (or revergence), 4) convergence and 5) reflection. Each sub step requires a shift in mindset and a different kind of creative techniques. There are thousands of creative techniques, which cannot all be discussed. However, it is important to understand the specific rules which are embedded in the creative techniques. In the next section the rules behind diverging techniques, clustering (reverging) techniques and converging techniques are revealed.

3.4.3.1 Divergence and its Golden Rules

Divergence seems to be at the heart of most creativity techniques. Remember the three main aspects to judge divergence are according to Torrance:

- fluency (the number of ideas per time unit),
- originality (the degree of newness of the ideas) and

- flexibility (the number of categories the ideas are based on or fit in).

The techniques for diverging use these aspects in different forms. Since Originality cannot be forced upon the members of the Resource Group but is seen as an outcome of Fluency and Flexibility the two major families of diverging techniques are based on those. Fluency techniques are also called Association techniques and Flexibility techniques Creative Confrontation techniques. There are thousands of this type of divergent techniques only slightly different from one and the other. All of these techniques are based on three Golden Rules.

The Golden Rules for diverging are:

1. Quantity breeds quality
2. Postpone judgement
3. Hitchhike on other's ideas

The most well-known Fluency Technique is *Brainstorming*. The story goes that Alex Osborn "invented" this ideation method by observing his co workers during work. He was one of the founders of the famous advertising agency BBDO. This New York based agency was founded in 1928 by Batten, Barton, Durstine and *Osborn*. He observed that if someone was making a suggestion or putting a new idea on the table that most colleagues reacted with expressions like: "that does not work", or "that is not what they expect of us", or " that does not fit their policy", or "that is much too expensive", etc. This set of negative expressions is known as the "Killer phrases": easy ways to kill an idea. Indeed it is easy to kill an immature idea. By the way the universal killer is absolute silence: just ignore what the other just has said, go on with your real work. This really sucks out all energy of the person with that new idea. As a solution for overcoming this negative behavior Osborn suggested to behave according to some specific rules if the group was executing an ideation task. This set of rules became later the above mentioned three golden rules of diverging.

Experienced brainstorming groups easily get 120 to 150 ideas in about half an hour. A warning is needed here. Most people think that this single idea production step equals the total brainstorming creative problem solving process, but it is only the divergence part of one of a series of many creative diamonds. In this popular, but wrong view of Brainstorming it is limited to only the diverging part of the second creative diamond (idea finding). This wrong popular view is probably the origin of the major criticism about brainstorming.

A real true *Brainstorming* procedure, as it was intended by Alex Osborn, should always include the first two diamonds, preferable all three if you want the ideas to get implemented. If the brainstorming group has not dived into the problem (the first diamond), they will never get interesting new ideas (the second diamond), and without promising ideas there will be no implementation (the third diamond). This is best understood by experiential learning where inexperienced creativity groups discover over time this huge importance of spending effort and time on getting and finding a proper problem definition (the first creative diamond).

As said before experienced brainstorming groups easily get 120 - 150 ideas in this diverging stage of the second diamond (this ideation last usually between 30 and 45 minutes). Now they obey to the first golden rule: quantity breeds quality, which is just another way to say "thou shall diverge".

The idea production generally comes in three waves: first there are the obvious, traditional, expected and common ideas (say the first 20 to 30 ideas), followed by a wave of silly and idiot ideas without any attention to the usefulness of those ideas (in some groups a "competition" gets started to find out who is the funniest person in the group) (again some 20 to 30 ideas). After this the most interesting third wave will come, the wave of the really challenging and novel ideas (the last 40+ ideas). These novel and good ideas are usually combinations and extensions of the earlier produced silly and idiot ideas, but now the usefulness is included (Parnes, 1961). See the figure below.

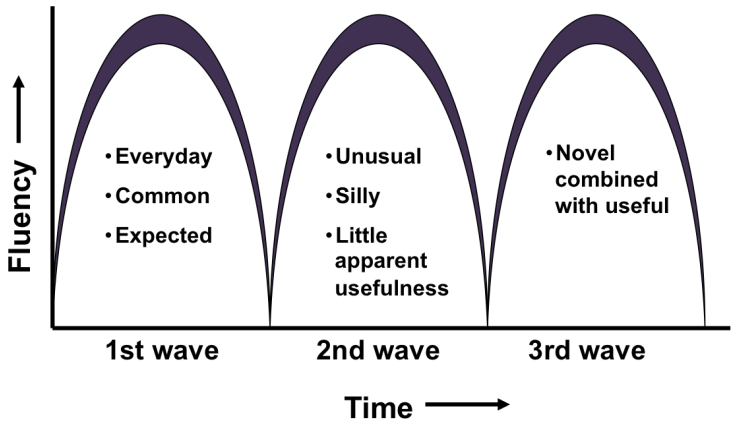


Figure 25. The three waves of ideation based on Parnes (1961).

Experienced creative groups do know this three wave ideation phenomenon and they behave accordingly. They immediately start sharing the obvious ideas (which is called the "purge stage" of the session) as quickly as possible, to get their brains free for better and new ideas. They also know that silly ideas will come up, so the really experienced ones sometimes start right from the beginnings with shouting silly ideas.

Characteristic for *Brainstorming* is the rule to produce many ideas in a short period of time. One of the explanations for this necessity of speed within the brainstorming procedure can be illustrated by using the metaphor of right- and left brain thinking. The speed will clutter the left brain and will give mental space for right brain thinking. Right brain thinking symbolizes making connections between loosely coupled ideas, domains, images and words. An essential engine for the production of silly and of good ideas. This is the application of both the second and third golden rule. Making new connections, associating on ideas others have produced. Building on ideas others have generating is indeed "hitchhiking on each other's ideas" (rule # 3). The left brain symbolizes the part of the brains that wants to criticize what is being said and done. Essential for diverging is the "postponement of judgment" (rule # 2). So keeping the left-brain busy will help. Diverging within

this brainstorming procedure is not about coming up with good ideas, but about coming up with as many ideas as possible. In Torrance's view: *fluency*.

Evaluating the ideas is executed in the converging stage of the second creative diamond. After clustering of course. Then the resource group is judging and evaluating all the ideas that were generated in the earlier diverging stage. In that situation left-brain thinking is encouraged.

In the application of the second golden rule (postpone judgement) we experience a big difference between experienced brainstorming groups and inexperienced groups. If for instance the Facilitator is making a writing error on his or her flip chart board, inexperienced group members will put attention to that fact. Showing that they are much cleverer than the facilitator, as well as showing that they are very good in judging and evaluating (in our western cultures being critical is seen as a positive attitude). Or if someone mentions an idea that has been said earlier, inexperienced members want to show that they are fully involved and need to share this critical observation in public. Or if someone misinterprets a word: "snow" instead of "show", they immediately want to correct this wrong understanding. During all these actions of judgment and evaluation (= converging) they are not able to contribute to the production of new ideas (= diverging). The participants who are criticized by them feel sometimes so threatened that they do not come up with new ideas anymore. So a double negative effect on ideation is the result.

Experienced brainstorming groups react completely opposite. They use every mistake, typo, misunderstanding or pun as a starting point to think outside the ongoing stream of ideas. They use all these "wrong ideas" and "mistakes" as stepping stones to come up with wild ideas, to (re-)ignite the fire of new idea generation. By ignoring these mistakes as mistakes and using them as mental spring boards they demonstrate to the group that they fully understand the notion of "postpone judgment" as the most essential working mechanism for a successful ideation session.

To overcome the difficulties of classical brainstorming for inexperienced groups a wild variety of silent, written techniques were developed, from Brainstorming with Post-Its to the German “Karten Umlauf Technique” and 6-3-5 (Schlicksupp, 1977). Within the *Brainwriting* type of creativity techniques the basics are the same as in the classical *Brainstorming* procedures, but now everything is put on paper by the participants themselves.

3.4.3.2 Revergence (Clustering) and its Golden Rules

In chapter 3.2.2 the term “reverging” was introduced, indicating the sub step in between diverging and converging. After diverging, the Resource Group has to do ‘something’ with the generated options, before moving on to the converging stage. In most literature the activities in the reverging step are not seen as a separate step, but rather as part of the converging step. Modern scholars of Creative Problem Solving and Facilitating emphasize reverging has a significantly different mindset and goal than diverging and converging and should be considered as a separate stage as important as diverging and converging.

Tassoul and Buijs (2007) named the reverging stage 'clustering' after a frequently used technique for this stage in CPS. Around the same time, Kaner (2005) encountered a struggle in facilitating group decision-making. He found that after the diverging stage a group "has to" go through a painful and frustrating stage, before moving onwards to the converging stage. He named this stage the 'groan zone'.

Clustering and the *Groan Zone* were developed in parallel in different fields. *Clustering* emerged as part of the CPS approach and is incorporated in all three iCPS basic modules of the content finding process: problem finding, idea finding and solution finding. It must be noted that clustering as a technique is most useful in the problem and idea finding stage, especially when the number of options exceeds 100. The *Groan Zone* was developed as part of reaching consensus within group facilitation. When looking at the three stages of the content finding process, it can be argued that the groan zone is mostly present at the third iCPS basic module: solution finding. Thus, *Clustering* and the *Groan Zone* were described from a different angle, with a various focus and approach, but the basic concept behind it is the same.

Besides the technique clustering, there are other approaches and techniques to deal with this stage and it is not necessarily a painful (groaning) struggle. Therefore, it was decided to coin a new, overarching name for this stage: 'revergence'. This term is in line with 'divergence' and 'convergence' and referring to the main goals of the sub-step: *re*-visiting and *re*-arranging options; *re*-vealing knowledge; and *re*-setting your mindset. On top of that it is about Group Dynamics of the *Re*-source Group (see table 3 on the next page).

Clustering, a technique from the reverging stage

For the Reverging stage a couple of creativity techniques exist, but it is much less elaborated than the creativity techniques for diverging. As said before, the most frequently used technique is called 'clustering', which covers all four revergence goals through an activity of rearranging all generated options from the divergence stage into clusters. Usually the number of options exceed the 100's and with this number it is difficult to get an overview of the different directions those options explore. By deliberately creating an overview we can easily see five to seven clusters or families of related options (i.e. Revisit and Rearrange options). Of course there will always be options which are a category on its own. We put them in the rest-category; which by no means is a weak cluster. Sometimes these unrelated options prove to be of an outstanding quality. Because we do not throw away any option clustering is not the beginning of converging, but technique for the Reverging stage. Based on this overview of all the options we can discover interesting things. For instance not all clusters or families are equally large. Which could lead to an iteration to re-do the diverging part to get extra options within one of the smaller clusters (i.e. reset). Sometimes another surprise comes to the front: by seeing the clusters and trying to give them stimulating names, we could even discover other clusters for which no options have yet been generated. Again this can lead to re-doing the *Problem Finding* stage (the first creative diamond) or to an extra ideation iteration to get options within this "empty" cluster (ie. reveal and refine the problem- and solution space). In

both cases this will lead to extra new options. So, from clustering we go back to diverging again. This reasoning is based on the content of the options.

Reverging goals	**Description**
Resource Group Dynamics	During the Reverging stage, the Resource Group builds a shared understanding of the generated options and obtains a better grip on the problem space and the solution space. Reverging is about group dynamics: a complicated social process or "groaning" as Kaner calls it.
Revisit and Rearrange options	During the Reverging stage, the Resource Group gets the chance to revisit all options generated, in order to know which ideas were generated. By rearranging the generated options, the Resource Group will create structure and overview. The aim is to make sense out of the (bulk of) options.
Reveal and Refine the problem and solution space	The Reverging stage is about revealing the full spectrum and quality of options. Knowledge is expanded and generated options are enriched through connecting ideas and identifying relationships. New insights and perspectives are revealed, leading to a deeper understanding and further refinement of the problem and solution space.
Reset	The Reverging stage is a moment to reflect on the previous diverging stage and decide how to proceed with the next stage (e.g. do we have enough options to proceed to the converging phase?). In case the next step is converging, the reverging stage provides the opportunity to reset the mindset and shift it from a diverging state to a converging state.

Table 3. the 4 goals of Reverging.

There are also arguments for this in-between step between diverging and converging based on the creative process itself. Diverging asks for a complete different mindset than converging. By building in a reverging activity it is much easier for the participants to switch to that other mindset (i.e. reset). Reverging helps both on content as well as on process level.

The easiest way to do the technique 'clustering' is to look at the outside characteristics of the generated options. For instance different shapes, colors, tastes, smells or sizes could form a different cluster. Another way is to categorize them accordingly to the relation with the solution direction they fit in. For instance are they technical options, organizational options, administrative options, market-related options or are they logistically oriented. Another way could be to look at other

formal characteristics like materials, costs, potential ownership or which organizational departments are related to the ideas.

A variant on clustering is called criteria clustering: in some cases the participants of the creative session want to have criteria upfront to categorize the ideas. These criteria could be a kind of "prototype-criteria" for the later converging step, but they could also be used for the reverging step alone. The best practice however, especially after ideation with post-it notes is to let all participants themselves do a spontaneous clustering by participants themselves (Buijs and van der Meer, 2013). They just start looking at a couple of post-its, each with one option, and try to cluster them into groups. For each new group or new category a separate flip chart is used. After some preliminary deliberations the participants come easily to five to seven different categories. As soon as they have discovered their own rest-category the clustering process is calming down. Participants are than challenged to give all clusters a kind of symbolic name, which hopefully will help them to let the options make progress during the rest of the CPS-process. Activating the participants to do the clustering themselves will positively influence the necessary support in the later stages to implement the ideas or concepts (i.e. Resource Group Dynamics).

There are more approaches that can be used in the Reverging stage, for example matrix approaches, where options are arranged in a 2x2 matrix. An example is the C-box (Raison, 1993). The two axes of the C-box are: 'innovativeness' and 'feasibility'. In this technique the secondary goal seems to be "idea-improvement".

Golden rules for revergence

As said before, revergence requires a different mindset then divergence and convergence. Hence, we are suggesting 3 basic rules for revergence .

The Golden Rules for Reverging are:

1. Active participation
2. Responsive listening
3. Move circular

1) Active participation:

Reverging is a group effort. The aim is to develop a shared framework of understanding. Therefore everybody needs to be part of the reverging process. If you only look at the results you will miss a lot of tacit knowledge. For example: if you only see the final 7 clusters of a clustering activity, it does not mean that you have a full understanding of the content.

2) Responsive listening:

The discussion during the revergence activity is what builds the shared understanding. Therefore, it is important to listen to each other with the intent of understanding, instead of replying.

3) Move circular

Reverging is not a linear process but in essence circular. It doesn't matter where you start, just start. The task may seem difficult at times, but once you start doing the reverging activity (whether it is clustering, categorizing or any other), you will find that value is being created along the way.

3.4.3.3 Convergence and its Golden Rules

Like the clustering techniques, the techniques for converging are as equally unknown. Converging, or selecting looks like an easy task, but in reality it proves to be a rather difficult one. Choosing among different options is according to economics very simple: first you know all options, secondly you have all information to base your judgment on, and thirdly you behave rational, and you strive for utility maximization. Unfortunately people are less rational than the economic theory thinks they are. People regret that they cannot choose more than one option, if they have chosen an option they start doubting the result, and especially if the outcome is very conservative they want to start all over again. So a good facilitator needs to guide the process in this stage with the same level of attention and care as he used in the previous stages of our creative diamond.

Stages in converging

One of the "Laws of Innovation" is a lot of options are needed to find a successful new product or service. Although the numbers in the various studies can vary the basic pattern is one as we see in the figure below.

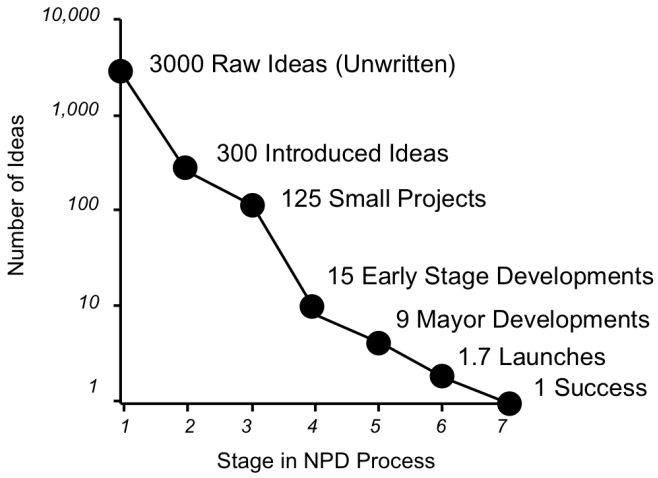


Figure 26. The ideas mountain: 3000 raw ideas equals 1 commercial success. (Stevens and Burley, 1997).

In this study (Stevens and Burley, 1997) was found that you need over 3000 raw ideas to find one success in the marketplace. When they write about "raw ideas" they mean the type of options you get in creative sessions. Diverging is not just a theoretical concept, but a proven reality! So there is a lot of refinement to be done during and after a creative session.

In creativity and innovation literature the type of curve Stevens and Burley found is called the "mortality curve" a term normally used in biology to represent the number of deaths in a

population, scaled to the size of that population, per unit of time. In 1968 the consultancy firm Booz Allen and Hamilton tossed this term for describing the innovation process and the several stages in it. In the figure below you can see an often used version of this mortality curve.

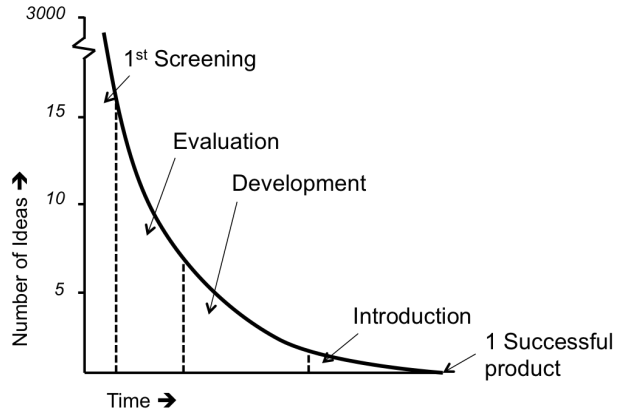


Figure 27. The mortality curve, adapted from Booz, Allen and Hamilton 1968.

Looking at this curve you can easily see the general objectives of the converging stage. Firstly we want to reduce the “not successful” options as soon as possible. Secondly we enrich the option during the process thus improving the success rate of the option we are still working on.

Investigating all options on their feasibility is a nice thought, but will bring enormous cost in time and money, which is impossible. You want a quick down falling mortality curve and a slow rising cost curve. In practice however we see too much "weak" options to be included in the converging process for a too long period of time. See the figure 28.

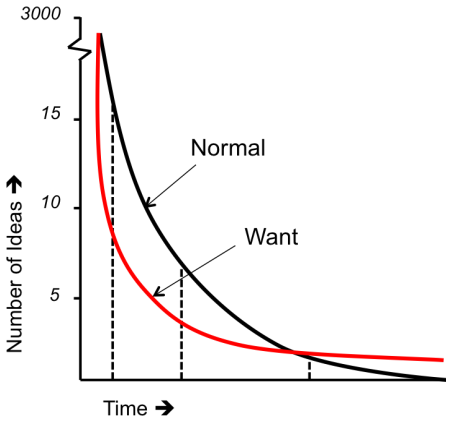


Figure 28. Objectives selection tools of the converging stages.

Selecting means also you will lose a lot of the options generated with so much enthusiasm in earlier stages of the process. Hardly anybody likes to give up on options especially not the ones you have generated yourself. In a good facilitated creative session the negative feelings of selection are

reduced to a minimum or even better: transformed into energy for the next stage. By good executed converging you are preparing the members of your resource group (the participants) for action.

This brings us to the three goals of the converging stages:

1. Reducing the costs by eliminating the “unsuccessful” options fast.
2. Improving the options.
3. Preparing for actions and Acceptance Finding for the options to implement.

This is easier said than done. First we need to have criteria on which we can select. Than we need information on each idea. And last but not least we need converging tools fitting in the flow of the process we are facilitating. As the number of ideas in our process is rapidly decreasing we see the amount of information per idea increasing. Also the efforts and costs we have to put in the idea to develop it is rising.

No standard solutions exist for this converging dilemma. It is dependent on the specific urban situation, the urgency of the process, the power of the Problem Owner, the enthusiasm of the stakeholders, the allowed budget, etc. Important is that all people involved are aware of this dilemma: you cannot investigate all options on their feasibility, and on the other hand you just cannot implement one "brilliant" idea without no checking of its quality at all.

For a smooth process we suggest the converging stage will be like figure 29.

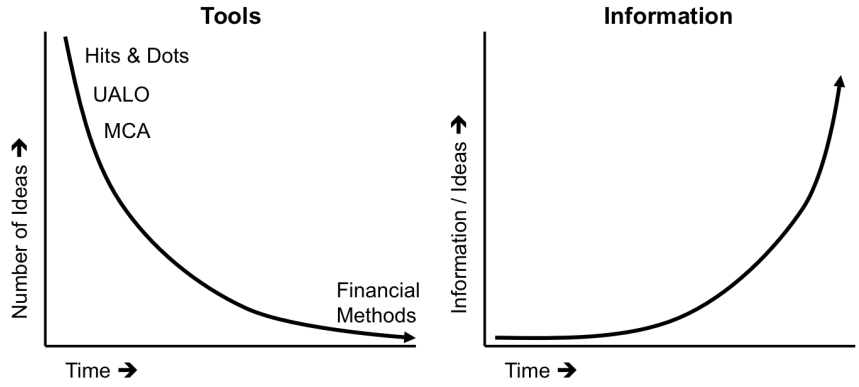


Figure 29. Good practice in converging.

So starting with thousand of options we would use rather fast and intuitive techniques like Hits and Dots or Paired Comparison(see f.i. Isaksen et al., 2010). Than with ten or so options we can progress with Itemised Response or UALO(see f.i. Isaksen et al., 2010). In most sessions this will prove to be the limit the group can cope with. You need new sessions and a lot of work in between to use techniques like Multi Criteria Analysis (Buijs and van der Meer, 2013). Only in the very last stages of development of an idea you will have gathered enough information to use financial methods like Net Present Value or Discounted Cash Flow (Buijs and van der Meer, 2013). We never have seen this type of financial methods being used in the setting of a creative session. It is more the slideshow

type of meeting to convince top management to fund market launch or the public to cooperate on the new Urban Plan.

The Golden Rules of Converging

One of the classic authors in our field, Parnes, developed some basic rules for the converging stage or as he calls it "focusing options" (Parnes, Noller and Biondi, 1977). Building on this work we suggested 3 basic rules for the convergent stage (Buijs and van der Meer, 2013):

The Golden Rules for converging are:

1. Use affirmative judgment
2. Protect originality
3. Have action in mind

1) Use affirmative judgment

The basic attitude for converging should be to give all ideas, all options a chance. It is very easy to evaluate all ideas to dead. Remember the killer phrases and the way Alex Osborn invented the rules for Brainstorming. As soon as you start using hard criteria like investments, cost price, time to market, market share or profit target all primitive ideas in the early stages of any creative problem solving process will fail to get through this converging stage. All ideas are still very immature, they all need extra refinement for getting implemented, so you should handle them with care. You should evaluate and select them on a positive way. Do we see chances of improving this primitive idea into a more promising one. Can this idea go to the next more detailed stage and will it become a better idea? Combining ideas into better ideas is one of the actions of the converging stage. Maybe this combined idea is much better in potentially solving "our" problem rather than the lonely idea.

Creative sessions are emphasizing on possibilities and try to eliminate a negative spirit as much as possible. We need an upward positive mood during all of the session and not only during the divergent stages. This means the facilitator should avoid converging in the "this and this and this is ***not*** good" mode. We never were fans of negative selection tools like the Hurdles procedure commonly used in so many large companies (figure 30). This type of convergent tools may satisfy the intellectual needs of corporate middle management but will have a devastating effect on the atmosphere in your session.

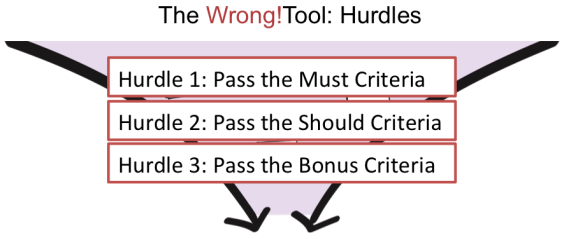


Figure 30. The Wrong!Tool: Hurdles.

And why should you select what you do not like? Nobody is able to predict the future especially not experts (Taleb, 2007). And there is so much you may like so why should you focus on the negative. We even have Biblical expressions for this phenomenon “The stone so easily thrown away at first sight turned out to be the cornerstone after all”. In wisely facilitated sessions we throw away not *one single* idea. We keep record of all ideas and in the converging stage we focus on the one we want to proceed with.

2) Protect Originality

When we consider our three basic criteria for converging (novelty, feasibility and effectivity)we can easily feel the seemingly paradox between Novel on the one and Feasible and Effective on the other hand . This phenomenon is called the *Creadox*, the paradox of creativity (Byttebier, Vullings and Spaas, 2007). You ask participants to come up with exciting new, out-of-the-box ideas, and if they have produced them, they do not fit into any well known category and all new ideas are thrown out. So you have to stimulate the participants to select with care and love for the novel and therefore strange ideas.

A small trick to keep people on board when most exciting ideas are unseen is to give everybody a “joker card”. They are allowed to mention one idea, even without any explicit argument, to go one stage further in processing. On this way they can circumvent the converging outcomes of the group. Because everybody can use one joker in each stage they have more belief in the overall converging procedure.

3) Have action in mind

The converging stage is a part of a complete process that will eventually lead to the implementation of novel and useful solutions. So after each converging stage, there is still a lot of work coming. Converging is not a free intellectual act. It is preparing the members of the resource group for the next step and probably a lot of work to be done. Since it is seemingly impossible to select “the best idea” experienced facilitators ask to “select the options you would like to work on yourself or you would like to invest your money on”.

3.5 Conclusion

Creativity is the process that leads to novel and useful solutions to given open problems and Creative Facilitation is all about helping a Resource Group to achieve that. This chapter was mainly about Creative Facilitation, since that is a key element in Ucodesign, especially within Co-Creation activities. When performing Ucodesign activities, the focus should not just be on the *Content Finding* process, but also on *Acceptance Finding* and *Information Finding*, as described in the *integrated Creative Problem Solving* approach. Creative Facilitation has 3 basic principles that should be embraced in the development of the U_CODE tools. In addition, some other requirements surfaced in this chapter that should be incorporated in the design of the U_CODE tools, which are merged in the list below.

Requirements regarding Creative Facilitation:

1. Ensure role clarity and rigidity (i.e. Who is the Facilitator?, Who is the Problem Owner?)
2. The Co-Creation process should be facilitated by an independent party
3. Start with a clear problem statement (i.e. SPARK)
4. Embed the Golden Rules for Diverging
5. Embed the Golden Rules for Reverging
6. Embed the Golden Rules for Converging
7. Balance in Content Finding, Acceptance Finding, Information Finding
8. Put a smile on the face of every participant

Requirements 4-6 are about the Golden Rules that must be complied to within each stage. Since each stage has different goals and a different mindset, the golden rules are unique for each stage and are listed once more below.

The 3 Golden Rules per stage:

Diverging	**Reverging**	**Converging**
1. Quantity breeds quality	1. Active participation	1. Use affirmative judgment
2. Postpone judgement	2. Responsive listening	2. Protect originality
3. Hitchhike on other's ideas	3. Move circular	3. Have action in mind

U_Codesign is a process taking may years and involves lots of Citizens and Professionals. To maintain a positive energy and flow in this process tools should be an effortless help and not a technical complex burden. It should be a pleasure to work with the tools, it should give energy. As phrased in requirement 8: All U_CODE tools should put a smile on the face of every participant using the tool. This will foster an open-minded attitude and creative thinking. If participants enjoy the activity they will likely put more effort and energy in the project, which will eventually promote Acceptance Finding of the Urban Design project. Therefore, the requirements of Csikszentmihalyi (1990) should be included. Besides, the barriers for citizens to participate in the Ucodesign process should be minimized, such as time, traveling, learning required skills, etc.

Foster a positive experience by including the eight conditions of Csikszentmihalyi as requirements:

1. Ensure a clear goal;
2. Ensure a challenging task;
3. Ensure a clear vision;
4. Provide the feeling to the participants that the task can be completed;
5. Ensure that participants skills are fully utilized;
6. Stimulate that participants are able to concentrate;
7. Establish the feeling of control of the situation;
8. Make sure all participants will receive immediate feedback.

For some aspects of the to be developed U_CODE tools we cannot produce very concrete guidelines or requirements yet, therefore we will present some challenges for the developers in the form of *How To* statements. Once the first U_CODE prototypes are being developed, these challenges can be further considered.

- How to make sure that Diverging does not get stuck in the silly stage?
- How to prevent the Creadox in Converging?
- Regarding the physical aspect of Co-Creation spaces: How to use the body language of Participants and the light/setup of the venue fitting to the stage of the creative process (see Appendix 5)

So far, we have discussed Ucodesign on small scale only. The next chapters will dive deeper into the implications of scaling up Ucodesign activities to massive scale participation and deal with the question:

- How to work with Resource Groups larger than 8 persons?

4 Ucodesign on Mass-scale

4.1 Introduction

There are different levels of collaboration possible within Ucodesign, ranging from Participatory Design to pure Co-Creation. Ucodesign always involves two-way communication between the Professional and the Citizen. Existing (on- and offline) Co-design tools and methods were studied (see also chapter 5). Urban Co-design, whenever taken seriously, needs to be by definition creative collaboration with a large number of participants beyond the size of workshop formats. However, during our study it was concluded that massive scale Ucodesign (including 1,000+ participants) is rather challenging.

All offline approaches we found were either inefficient one-way communication and referenda (f.i. Hamburg Olympics) or classical facilitation of sessions with subgroups. The latter is not efficient for massive scale since it was found 1 Facilitator can only handle a maximum of 10 Participants. Some recent attempts to massive scale Co-design like Living Labs [Criollo, 2016] show the same type of failure to meet the criteria of mass participation being both effective in the two-way communication and efficient in the Facilitator/Participants ratio.

Most online approaches reach a large audience and approximate what we have defined as Participatory Design, but struggle in being effective in the two-way communication. Pure Co-Creation on a massive scale, i.e. close collaboration in a mutual value creation process, has not (yet) been identified online. More recent approaches are experimenting with hybrid methods by mixing online and offline tools (f.i. companies like Zebralog[8] and Stormz[9]). For developing online approaches collaboration practices which suit the digital era should be acknowledged (Callabretta and Kleinsmann, 2017).

In the previous chapter the basic principles of Creative Facilitation were described. These principles are essential in Co-Creation activities but currently based on groups with a maximum facilitator/ participants ratio of 1 to 10. The tools and methods available within Creative Facilitation are mainly used in the Product Service System context. Applying these to the Urban Design context will lead to several implications. This chapter will list those implications, identify the underlying challenges and make a first attempt in tackling them. It is here where a USP of U_CODE can be defined. It must be noted that the implications are somewhat exaggerated for the purpose of describing two ends of a spectrum.

[8] http://www.zebralog.de
[9] http://www.stormz.me

4.2 Implications of transplanting Co-Creation from PSS into the Urban Design Context

The content of this section arose when trying to apply pure Co-Creation - as practiced in the context of Product Service Systems (PSS) - to the context of Urban Design. At first sight, the two fields of expertise (designers and architects) seem to be very similar: both professionals 'design' something for their customers. However, the nature of the Urban Design context largely affects the potential role of the customer (i.e. citizen) in Co-Creation. Five implications were identified and described below.

Implication 1: Democracy instead of individual choice to buy

The first implication is about what is done with the end product. Once a product (or service) is launched a potential customer in the end has the final say: to buy or not to buy. He or she will consider whether the investment is worth the product promise. On the contrary, in the context of Urban Design, the citizen will be affected by the new product (e.g. a train station), whether he likes the design or not. However, the level of acceptance by the citizen can be managed to a certain level and depends on several factors. Chapter 4.5 will dive into the topic of *acceptance finding and change.*

In line with democracy, decisions about e.g. a design should be made by either elected representatives or by the majority of the people. The main challenge however, is how to make sure that the actual participants represent the full range of opinions. Chapter 4.3 will elaborate on this bias of participant selection.

Implication 2: Project duration of >15 years instead of 1-2 years

Another big difference between PSS and Urban Design is the project duration. Most PSS projects take 1 or 2 years, while the project duration of Urban Design projects often exceeds 15 years. Especially in the early stages of a project the motivation of a citizen to participate in a Co-Creation activity in Urban Design is therefore much lower for multiple reasons, e.g. because of the lower sense of urgency of the citizen and because of the fact that once the project is finished they entered a new life stage or are even moved away already.

The main challenge resulting from this implication is how to engage participants along the project, especially in a very early stage. Gamification can play a significant role, therefore the topic of gamification will be explored in chapter 4.6. Obviously, transparent and continuous communication is crucial to inform, involve and engage the public. This communication should be executed in a technical correct way. In chapter 4.4. two more technical topics are covered: communication channels and boundary object.

Implication 3: Shifting group of participants instead of stable groups of participants

This implication is a result from the longer project duration. For Co-Creation activities, often people are selected who are potential buyers (i.e. the target group). It is likely that the same people will still be in the target group in the next 1 or 2 years. If professionals in the Urban Design context want to include the target group of a new building project (e.g. starters), these people will have totally different needs in 15 years from now. Since they will not have the direct benefit of providing input

for their own benefit, it is more challenging to motivate them to Co-Create the project. In addition, they often lack the trust that an effort that they make now, will still be embedded in the final design in 15 years from now.

With a stable group of participants synchronous Co-Creation activities can be conducted, using the principles from Creative Facilitation as described in chapter 3. With a shifting group of participants asynchronous activities are more obvious. Digitizing the approach will facilitate asynchronous and remote activities. Stormz[10] is an interesting example of translating the traditional (in-person) Creative Problem Solving process into a hybrid method of on- and offline Creative Facilitation. This and other interesting tools and methods will be discussed in chapter 5: Current tools and methods.

In addition, in line with the previous implication, engagement (and therefore communication and gamification) will play a role here.

Implication 4: Fuzzy, complex and shifting goals instead of a focused goal

The nature of long-lasting large Urban Design projects is that the future is unpredictable and subject to external factors like economic growth and politics, which enhance complexity. Due to the changing environment, the goals of the project are shifting as well. Even decisions made can be revised. This often leads to frustration of the citizens and affects their perception of their level of influence. In chapter 3.4 the importance of a clear problem statement (the so-called SPARK'ling problem statement) was emphasized. A way of dealing with fuzzy, complex and shifting goals is by presenting clearly defined sub challenges with the public (instead of one big hairy goal). This way focus is made and will also provide more flexibility for the project leaders of the participation activity to deal with shifting goals. Besides, sub challenges could be of interest as well for the engagement of the public, e.g. one can select sub challenges in line with their interest.

Regarding fuzzy and complex goals attention should be paid on how to present challenges and designs. Chapter 4.4 will therefore elaborate on the concept of Boundary Object and explain how to find the balance between plasticity and robustness of objects under discussion. In addition, transparent and continuous communication executed in a technically correct fashion will be key in dealing with shifting goals. Communication for informing the public will be investigated in chapter 5.3.2.

Implication 5: SuperModerator (SuMo) instead of Creative Facilitator

A creative facilitator is the person who takes primary responsibility for the creative process. The facilitator selects appropriate tools and methods; guides the participants through diverging, reverging and converging stages; helps the participants to focus on the task, and is sensitive to any sentiments and group dynamics. Within the context of PSS it is always recommended to appoint an independent facilitator to guide the creative process. However, in the U_CODE context the independency of the facilitator is even mandatory, in order to gain and maintain the trust of the citizens. The facilitator of the U_CODE process is named "SuperModerator".

[10] http://www.stormz.me

Although the primary focus of a SuperModerator is on facilitating the process, he/she should also have sufficient content knowledge to understand the context and the nature of the problem or challenge. In deliverable D4.1 the role of the SuperModerator is explained in more detail.

4.3 Selection Bias

Methods for CoDesign described in Chapter 3 flourish in processes with a limited number of participants. An ideal number of participants in the Resource Group is 6-8 per Facilitator. A highly experienced facilitator can work with groups up to 12 but in numbers higher than this the groups have to be split up and more facilitators are needed.

Most urban development projects have a huge amount of stakeholders (citizens, interest groups, authorities, politics, etc.) and each group of stakeholders can consist of thousands of potential participants. Large scale urban development can affect hundreds of thousands of people. This number of participants is impossible to cope for with classical facilitation methods.

The “common ways” to organize public participation in this large scale projects used so far are:

1. Inviting participants representing stakeholders organizations (see f.i. Bryson et al., 2013)
2. Inviting all members of the complete relevant public to participation events by mail or other traditional channels like papers, billboards, radio and television (Bryson et al., 2013; Albrechts 2015)
3. Using online surveys to reach the complete relevant public (see f.i. Roth, 2006)

For successful public participation it is key to provide an accurate representation of all possible opinions in the community. One of the prominent challenges in both practice as well as theory on public participation in Urban Design is that of non representative participant selection (Irvin and Stansbury, 2004; Fowler, 2013). As has been argued (Bryson et al., 2013) the first “common way” will lead to the phenomenon called “usual suspects” with obvious challenges . The group of stakeholders with the highest interest, power or will to participate (the ”usual suspects”) is most likely not representative for those who are affected by the project. The last two “common ways” have another challenge to cope with called “non response bias” or “selection bias”. The thread of “non-response bias” in traditional sample surveys is long known (see f.i. Donald, 1960). The higher the threshold for participation, the bigger the risk of “non-response”. So, mail surveys show even less “non-response” than participation meetings at City Town Halls (Manfreda et al, 2008). “Non-response” leads to an increase in variance as a result of a reduction in the actual size of the sample and the recourse to imputation. This produces a bias if the non-respondents have characteristics of interest that are different from those of the respondents. Furthermore, there is a risk of significantly underestimating the sampling error, if imputed data are treated as though they were observed data (Little and Rubin, 2014, p.59).

Jüni and Egger (2005) describe a form of selection bias in their research called attrition (loss of participants). This form of selection bias involves dropout, non-response, withdrawal and protocol

deviators. Here the researcher simply rejects everyone who drops out of the trial, when most of the ones who drop out are those for whom the treatment isn't working. We see the same effects happen in participation in Urban Design. Especially lower educated participants with an aversion to the proposed plan will not participate so policy makers will systematically underestimate the risk of resistance towards plans (Albrechts, 2015).

Concerning the third way, online surveys studies show deviation upon the total population in so called census research (Hammer et al, 2016) up to over 300% based on the same phenomenon of selection bias.

In literature 3 modern ways for overcoming "selection bias" can be found

1. Finding participants not *in* but *via* opinion leaders in relevant stakeholder organizations (see f. i. Pucci and Mulder, 2015)
2. Sampling by representation via random lotteries (van Reybrouck, 2016)
3. Sampling via indirect methods (Manfreda et al, 2008)

All three modern ways are promising avenues for preventing selection bias in public participation in Urban Design. In our first round of prototyping (Kazil, 2017) some first results were found in an online tool for public participation provided this online tool was used in combination with offline tools. It will need further research and prototyping to find a good mix of tools for Ucodesign that will reflect the public opinion correctly with a minimal selection bias.

4.4 Communication Channels and Boundary Object

4.4.1 Introduction

Within Urban Design activities, communication is key. "Communication" is a very broad topic and within the scope of this report we have selected two topics which are explored in further detail: communication channels and boundary object.

There is a broad spectrum of communication channels available and selecting a channel that serves the purpose of the participatory activity will foster effective communication. Chapter 4.4.2 will elaborate on this and includes a list of parameters which affect the choice of a communication channel.

Chapter 4.4.3 will discuss the concept of boundary object, which will shed light on communication challenges such as:

- How to communicate complex design issues to the public?
- How to communicate (draft) designs to the public, especially in an early stage of the project?
- How to deal with different levels of knowledge of the professionals and the citizens on the Urban Design project?

- How to deal with framing effects such as presentation formats and techniques or media channels?

4.4.2 Communication Channels

Reaching, informing and engaging the target group starts with selecting the communication channel that serves the purpose at hand. In this section we will elaborate on the different channels and the considerations to choose the right one. The content of this paragraph was written for the 21st International Conference on Knowledge-Based and Intelligent Information and Engineering Systems (KES-2017) and is being reused here due to the perfect fit. It is a fragment of the following article:

- Münster, S., C. Georgia, K. Heijne, K. Klamert, J.R. Noennig, M. Pump, B. Stelzle, H. van der Meer (2017). How to involve inhabitants in urban design planning by using digital tools? An overview on a state of the art, key challenges and promising approaches. *Procedia Computer Science*, 112, 2391-2405.

"A state of the art on communication channels

Participatory planning activities (tools and methods) can be delivered through physical or virtual communication channels, or a combination of both. Figure 31 and Table 4 provide an overview of possibilities, which can be divided into 1-way and 2-way communication. 1-way communication does not allow for participatory planning activities, since actual participation can only take place in interaction, thus 2-way. However, as the 1-way communication channels may be needed to reach the target audience in the first place and to inform them, they are included as well.

Examples of Communication Channels

	Physical			*Virtual*			
2-way	**Workshops** *e.g. charette, living lab, town hall meeting.*	**Booths** *e.g. info booth, pop-up store, info truck.*	**Interactive Installations** *e.g. message board, street interface.*	**(Mobile) websites** *e.g. platform, wiki, forum.*	**Apps** *e.g. Trip Advisor, Pinterest.*	**Social Media** *e.g. Twitter, Facebook, Instagram.*	**Remote Attendance** *e.g. tele-conference, Skype.*
1-way	**Advertising** *e.g. billboard, promotional gift, sticker.*	**Media** *e.g. press release, newspaper.*	**Mailings** *e.g. direct mail, brochures.*	**Advertising** *e.g. tv/radio commercials, online ads.*	**Media** *e.g. podcast, vlog, online newspaper.*	**Mailings** *e.g. e-mail, newsletters.*	

Figure 31. Overview of communication channels: physical, virtual, 1-way and 2-way

Parameter:	**Short explanation:**	**Consider:**	**Ref:**
Level of participation	Arnstein's participation ladder describes five levels of participation and sets the role of participants (active or reactive).	- Informing, consulting, involving, collaborating or empowering	[29-31]
Level of participant interaction	Participants can interact with each other in different compositions.	- Individually, in pairs, in groups, or a progress through these types (me-we-us method) - Synchronous vs: asynchronous	[32-34]
Purpose of the process stage	Different stages in the urban planning process require different mindsets and rules. E.g. the process of gathering opinions or obtaining ideas differs a lot from making decisions.	- Acceptance Finding, content finding, information finding - Problem finding, idea finding, solution finding - Diverging, clustering, converging	[9, 35]
Reach	It is important to target audiences where the barriers to participate are minimized. The ease of participation also plays a large role.	- Home, public and transit spaces, project site, event centres/town halls, and online space - The access need of mobile devices - Time and effort to participate	[36-38]
Scalability	In addition to the reach, the question is how many participants you want to reach. E.g. the facilitator/participant ratio in a face-to-face workshop is 1/8.	- 1-8 participants, 8-100 participants, 100-1000 participants, 1000+ participants	[35, 39, 40]
Participant selection	Closely linked to the previous two points is whether the reached participants represent the full range of opinions. See also paragraph 4.1	- Open to everyone (self-selection), stakeholder representative, demographically representative, or specific individuals	[9, 37, 40]
Participant skills	Consider whether the participants would need any training in order to participate through the channel.	- Initial/no participant training required	[41]
Cultural applicability	Cultural background should be considered, since it relates to participants' social behaviour in certain settings e.g. related to power distance.	- Online readiness - People behaviour in open vs. anonymous setting	[37, 42-44]
Costs	Some channels are more expensive to operate than others.	- Costs per participant - Total costs for participatory planning activity	[45, 46]
Interaction quality and depth	Not all methods have the same interaction quality and depth.	- Delivering high vs. low personal contact and impact	[9, 47, 48]

Required labour and expertise	Linked to the previous two points: costs and interaction quality and depth. Some channels require little high-skilled labour, while others need e.g. a closely involved expert facilitator.	- Amount of labour and expertise necessary for configuration, engagement, involvement, utilization, analyzing, etc.	[46, 48]

Table 4. Overview of parameters to consider when selecting the right communication channel(s) to fit the purpose of the specific participatory planning activity.

Within each channel, there is a wide variety of tools and methods possible. For instance, "workshops" can range from serious gaming, to living labs, to generative sessions, etc. Each channel has its own opportunities and limitations. Therefore, it is important to deliberately choose the right channel(s) for the right purpose of the participatory process activity. To understand which parameters should be taken into consideration, an investigation on purposes of participatory planning was done which led to the set of parameters listed in table 4. For compiling this overview the general snowballing guidelines [49] were used. The overview is largely based on three meta-analyses from Involve [50], Bryson et al. [9] and Leighninger [48] and supplemented by additional public participation literature as well as design research literature. This overview may not yet be complete, but should be interpreted as a starting point for a higher purpose, which is developing a framework to support selecting the right participatory planning or co-creation tool(s) for a specific stage or situation in an urban design project. However, this overview already shows that a lot of different combinations are possible in order to deliver the right participatory process and achieving the desired result. Since each situation requires specific types of communication channels, it makes sense that the different tools the planned platform should consist of will be using (a combination of) different communication channels. In addition, depending on the parameters described above, one can choose virtual or physical communication channels or a combination of both. It is likely that a combination of both will be used for an optimal experience and delivery of the participatory process. The strengths of physical (face-to-face) channels are the personal contact, the high interaction quality and depth and the possibility of utilizing non-verbal communication (e.g. body language). These components are very suitable for acceptance and consensus finding. These benefits come at the price of lower scalability, higher costs per participant and the need of more expert labour. The advantages of virtual methods are the high reach and scalability to involve and engage a large crowd, which could be very powerful in crowd sourcing tools and methods.

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4.4.3 Boundary Object

One of the challenges with setting up a Co-design platform for different groups of people with different backgrounds, expertise, biases, experiences and needs (in this case: citizens vs. professionals) is finding a common 'language' to exchange ideas, concepts, issues, etc. A well-defined 'Boundary Object' will promote more effective and satisfying Co-design.

According to Star and Griesemer, (1989), actors trying to solve scientific problems often come from different social worlds; "when the worlds of these actors intersect a difficulty appears" (Star and Griesemer, 1989, p.333). This difficulty happens when actors bring their own conception of their social world. New objects and new methods mean a different thing in different worlds. Therefore, actors are faced with the task of reconciling these meanings if they wish to cooperate. To tackle this difficulty, Star and Griesemer introduced the Boundary Objects concept: "these objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation" (Star and Griesemer, 1989, p393).

Star and Griesemer explained the concept of Boundary Object while discussing the history of the Museum of Vertebrate Zoology at the University of California. The work at the museum comprehended a diverse setting; it encountered a variety of visions from heterogeneous actors. Professional biologists, the general public, amateur naturalists, philanthropists, conservationists and university administrators were involved in this case.

Star and Griesemer considered the majority of the visions of these actors, putting emphasis on the ones that they called "entrepreneurs" who in this case were the founders of the museum, the

managers of the process. Alexander, an amateur naturalist and Grinell, a bird and mammal collector started the process while discovering that both were interested in the research and conservation of species. Through time, not only their own social worlds intersected but also a number of intersecting social worlds came together when more actors joined, Co-creating the museum.

After analyzing the different visions of the actors, it was found that the success of the museum was that the different worlds share goals of conserving California and nature. The entrepreneurs Grinell and Alexander draw a line and declared a specific space in California as a nature preserve. This area in California was the Boundary Object that permitted the diverse actors to join together. For the founders of the museum, this area became a delimited laboratory in the field for research of specimens. For the amateurs, it concerned with flora and fauna and its conservation. For the university, they could act as administrators and support their interest of research. The Boundary Object, in this case, is the delimitation of this area in California, an object "which lives in multiple social worlds and which has different identities in each" (Star and Griesemer, 1989 p.408).

This is how Star and Griesemer concluded "Boundary Objects are objects which are plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" (Star and Griesemer, 1989, p393). Star and Griesemer introduced the concept of Boundary Object, which explains how actors from different backgrounds come together in a certain context and effectively works together through the interpretation of an object. Such an object brings several different actors together in order to achieve large projects (Hjalmarsson, 2015). These objects not only facilitate the communication between actors with different frames but also incorporate flexibility at the moment of interpretation, which allows them to renegotiate the outcomes of interaction processes (Gieryn, 1983).

The role of different Boundary Objects can be seen throughout a whole process; for instance, in negotiations. In each phase of the negotiation, there is a shared understanding that is evolving as actors learn about each other (Koskinen and Makinen, 2009). As the process goes on and becomes inhabited by new actors, those within may begin to start other Boundary Objects and a cycle is born (Star and Griesemer, 1989). In each phase, a Boundary Object is born. "The creation and management of Boundary Objects are key processes in developing and maintaining coherence across intersecting social worlds" (Star and Griesemer, 1989, p393).

Other examples of a Boundary Object could be: a research report about the expected environmental impact of a future project; a billboard with an artist impression of a new train station; a 3D model of a building; a quick-and-dirty black and white sketch of a house; a drone-made movie of an area, etc. Basically, a Boundary Object can be anything as long as it has the right balance between plasticity and robustness. Finding this balance is quite a challenge.

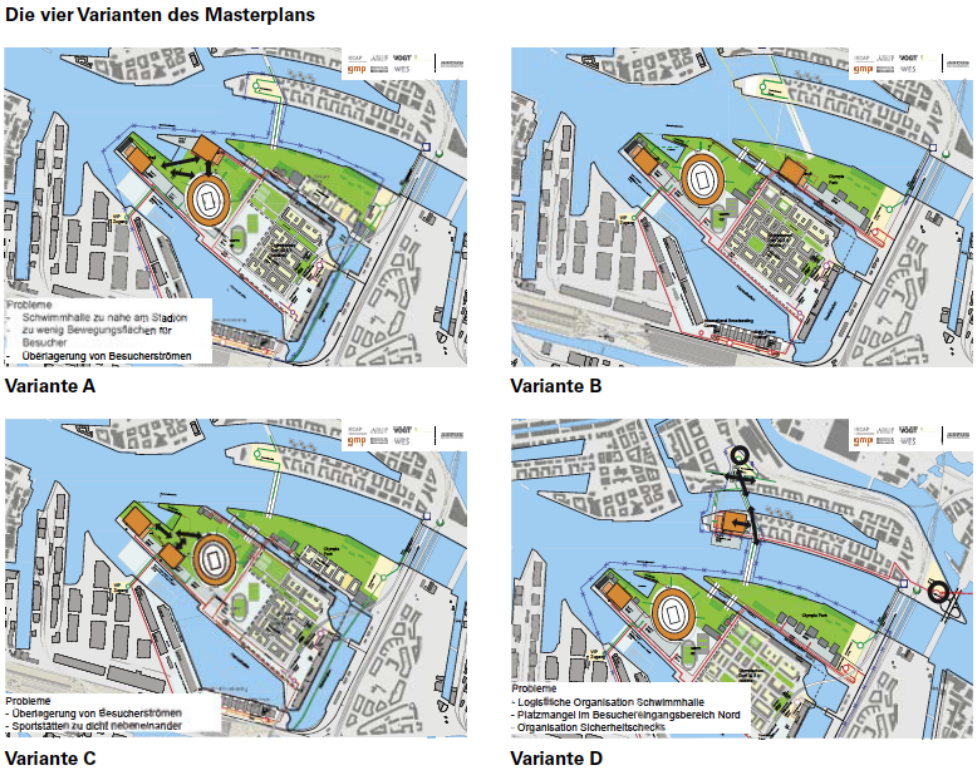

Figure 32: screenshot from a brochure about the concepts for Hamburg Olympic city (Stadtwerkstatt 9, 2015).

An example from the analysis of the 2024 Hamburg Olympic Games case study [OTD GE, 2016] illustrates how the lack of plasticity perceived by the citizen could backlash. At one of the city-scale workshops four masterplan options were presented for discussion (see figure 32). Although the workshop resulted with one chosen option for further development, such graphic representation of the plans, looking as if they were already set in stone, demotivates and discourages the public to actively participate in the discussion, with only one way out: to shout "No!" at the referendum held at a later stage.

To conclude, Boundary Objects are core in the U_CODE tools to be developed. Especially in the diverging phase, Boundary Objects should not be the perfect representation of a future Urban Design, but be inviting to both Professionals as well as Citizens to start a dialogue on what the future Urban Design could be and e.g. what the city could look like.

4.5 Acceptance Finding and Change

Acceptance Finding will play a major role in the to be developed Ucodesign tools. In chapter 3.3.1 we have introduced the topic as a parallel activity to the subprocesses *Content Finding, Information Finding* and *Project Management.* This chapter will continue with this topic and dive deeper into its principles.

In the literature on creativity and creative problem solving hardly anything can be found on the basics of Acceptance Finding apart from some remarks on it covering the convergent stage(see f.i. Isaksen et al, 2010). The vast literature on (organizational) change (see f.i. Burke, 2017) nevertheless provides us with some models and approaches that can be helpful in the perspective of Urban Design processes.

Lewin is considered to be the most influential writer on the basics of organizational change. Some seventy years ago he published his famous three (or five) stage model of change (Lewin, 1958). Each process of change will flow through these stages.

The process model of change:

(old situation)

1. Unfreezing
2. Changing
3. Refreezing

(new situation)

Figure 33. The process model of change (Lewin,1958)

Although later authors try to cope with constant change by reworking stage 3 Refreezing (see f.i. Burnes, 2004) the standard Lewin set (unfreezing - changing – refreezing) is still the basic description of change from a process perspective.

Lewin describes the basic steps of how change occurs but leaves us with the question how we can manage this process. On the how we can find also a vast literature. In an approach to understand this literature we follow the line of reasoning of David Silverman (Silverman, 1970) dividing it in the structural functionalism or Harmony Model and action theory or Conflict Model. Although Harmony and Conflict are oversimplifications and no serious academic or practitioner will find herself totally devoted to one model it will nevertheless help us to structure the Acceptance Finding activities. For each model we will discuss one relevant example as a source for inspiration for U_CODE

4.5.1 Acceptance Finding in Harmony Models

The basic assumption in the harmony models on change is all participants in the end can reach a common goal and the new neighborhood is a better place for everybody and all parties involved will truly only benefit. The general motto of these models is:

> *"People do not resist change, they just don't want to be changed."*

In this view there is no "resistance to change" but a "lack of information and communication".

A good example of this models is "Angst voor veranderen? Een mythe" (Wissema, Messer and Wijers, 1986) loosely translated in "Fear for change? A myth". Since this study offers a wealth of

practical advice it is of importance for U_CODE. Firstly Wissema translates the classical Lewin process in "a successful strategy for change" as shown in the following figure

A successful strategy for change:

1. Soak in
2. Clear goals
    a. no beating about the bush
    b. one change at a time
3. Real intention to communicate, good procedures, mutual trust
4. Possibility of participation and adjustment
5. Complete execution and total feedback

Figure 34. Successful strategy for change (Wissema et al, 1986)

Most of the elements Wissema et al mention are recognized by other scholars (see for an overview Burke, 2017) the five elements provide us with a complete framework for a successful Acceptance Finding strategy and at least one element is counter intuitive. A lot of urban developers are so energetic and ambitious that they will easily overstress the public by initiating an overwhelming number of changes at the same time. According to the study of Wissema this is a pathway for failure of the change process.

The 5 elements of a good strategy are then instrumented with lots of practical implications and "To Do's". In the next figure we summarize the most important "To Do's" for participation in urban development.

***"To Do's"* for participation in urban development:**

1. Analyze the present situation of the social system
2. Plan activities and information fully
3. Build trust by building personal relationships
4. When problems arise: more information not less
5. Communicate both success and disappointment
6. Good technical preparation
7. Use crowd representatives
8. Keep the culture homogeneous, avoid Us-They schisms
9. Crowd opinion leaders are the pivot for change
10. Use multidisciplinary teams

Figure 35. ToDo's for Acceptance Finding (Wissema et al, 1986)

The first ToDo "Analyze the present situation of the social system" puts the Wissema model in the school of "Contingency" (Donaldson, 2001). In this school there is not one way to organize. According to the situation of the social system as well as the nature of the change itself a good approach for change can be found. Wissema proposes a framework of analyses to choose an appropriate approach of the change and thus Acceptance Finding. This framework starts with four distinctive approaches for change:

Approach 1. Detailed structured strategy

Change can be implemented by a detailed time and activity table. It is possible to design this table before starting the actual change.

Approach 2. Step by step strategy

This strategy is also implemented by using a timetable and stages of activity. The difference with strategy 1 is we will only plan the actual activities of a step in detail after we succeeded and evaluated the previous step.

Approach 3. Hurry strategy

Because there is an enormous time pressure it is impossible to prepare a good time and activity table. So we have to improvise more. Power, personal persuasiveness (the gift of the word), empathy and flexibility of the leader (in U_CODE the SuMo) of the change process are success factors.

Approach 4. Complexity strategy

In this strategy nothing but the desired end state is clear. All kind of unexpected interventions (both internal and external) occur. Wissema et al. do not elaborate on this somewhat vague description of this strategy. They only provide us with a golden rule "When complexity doubles you need to provide four times as much information". This is also counter intuitive. In normal management practice we see managers in complex situations (lots of uncertainty) communicate less (since everything seems so uncertain = out of control).

To choose the appropriate strategy for the situation Wissema suggests the matrix below

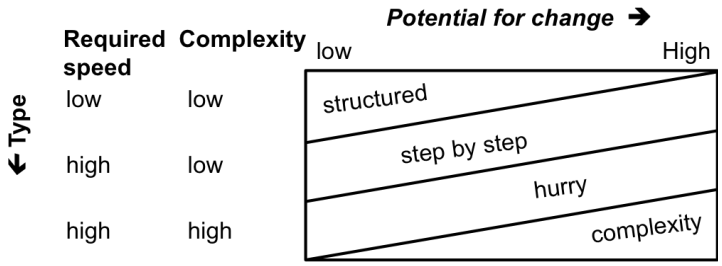

Figure 36: How to choose a strategy for change (Wissema et al, 1986)

In most cases of Urban Design we see a low speed in combination with high complexity. In the terms of Wissema et al the complexity strategy seems most appropriate here. In practice we observe a lot of structured or step by step approaches and when these fail falling back on a hurry strategy is the normal reflex of those in charge.

4.5.2 Acceptance Finding in Conflict Models

The approach Wissema et al choose for their explanation of how to handle change is one of harmony. In their view the changed situation is a better place for all of us. In this respect their approach is a dangerous oversimplification especially in most cases of Urban Design. Although the

"school of harmony" gives us a lot of very useful and practical insights let us now look at scholars of "conflicts".

A classical approach in this school is by Beckhard and Harris (1977). Using the early work of Gleichner (Dannemiller and Jacobs, 1992) they provide us with a very useful framework for understanding successful change. In this framework three basic Helps and two basic Hindrances are identified.

How to stimulate change

Helps

1. Dissatisfaction with the status quo
2. A shared vision of a better state
3. Knowledge of practical first steps

Hindrances

1. Economic costs of change
2. Psychological costs of change

Figure 37: How to stimulate change (Beckhard and Harris, 1977)

Looking at the Hindrances we see in Urban Design projects often a rather rigid focus on economical costs by the Professionals while the psychological costs of change of Citizens are as real as money is and often these costs are high.
One of the elegant elements of this five-factor theory is the fact that the three helps are ordered in the so-called lexicographical way. So first you have to provide for factor 1 before factor 2 has any relevance. In Urban Design we see often the first factor “Dissatisfaction with the present status quo” being rather ignored. A good program of Urban Design should start with this.

In the theory the second factor "A shared vision of a better state" is of course the pivot for change (Parker, 1990). For creating a shared vision some techniques can be found of which Metaplan (Schnelle, 1982; Freimuth, 2010) and Guided Fantasy (Bromberger, 2004; Meinel and Voigt, 2017) are promising tools often used in Urban Design.

4.6 Gamification

4.6.1 Gamification, Serious Games and Playful Interaction

A major hurdle for Ucodesign is establishing a sufficient number of participants (Münster, et al., 2017) and subsequently, maintaining them. This may be caused by lacking information on the process (Brabham, 2009) (Nabatchi, 2012), barriers in culture, understanding or accessibility (Deyle and Schively Slotterback, 2009) or weak motivation to participate (Giering, 2011). Motivational strategies such as gamification as well as the implementation of playful approaches

through innovative technologies are in the scope of the U_CODE project in order to amplify user engagement.

At first glance, fostering a citizen's interest in the field of Urban Design seems to be challenging. But, due to technological progress and innovative research approaches, the field is actually given a wide range of possibilities like we already mentioned in deliverable D2.1. Gamification distinguishes itself from mere playful design that contains no rules or specific goals but also from serious games that are defined as full-fledged games for non-entertainment purposes (Deterding, Khaled, Nacke and Dixon, 2011). According to Deterding et al. (2011), gamified applications rather implicate the use of "of game design elements in non-game contexts". An overview of this differentiation is illustrated in figure 38. However, within this report the sometimes difficult distinction between gamification, serious games and playful interaction will not be practiced that strict. The focus will rather be on whether and how an element makes an activity more game-like and affects the motivation to participate.

Figure 38. Differentiation between Gamification, Serious Games and Playful Interaction (Deterding et al., 2011, p. 2)

In literature, two different sources of user motivation are discussed that are named intrinsic and extrinsic motivation. While intrinsic motivation explains user actions because they are seen as "inherently interesting or enjoyable", extrinsic motivation is generated because "it leads to a separable outcome" (Ryan and Deci, 2000, p. 55). That means an action is intrinsically motivated when it is done for the action itself, while an extrinsically motivated action is done for something else (Kim, 2015). In other words, intrinsic motivation originates from the user himself, whereas extrinsic motivation can be pushed, e.g. by external rewards (Zichermann and Cunningham, 2011).

Well-known game elements are e.g. points, badges, leaderboards, progress bars or quests. While inside the gamification environment, points and badges are achieved for certain activities, leaderboards are used by participants to compare their rank with others. In contrast, progress bars

provide users with status information on the pursuit of a specific goal or minor tasks that can be administered by quests. From a psychological point of view, these game elements should be able to address motivational mechanisms that foster user motivation, e.g. by stimulating the user's individual motive for achievement, competition or membership (Sailer, Hense, Mandl and Klevers, 2013).

In game science, motivation is often referred to in terms of player types. Even if the typology of players remains a relatively open field for scientific research, it can be shown that motivations of play are components of motivation, instead of exclusive types. They don't contradict another. (see Hamari and Tuunanen,2014). Preferences are very strong though. Some players preferably consummate content, whereas other players finds pleasure in creating content and receiving attention or response (Pine II and Gilmore, 1998).

The video game industry keeps player numbers of games up by offering new content from time to time. All of the 10 most revenue games of 2016 (Galyonkin, 2017) offered additional content after the first purchase of the game. This can be both produced by the developer or made by users. It can be shown, that games that offer player generated content have higher engagement and stable and lasting player communities (Krumm, Davies and Narayanaswami, 2008). Another successful example of a way to keep the community active are regular challenges. Even though often generic, those extra tasks provoke user activity. This variance can be gained e.g. by adding a time limit to a known task, mirroring a level or resetting random parameters that are integrated in the game already. In a walking simulator, where the user moves through a virtual environment, this could mean: Rewarding Objects vary in location or the environment is altered (weather, light, colours of objects or architecture…).

"Unlocking" is another very usual game mechanism and is also considered for U_CODE. Instead of simply offering different activities on a platform equally, players shall be invited to suitable activities once relevant. The player is shown that he is now permitted to do something that was not possible before. The next activity is then not offered as an option, but rather as a prize, which the player has won through previous activities such as commenting or other ways of contribution. More game mechanisms, like role play, will be discussed in the systematic review of tools and methods.

Because of its motivational effects, a well-considered use of game elements seems worthwhile to be further investigated. Nevertheless, Werbach (2014) points out that just adding game elements in a non-game context such as points and badges does not necessarily lead to enjoyment. Also, recent studies on the motivational impact of gamification elements partly lack scientific accuracy (Seaborn and Fels, 2015). However, an overall positive effect in this regard is visible (Hamari, Koivisto and Sarsa, 2014; Morschheuser et al., 2016). Therefore, further exploration of gamification formats will be included in the systematic review of current tools and methods in Chapter 5. But first an overview of potential gamified Ucodesign activities is provided.

4.6.2 Gamified Ucodesign Activities

Designing gamification does not automatically ensure user engagement, instead it depends on the user and whether he takes part, which is why the goal of a gameful design should be very much alike the goal of the user (see Kim, 2015). If a gamified tool does not lead to an expected outcome, the game elements will not ensure its usage. In regard to U_CODE, a Ucodesign tool should therefore promote visible impact or at least provide immediate and constructive feedback for its users: i.e. both professionals and citizens. Additionally, game elements should be implemented thoughtfully since they can also lead to demotivation, e.g. citizens that enter a gamified crowdsourcing tool might lose their engagement as they realize themselves at the bottom of a long-term leaderboard (see Ipeirotis and Gabrilovic, 2014; Thiel and Lehner, 2015).

In line with the U_CODE Minimal Viable Process, the ensuing activities have to be implemented into the platform:

	Exploration	**Creation**	**Feedback**
Physical Environment	Exploration of the city	Interactive modelling with tactile objects on touchtable	Feedback of the city
Virtual Environment	Exploration of proposals	Creation of proposals	Feedback on proposals

Table 5. Activities for physical and virtual environments

There are at least six activities, that are going to be possible within the U_Code Platform:

1. Engaging in U_CODE
2. Exploration of the city
3. Feedback on the city
4. Creation of proposals
5. Exploration of proposals
6. Feedback on proposals

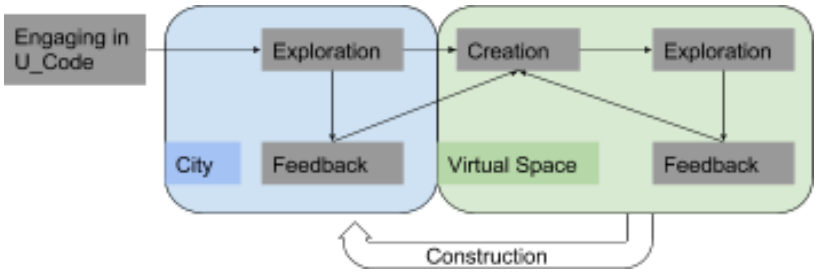

Figure 39. Six possible activities for the U_CODE-platform

Every single activity will make use of its own motivational design. Additionally, the activities have to blend in one Platform, with each process leading to another. The user has to be offered different

spaces or environments for different activities. Once the player was motivated to contribute in one of the 5 activities, the threshold for further contribution must be kept as low as possible, and the decision to go into a different activity phase must be motivated.

Players that explore the city for example, should not only be rewarded, but be invited in an easy way to give feedback, without any further activities like dealing with complex user interfaces. Giving feedback again, should be fun and rewarding. The offer to create virtual content as a citizen, again, must raise positive awareness by e.g. seeming easy, fun or even relevant.

In general, we can expect that thresholds to go into new phases can rise during the process, but are especially critical in the beginning. Once one or more activities are introduced and don't evoke insecurity any more, players won't be lost through threshold, but rather stay with activities that are still rewarded.

Activity 1: Engaging in U_CODE

Before Activity "Exploration of the city" can be distributed by citizens, even with an extremely low threshold of participation, citizens have to consider contribution and may therefore install an application.

Activity 2: Exploration of the city

Passive Activity: U_Code can offer a process that lets citizen discover the city physically, possibly supported with location tracking technology (proposed is GPS). This process can even work as a passive distribution of users, that is still rewarded and results in positive feedback. (Du läufst rum, du bist ein ganz großartiger Bürger! Diese Klammer bitte löschen.) Additional information on the city or projects might occur. Furthermore, the passive movement is a constant framework for further invitations into active activities.

Active Contribution: Expecting a smartphone or mobile device with internet connection and GPS being available to the user, it is possible to promote and lead to interesting spots in the city. These could either be districts that may undergo changes in the future, or designated construction areas. Also random places could be pointed out, to get a better overview on the city. Showing targets and the player on a map on a mobile device results in an interactive treasure map. The user shall be invited to go to such locations. Pokemon GO as an example, shows points of interest and once players reach the destination, they are rewarded with different items that they make use of in the game. Another potential game mechanism that is essential in the extremely successful application Pokemon GO is to not show certain destinations, instead giving players hints concerning closeness and direction. A potential application of this mechanism can be discussed. Once a location is reached, the player is rewarded, may be informed and also invited to contribute in terms of a different activity, that might or might not be unavailable to the player before arrival (Unlock)

Motivation for activity: Destinations without a specific meaning may not be easily motivated or disappointing once reached. Instead navigating to interesting and relevant locations, can support the activity with positive feedback once completed. Making the journey an adventure with an

unknown destination can be fun for people that like exploration, but may also lower motivation. Not giving a clear target, but working with a hint system works as a constant loop of feedback and reaction, whereas coming closer to the target can feel rewarding by itself. Once reached, the player will be rewarded with reaching the target that might be interesting by itself. Badges or ranking Points may be given. New Activities may be unlocked, one of them being Activity 2.

Activity 3: Feedback on the city

Activity: As described in D2.1, feedback can be given in various degrees of complexity.

The simplest feedback would be the possibility to give a positive or negative feedback at the place, whereas the location, and therefore object of feedback is defined not solely by the user, but defined by the situation, precisely, the user being at the location of interest.

Facebook as an enormously popular social network, used 'likes' as the only possible feedback for comments, pictures and other contents. There is different reasons for concentrating on only positive feedback. Only negative feedback without further detailing is, especially for open questions, not considered as constructive feedback. Negative feedback should be connected with detailing or suggestions to result in the solution of a problem (Wu, 2011).

To make feedback measurable but complex, it seems beneficial to offer different degrees of detail. Users should be able to quickly give an idea of their impression, while meanwhile offering space for more detailed feedback. In 2015, Facebook changed its feedback mechanism to 6 different emoticons that offer a relatively wide spectrum of expressions, containing faces that depict laughter, anger and sadness. However, the tool is insufficient to describe precise feelings. Any further feedback has to be given with additional methods. In facebook, replying to content is additionally offered via text post.

As another option, voting between different options can be used as a feedback mechanism.

Motivation: The app rewards feedback with ranking points or badges. Furthermore, feedback is presented to the community and to the contributing user, collecting data, or showing statistics. Activity 4 "Exploration of proposals" might be offered or even unlocked.

Collected Data can be discussed as a potential seventh activity "Discussion". Therefore, the citizen can be invited to or unlock such a discussion at this point.

Activity 4: Creation of ideas

Activity: In a tool that is made for the creation of new architectural ideas, but easy to handle by non-experts, citizens can play, imagine and test different approaches for a given site.

Due to technical limitations of mobile devices, this tool, might not be available, or not to its full extent, on a mobile app, but has to be installed on a personal computer instead.

It has yet to be defined whether such tool is mainly a tool for envisioning ideas, or has relevant simulation and gaming features. Both types of a design app, also as solutions that can be not clearly defined by one or the other have different types of motivation. In any way, the software has to be reactive, in ways of giving the user positive feedback on every step of designing, even if it's only an appealing visualization or appealing sound design. "Silk - Interactive generative Art" (e.g. Picture 37) replaces the classic digital pen or brush with more extended features, resulting in drawn lines to be glowing, mirrored, and blurred. Even simple line drawings can result in interesting compositions, that are popular to share on social media.

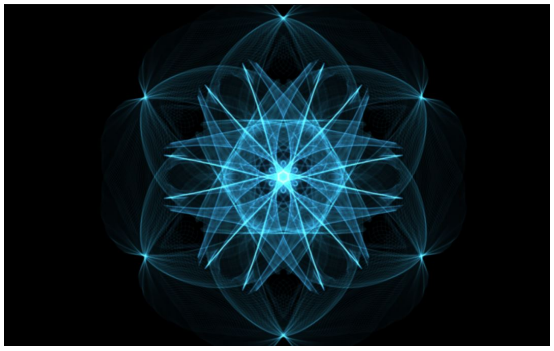

Figure 40. Silk - Interactive generative Art (Vishnevsky, 2017)

Applying this strategy to Urban Design, houses could be animated live, for example by simulated citizens that move in or make use of the space offered, different options of weather effects, up to the designs affections on traffic, as in the urban-design game 'Cities: Skylines' (e.g. figure 41. Note: more examples will be provided in chapter 5.4)

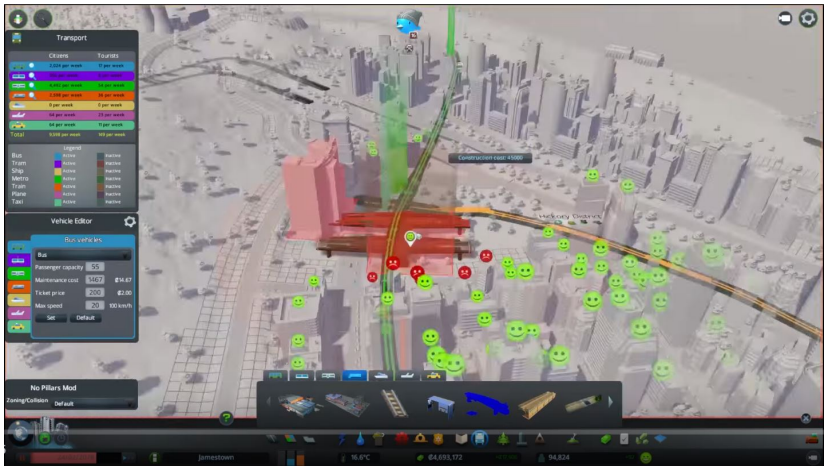

Figure 41. Cities: Skylines (Colossal Order, 2015)

The actions of a user during playfully designing a space, could either be supported for the person to finish and contribute an option, but even motivate to further detail, rethink and improve his or her design. This would make the creation tool even more of a game.

Motivation: creating is fun, idea is simulated, visuals are interesting, sharing, gaining positive feedback from community, maybe even feedback from experts.

Activity 5: Exploration of ideas

The exploration of Ideas might take place in an augmented reality feature. Ideas equal 3-dimensional proposals, that evolved in the creation tool described in activity 3. By blending 3-dimensional images over the camera picture, we can blend virtual and physical environment. With helps of modern sensors and data, those 2 environments can be closely linked, to improve the illusion. Potential improvements can be integrated into the software and hardware, as the application of shadow rendering, object tracking, and overlapping digital objects.

Motivation: Apart from Badges and Ranking Points, the exploration can be expected to be a rather exciting task by itself. Citizens may be curious to test augmented reality and experience the imagination of other people.

Activity 6: Feedback on ideas

Activity: Giving feedback on virtual spaces is similar to Activity 2, feedback can also be given via emoticon or further detail if beneficial. Those 2 activities, feedback on both physical and virtual environments can be seamlessly and equally offered in the same interface.

Motivation: As in activity 2, the app rewards feedback with ranking points or badges. Furthermore, feedback is presented to the community and to the contributing user. Statistics of opinion, taste or (dis)agreement are shown. Additionally, the feedback can lead to further power of the user, by unlocking new options.

Activity 7 (optional): Discussion

"Discussion" is a potential seventh activity, that may or not be rudimentary for U_Code.

What to do: To gain further knowledge, an informed and interested community, they must be offered a platform, maybe forum/board to discuss projects and ideas in a deeper level of complexity. This board should be interconnected with projects, ideas, stats and other contents that are created within U_Code Platform, or especially U_Code_GO.

4.7 Conclusion

Chapter 4 tackled a wide variety of topics, but they will all play a significant role when applying Ucodesign in the Urban Design context on a massive scale:

- *Selection Bias* should be prevented in order to make the actual group of participants representative for the affected citizens.
- *Boundary Objects* is basically any piece of information that will be created for the Professional-Citizen interaction in Ucodesign, i.e. 3D-models, sketches or research reports. A well-defined 'Boundary Object' will promote more effective and satisfying Ucodesign.

- *Communication channels* (physical and/or virtual) are the media through which Professional-Citizen interaction takes place (e.g. interactive installations, social media or mailings). They should be picked wisely in order to fit the purpose of the specific Ucodesign activity.
- *Acceptance Finding* is a parallel activity to *Content Finding* and *Information Finding* and can be approached as a form of change management
- *Gamification*, Serious Games and/or Playful Interaction should be used in the Ucodesign tools to foster user engagement.
- *SuperModerator:* the SuMo is the facilitator of the Ucodesign process.

Per topic the key recommendations for the development of the U_CODE platform and tools were collected and listed below..

1. The public opinion must be reflected correctly through U_CODE tools, without selection bias

It may be necessary to come up with hybrid tools (both on- and offline) to achieve this requirement.

2: Ensure appropriate balance in plasticity and robustness of the Boundary Objects

Boundary Objects should be plastic enough to adapt to local needs and constraints of the Professionals and the Citizens, yet robust enough to maintain a common identity across sites. The balance depends on stage of the Urban Design process. e.g. in the diverging phase of the Design stage, Boundary Objects should not be the perfect representation of a future Urban Design, but be inviting to both Professionals as well as Citizens to start a dialogue on what the future Urban Design could be like.

3. Combine different communication channels to deliver each Ucodesign activity

Since each situation requires specific types of communication channels, the U_CODE tools should be using a combination of different communication channels. Parameters that should be considered are level of participation; level of participant interaction; purpose of the process stage; reach; scalability; participant selection; participant skills; cultural applicability; costs; interaction quality and depth; and required labour and expertise. For an optimal experience and delivery of the Ucodesign activity, a combination of both virtual and physical communication channels should be aimed for.

4. Balance in Content Finding, Acceptance Finding, Information Finding

The use of almost any tool in the process of U_Codesign will mean an intervention in the social system consisting of Citizens and Professionals. Since Professionals have the tendency to focus on the Content and/or Information Finding, the Acceptance Finding probably will be overlooked. In the best case this will mean “an opportunity missed” and in the worst case “irreparable damage to the process of Acceptance Finding”. Therefore, all U_CODE tools must deliberately balance Content Finding, Acceptance Finding and Information Finding.

5. Start the initial Ucodesign activity with "dissatisfaction with the present status quo"

In order to prepare the citizens for change (i.e. the Urban Design project), the citizens should become aware of their own dissatisfaction with the current situation. Once they recognize that, consensus on necessary change can be reached more easily.

6. At least one of the U_CODE tools should aim at establishing "a shared vision of a better state"

There are different types of techniques available for developing a shared vision of a better state, like Metaplan and Guided Fantasy. 3D modeling and Virtual Reality can enable building a shared vision.

7. Gamified applications should be used throughout the whole Ucodesign process

For the sake of consistency and minimizing the threshold to participate, the gamified application should be used in all stages of the Ucodesign process.

8. A gamified Ucodesign tool should always provide immediate and constructive feedback to the user.

If a gamified tool does not lead to an expected outcome for the user, the game elements will not ensure its usage, therefore the tools should promote visible impact.

9. Stimulate external motivation of the citizens through social feedback, badges and points.

Rewarding elements like social feedback, badges, and points will stimulate the user's individual motive for achievement, competition and/or membership. However, remember that game elements should be implemented thoughtfully since they can also lead to demotivation.

10. The threshold of participation should be minimized as far as possible

In general, thresholds will rise along the process, that is ok, but in the beginning of each phase minimizing the threshold is critical. Once one or more activities are introduced and do not evoke insecurity anymore, the users will stay with the rewarding activities.

11. The SuperModerator should be neutral and acting independently

In order to gain and maintain the trust of the citizens, the SuMo should act as an independent agent, who mediates between all project stakeholders and commit himself to neutrality. This way, it should be avoided that professionals (i.e. investors) use the Ucodesign process as a way to 'sell' certain (predefined) solutions in an Urban Design project.

On the next page, the 11 requirements derived from chapter 4 are listed once more.

Requirements for the development of the U_CODE platform and tools:

Selection bias:

1. The public opinion must be reflected correctly through U_CODE tools, without selection bias.

Boundary Objects:

2. Ensure appropriate balance in plasticity and robustness of the Boundary Objects.

Communication Channels:

3. Combine different communication channels to deliver each Ucodesign activity.

Acceptance Finding:

4. Balance in Content Finding, Acceptance Finding, Information Finding.
5. Start the initial Ucodesign activity with “dissatisfaction with the present status quo”.
6. At least one of the U_CODE tools should aim at establishing “a shared vision of a better state”.

Gamification:

7. Gamified applications should be used throughout the whole Ucodesign process.
8. A gamified Ucodesign tool should always provide immediate and constructive feedback to the user.
9. Stimulate external motivation of the citizens through social feedback, badges and points.
10. The threshold of participation should be minimized as far as possible.

SuperModerator:

11. The SuperModerator should be neutral and acting independently.

5 Current Tools and Methods

5.1 Introduction

The first part of this report a shared understanding was developed on Ucodesign, which was mainly based on theory. Now, it is time to look at practice and discover existing tools and methods . When reviewing the tools and methods it has to be considered that tools are not a “stand-alone”. As Sanders (2009) points out tools need to be practiced through methods, which are organized, clustered and approached through methodologies. But most critical is the mindset by which these tools and methodologies are used. This mindset depends again on the culture (see figure 42). In this chapter, a wide variety of tools and methods will be outlined, with a special focus on gamification tools and methods. More about methodologies, mindsets and culture will be covered in chapter 6.

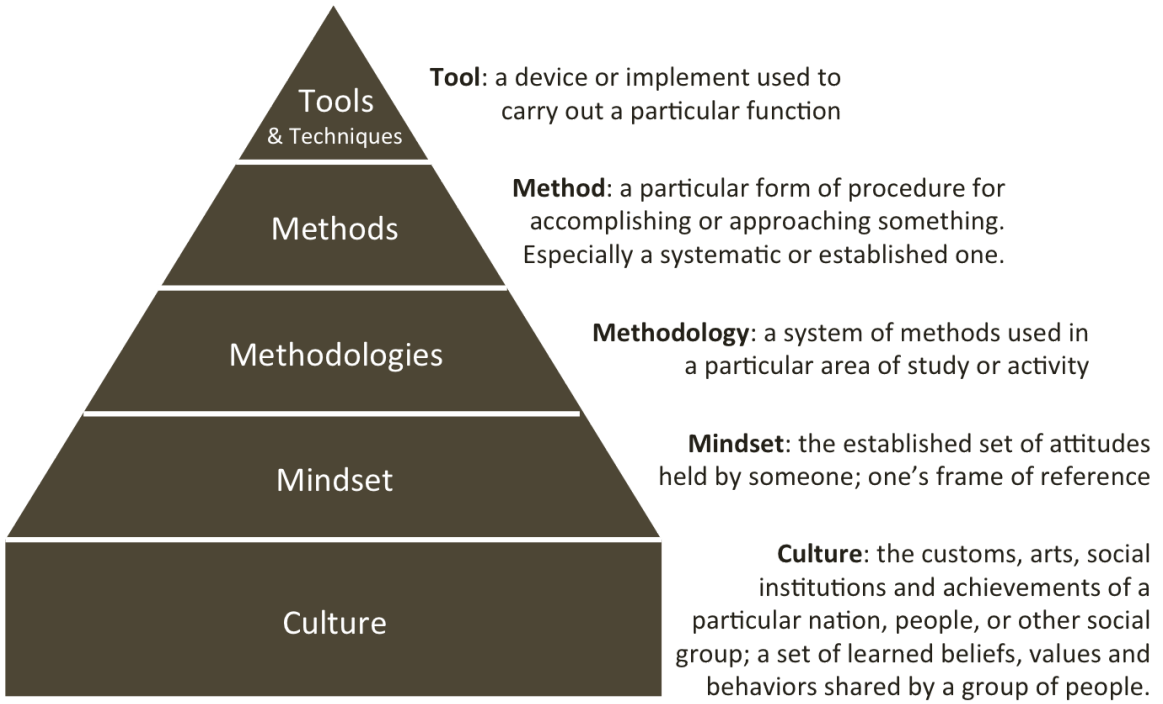

Figure 42: Tools pyramid (Sanders, 2009).

The tools and methods included in this review were found in literature, books, on the web and in expert interviews. The methods were finally collected in a “MethodBank” database, that not only gives an overview of currently available participation methods but also contains several filtering options that are useful for in-detail investigation. For example, the possibility is provided to filter entries e.g. in respect of the stage of the Urban Design process, the intensity of participation or whether the tool can be applied either online or offline. The database also provides additional information on every method, including examples of existing tools and therefore facilitates future

work within the project. With the focus on the methods instead of only specific tools the collection is a support to existing platforms like https://www.participedia.net/, http://www.mspguide.org/ and http://participationcompass.org/, which mainly contain tools and cases or a database like http://www.datenbank-buergerbegehren.info/ which contains public petitions in Germany.

The following pages will present several examples that can be found in the database and illustrate current lines of development in the field of public participation. To do so in a structured way, this introduction firstly examines categories with regard to previous theoretical works on the different stages of public participation that are carved out in the literature. At the end of this section a special review of gamification tools and methods will be provided..

5.2 Approach to categorizing Tools and Methods

In literature on public participation, different levels of citizen's impact on final decisions during Urban Design processes are mentioned. In chapter 2.3 the participation spectrum of the International Association of Public Participation (IAP2, 2013) was selected as a standard model for use in this report. IAP2 describes 5 levels of participation: inform, consult, involve, collaborate and empower. However, for the purpose of classifying existing tools and methods, this model was simplified to 4 labels (see table 6). A reasoning for this is provided below.

Category	**Information**	**Consultation**	**Collaboration**	**Empowerment**
Description	Citizens inform themselves or are being informed of current plans, decisions and actions	Citizens are asked to give input and feedback (e.g. User-Centered Design)	Citizens and other stakeholders actively work together in decision- making (e.g. Co-Creation)	The authorities implement the decisions of the citizens
Relation	One-way (Authorities to Citizens)	Limited two-way	Advanced two-way	One-way (Citizens to Authorities)

Table 6. Stages of citizen participation

Label 1: Information

The vast majority of sources include the strategy of providing the citizens with information or giving them the possibility to inform itself as a first step of citizen participation; that can be accomplished in different ways, e.g. by publishing proposals of new urban projects or explaining their regional impact. On the informational level, citizens are not able to reply on that input, that is why this state can be described as one-way communication (Arnstein, 1969) or one-way relationship (OECD, 2001). Hence, informing the citizens has to be seen as public participation on a very low-level. Informing is not labeled as a Ucodesign activity, however it is a mandatory parallel activity in order to deliver effective Ucodesign activities.

Label 2: Consultation

A broader form of public participation that goes beyond mere information is achieved when the public is consulted in Urban Design matters. Consultation generally means that public input and feedback is collected and taken into consideration during the planning process (e.g., IAP2, 2013). In that way, citizen's concerns, aspirations and ideas have the chance to be taken into account in decision-making. For instance, existing opinions or ideas that derived from the public can be taken into account. On this level, citizens are also given the chance to act as local experts as they are able to contribute valuable information to the planners. However, it depends on the planner's decision whether to include this kind of information. User-Centered Design activities, as defined in chapter 2.4, would be labeled as 'consultation'.

Label 3: Collaboration

In literature, the next dimensions of participation are often named involvement or, on an even higher stage, collaboration with the public. Compared to the first rungs information and consultation, these two categories are more difficult to distinguish clearly, because both are used to pronounce a certain extent of cooperation between the public and the other stakeholders (e.g., IAP2, 2013). Whereas involvement is described as directly working with the public and reflecting their concerns throughout the process, collaboration goes a step farther by stressing a partnership between citizens and professionals in which citizens advice is being implemented "to the maximum extent possible" (e.g., IAP2, 2013).

For a sharper distinction and a more distinct categorization of methods, it is advisable to summarize these aspects in one category that will be subsequently called collaboration. Collaboration in this sense means that citizens directly contribute to the process of Urban Design by discussing ideas, developing solutions and creating alternatives by deep interaction with other stakeholders. In contrast to consulting, the communication between all participants is rather intensive, citizens and planners treat each other as partners that leads to fruitful exchange, dialogue and deliberation. Collaboration therefore needs elaborated channels for stakeholder interaction and an exceptionally open-minded attitude of experts and planners. Participatory Design- as well as Co-Creation activities, as defined in chapter 2.4, would be labeled as "Collaboration".

Label 4: Empowerment (excluded from in-depth tools and methods review).

The highest impact of the citizens in regard to participation in Urban Design is often termed as the empowerment of the public (e.g., IAP2, 2013; Tufte and Mefalopulos, 2009). Extensive understandings of this dimension demand the citizens to be in full control of decision making (e.g., IAP2, 2013). This status can be seen as a kind of ideal type that is nowadays hard to achieve but nevertheless desirable to improve public participation in urban processes. A referendum is an example of reaching this extent of citizen power in matters of Urban Design. For a complete overview of the different stages of public participation, the category of empowerment is vital, but was excluded from the tools and methods review for three reasons. Firstly, there are only limited methods available in this category. Secondly and more importantly, is that empowerment is typically about 1-way communication (from citizens to professionals) and therefore not an example of

Ucodesign which is a joint effort of professionals and citizens. Thirdly, developing tools for empowerment is complex and may conflict with some legislation in the different European countries (see also chapter 6.5).

Figure 43 gives an overview of the categorization of currently known methods that try to foster public participation in Urban Design processes and, as mentioned above, it thereby distinguishes between the categories of “informing”, “consulting”, “collaborating” and “empowerment”.

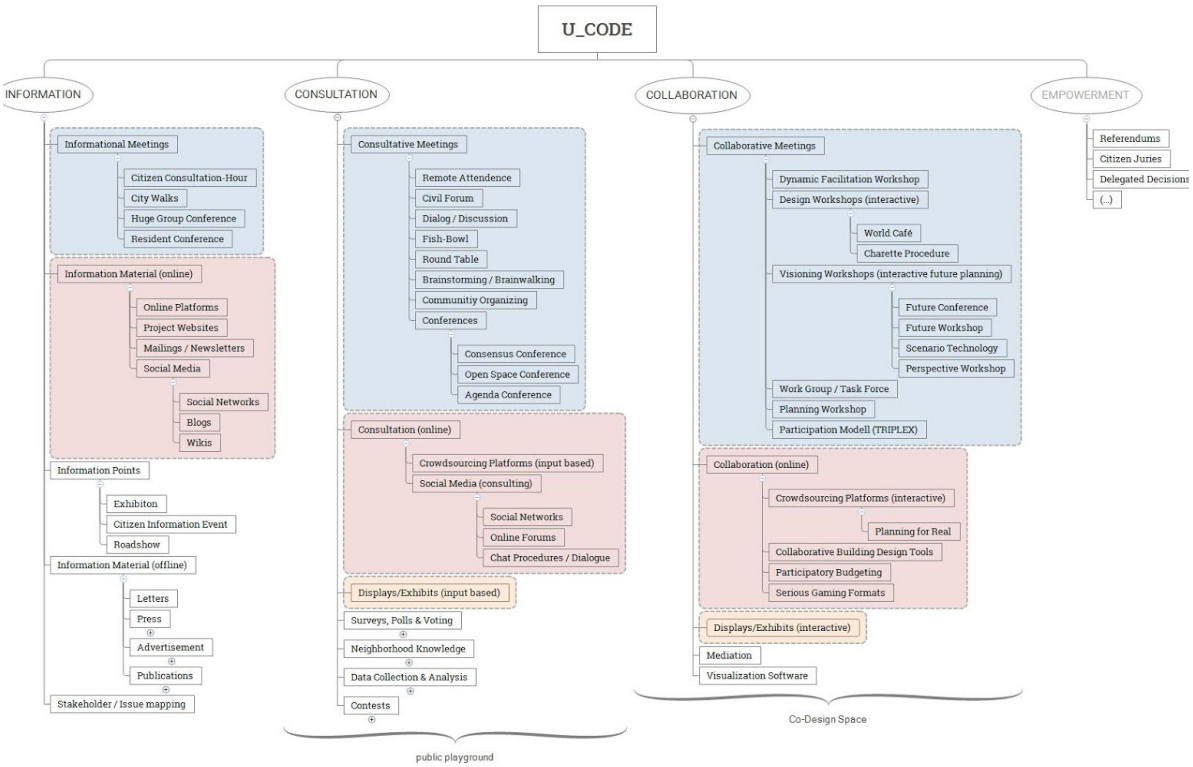

Figure 43. Categorization of participation tools and methods in Urban Design

The actual “MethodBank” which is published at http://www.u-code.eu/methods contains about 70 methods which can be searched by different parameters such as online versus offline or number of participants (Figure 44).

Search search

« PROCESSNAME »	« CATEGORIE »	« SUBCATEGORIE »	« ONLINE »	« PARTICIPANTS »
- PROCESSNAME -	- CATEGORIE -	- SUBCATEGORIE -	- ONLINE -	- PARTICIPANTS -
Activating interview	Consultation	Surveys, Polls & Votings	No	up to 100
Advertisement - Bulletin/Poster	Information	Information Material (offline)	Yes	not defined
Conferences - Agenda conference	Consultation	Consultative Meetings	No	up to 100
Assessement Procedure	Consultation	Surveys, Polls & Votings	No	up to 500
Social Media - Blogs	Information	Information material (online)	Yes	not defined
Brainstorming / Brainwalking	Consultation	Consultative Meetings	No	up to 25
Mailings / Newsletter	Information	Information material (online)	Yes	unlimited/more
Social Media (consulting) - Chat procedures / Online Dialogue	Consultation	Consultation (online)	Yes	
Citizen Council	Consultation	Surveys, Polls & Votings	No	up to 25
Citizen Dialogue	Consultation	Surveys, Polls & Votings	No	up to 25

Reset search

Page 1 | Page 2 | Page 3 | Page 4 | Page 5 | Page 6 | Page 7 | > >>

Figure 44. MethodBank for public participation (Pump, Klamert, and Stelzle, 2016)

5.3 Current Participation Tools and Methods

5.3.1 Systematic Review

This section will present the results of a systematic review on existing public participation tools in the context of Urban Design with a focus on digital tools. The used search items are “gamification”, “gamif*”, “playful”, “mobile participation” and “Urban Planning” or “Urban Design”. The included databases are EBSCOHost, ACM Digital Library and Scopus. Besides, by using the snowball principle, additional scientific works have been found that were not covered by the database-driven keyword search. Due to the rapid development in this research field, an additional internet research went beyond scientific contributions and included current participation services in Urban Design.

The final selection of the findings was based on whether the participation tool exemplarily represents a new facet to the topic of public participation in Urban Design. The tools and methods were categorized after the three levels of participation: *information, consultation* and *collaboration*. *Empowerment* was excluded, since it is outside the scope of U_CODE (see reasoning in chapter 5.2).

By uncovering the diversity of tools and methods that are currently available, the obtained results present an overview of the state of the art and offer impulses for shaping the future design of an innovative and well performing U_CODE platform and tools. The diversity of definitions concerning Gamification, Participatory Design, Co-creation and Co-design makes it difficult to compare empirical findings on the subject.

5.3.2 Tools and Methods labeled as “Information”

Regarding the lowest level of participation, there are different tools and methods that help to inform citizens about Urban Design projects and which can be expressed in several categories. Well-known

conventional options of spreading information to the public are e.g. the dissemination of official documents and letters, the use of the press, the placement of advertising or the organization of an information event. Furthermore, informative physical meetings such as city walks, consultations and constituency surgeries on Urban Design projects can be arranged.

Besides that, the internet offers multiple possibilities to distribute information, e.g. by initiating informative online platforms, project related homepages or by offering newsletters and mailing services that supplies subscribers with updates or additional background information. A website that implements some of these tools is called “Seattle in Progress”, it creates an overview on urban projects in Seattle by displaying them on a map of Seattle. Users can click on their locations either to receive additional information about an urban project, to see design proposals (see Evans Cowley, 2014b) or to receive project related email notifications. In contrast, the Envision Scenario Planning tool (ESP) informs users by visualizing and reporting on different redevelopment scenarios at a precinct level from a sustainability, social and economic basis; therefore, a variety of precinct objects, such as residential buildings or public open space, can be defined and placed within a 3D representation. Environment centric applications which are often initiated by local governments such as “Metropulse” also enable a one-way flow of information from professionals to citizens. (Ertiö, 2015).

Other online formats that are useful to distribute information are social media platforms such as social networks, blogs and wikis; they provide different options to share information to the public on the internet; for instance, “Facebook” can be used to offer project related sites that contain information and updates. Informative and demonstrative videos can be shared in an established “YouTube”-channel, photo material can e.g. be published via “Pinterest” and blogs such as ”WordPress” provide its readers with current and relevant updates on planning issues (see BMVBS, 2013).

Additionally, new technologies such as augmented reality (AR) and virtual reality (VR) are able to effectively support informational purposes: software such as LayAR can be used by smartphone and tablet users displaying future Urban Design projects in existing landscapes (see Höffken, 2015); transforming a 2D development plan into 3D for a better understanding of non-professionals (see Broschart and Zeile, 2014); or improving ordinary city walks with AR that displays additional information on building architecture (see Broschart and Zeile, 2015). Project related mobile apps such as “Dundee Waterfront 2018” are being developed that enable 3D visualized tours to future public areas (see Evans-Cowley, 2016).

5.3.3 Tools and Methods labeled as “Consultation”

By consulting the public, a limited two-way relationship between citizens and other stakeholders is needed that seeks for producing and collecting public feedback. A popular way to achieve that is the use of consultative meetings that can be designed variously, e.g. as round tables, civil forums or input based visioning workshops; within these meetings professionals often invite the citizens to participate in the process, e.g. by expressing concerns or opinions. Another method to consult the

public are contest formats in which citizens can contribute ideas or mock-ups directly to planners or city authorities. This approach raises the awareness to an urban issue in a playful way and additionally also helps to express citizens' preferences. User-Centered Design tools (as defined in chapter 2.4) will also be labeled as 'consultation' tools.

Professionals should consider citizens as local experts and therefore try to collect neighborhood knowledge, e.g. by physical meetings or via special data collection tools such as the mobile application "Maplocal". This app asks users for feedback about their residential environment by letting them post photos or commentaries. The design seeks for improving public engagement in the early phase of planning processes (Jones, Layarad, Speed and Lorne, 2015) and offers playful options to contribute to the planning process by simply wandering around a familiar district.

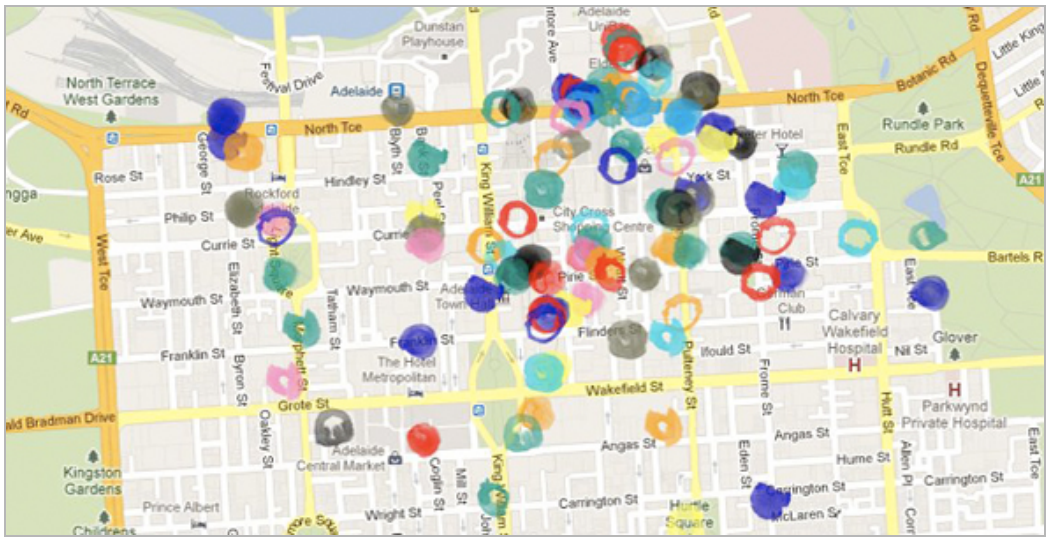

Figure 45. Stereopublic app shows quiet places (Muller, 2013)

Apart from that, valuable data for planners can also be aggregated passively by special mobile apps (Höffken, 2015). For example, "Stereopublic" (figure 45) and "Widenoise" capture noise levels and display them on a map (Evans-Cowley, 2014a). Apps like "Strava" (Evans-Cowley, 2014b) and "Cycling Glasgow" (Evans-Cowley, 2016) collect tracking information of runners and cyclists. Gathered information like silent and noisy areas in cities and highly frequented cycling routes contain valuable input for the professionals' decision-making process. These environmental monitoring formats can be gamified (Marti, et al., 2012) for improving the user's motivation to contribute.

Other tools such as ArlingtonVA (Evans-Cowley, 2016) or FixMyStreet give citizens the possibility to easily report problems or service requests to the city administration in order to get local issues solved. These reporting apps often support the upload of geo-tagged feedback (see Ertiö, 2015, p. 312). Moreover, public displays such as idea walls represent a creative way of consulting the public, ideas can be written on post-ups and pinned on the wall that in the end displays an overview of the citizens' opinions. Social media channels are also suitable for consulting the public by providing

formats that display the users' feedback, e.g. within commentary sections or by liking and disliking contributions.

The online platform "MetroQuest" (Biggs, 2015), whose design is inspired by a game called "Sim City", educates the public about urban projects through a series of informative screens and offers options to rank priorities, rate scenarios or allocate budgets, whereas professionals can use the platform e.g. by initiating surveys (e.g. figure 46). By offering a variety of screen-based participation formats, the tool is adaptable for many Urban Design projects, supporting options for different levels of public participation. Similar to MetroQuest, the data-based platform "mySidewalk", formerly known as "MindMixer", allows professionals to engage with citizens by letting them post ideas, give feedback or support and vote on Urban Planning ideas. The platform uses a gamified design that rewards user activities with digital coins and also implements high-score lists for raising user motivation (Thiel and Lehner, 2015).

Figure 46. MetroQuest view of transportation corridor and hub (Bendor, 2013)

Additionally, different types of crowdsourcing tools exist that collect citizens' input for Urban Design matters, e.g. on the website "CoUrbanize", professionals can list their urban projects and citizens are able to give feedback. Moreover, it provides a forum in which all community members are given the space to discuss contributions. Many crowdsourcing tools which collect ideas for social challenges involve some kind of contest, like "Seezers.nl", "Battle of Concepts", "OpenIDEO". Generally, all kinds of idea contest formats that refer to non-game contexts possess certain game elements such as competition and self-expression that address intrinsic motivators and thereby have the potential to make activities more fun.

The web-based online platform "Community PlanIt" is designed for assisting Urban Planning meetings, transforming an urban instance into a "mission" that contains game elements such as challenges, leaderboards and in-game rewards (e.g. Figure 47). By completing those missions, the

citizen contributes to the planning process, earning virtual coins which can be spent to support urban concepts that frame the topic (Thiel and Lehner, 2015). Additionally, the platform seeks for integrating as many stakeholders as possible and strives to initiate a mutual learning process. Besides online activities, the game final is facilitated by an offline workshop that is also open for non-members (Gordon and Baldwin-Philippi, 2014), which would be an activity labeled as 'collaboration'.

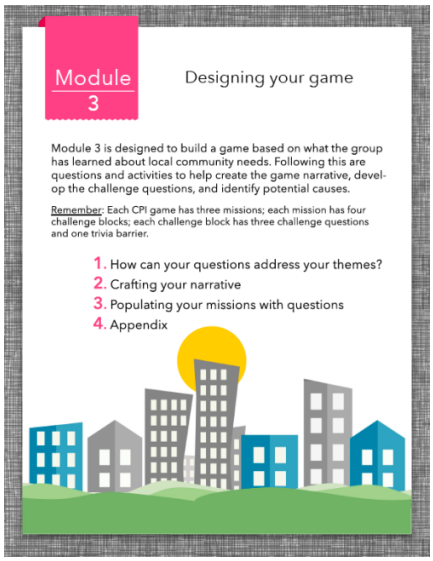

Figure 47. Community PlanIt guide for designing a game (PlanIt, 2011)

Applied to the context of Urban Design, digital User-Centered Design tools should be able to support language by which citizens (i.e. non-professionals) can express aesthetics of urban experience and unveil still unknown, ill- or undefined or unanticipated or latent citizen expectations, needs, feelings and emotions (Sanders, 2002). Traditionally, designers use make tools such as physical full-scale real and three-dimensional kits for space prototyping to facilitate the creative expression of non-professionals. They have proven to be efficient in collecting end-users' ideas and spurring design proposals from non-professionals; however, the cost of such prototyping turns to be high (Sanders, 2009). With 3D technology and the new interfaces offered by virtual reality, augmented reality and mixed reality available at affordable cost, it is now possible to overcome this problem. Different technological and methodological solutions have explored support visioning (see), narration (say) and forms of prototyping (make). However, still a translation has to be made by a researcher to turn the citizens output into useful, relevant input for the professionals. The first U_CODE prototype LocaLab is also on this level of consultation, named User-Centered Design.

Virtual worlds such as the online platform "Second Life" offer playful environments in which citizens can familiarize with urban issues, exploring future public spaces by controlling an avatar (Mallan, Foth, Greenway and Young, 2010). This kind of immersive experience shows potential to inspire people to engage in Urban Design projects. The approach can easily be gamified by rewarding exploration of virtual environments. Simple rewards could stimulate motivation to engage in those 'passive immersive' tasks by implementing a task-board (In gaming usually:

"Mission"), rewarding score points adding up in high-scores. Considering mixed reality applications as "Pokemon GO", not only the exploration of virtual spaces can be rewarded, but even the physical environment as your own city district. Further interest in exploring could emerge by offering a treasure map. In addition, public and professional feedback on urban development projects can also be requested in order to facilitate a better consultation process between the parties involved or between all stakeholders.

Finally, Vectuel (http://www.vectuel.com) should be mentioned, since it offers 3D city models combining 3D renderings of cities and the creation of 3D media (3D images, 3D films as well as virtual 3D 360-degree tours). The city models are accessible on touch-screen interfaces, PC, iPad, in augmented reality, on the Cloud or even using immersive displays (immersion rooms, Cardboard, Oculus etc.). Vectuel has 3D models of most major French cities stored and ready for project integration. The models natively integrate BIM data, of which they enable seamless and fast 3D visualization while retaining all technical information. Vectuel proposes applications aimed at facilitating understanding of and rallying support for urban projects. A great many private project owners and public contracting authorities now utilize these tools in order to design and communicate on their development projects through renewed public consultation. However, it shows great potential for collaboration activities as well.

5.3.4 Tools and Methods labeled as "Collaboration"

In order to promote collaboration between citizens and professionals, participation formats should offer possibilities for all stakeholders to have in-depth interaction and optimally provide a hand in hand workflow, constant exchange and fast feedback, or at least include tools that enable and facilitate the process of mutual collaboration. Ucodesign (as defined in chapter 2.4) is at this level of participation. Still, this level should be interpreted as a range, where Participatory Design is one end of the spectrum and pure Co-Creation is the other end.

Collaboration can be accomplished by different forms of collaborative meetings, e.g. by interactive design or visioning workshops that include all stakeholders. For example, charrette workshops are used to involve designers, citizens and other key stakeholders to solve an issue of Urban Design. Here, participants form small groups appoint a person that captures the group's ideas and portray them visually. Afterwards, the groups discuss resulted proposals and repeat the process until a final design is accepted. In that regard, several software applications such as "SketchUp" or "Archisketch" can facilitate the process of visualizing ideas, although they are primarily made for professionals.

For digitizing the collaborative meetings and interactive workshops itself "Stormz" did a great job (see Appendix 3). A wide variety of tools typically used in *integrated Creative Problem Solving* was digitized by Stormz, enabling asynchronous workshops with a facilitator:participant ratio beyond 1:8. Stormz also attempts to respect the Creative Facilitation principles listed in chapter 3.

An interactive and mobile concept that facilitates Participatory Design processes is called "Community Circles" and stimulates user interactions and contributions that refer to local Urban Planning issues with digital points (Thiel and Lehner, 2015). It also implements user profiles to

visualize individual progress and establishes leaderboards to rank the players' overall score with others. Similar to Maplocal, the app demands participants to explore their location in order to participate. Additionally, in-app crowd-sourced user contributions are slowly about to disappear if community feedback is lacking - in that way, high amounts of user input is filtered for relevant distribution. The platform not only allows citizens to contribute opinions and ideas (see figure 48), but also enables professionals to give constructive feedback or to raise urban issues, the so-called 'missions' (Thiel, Lehner, Stürmer and Gospodarek, 2015). Above all, contributions can merge into "communities" if they are in immediate proximity. In that case, user actions within such a community are rewarded with more credits, which helps the discussion to focus on already existing debates (Thiel and Lehner, 2015).

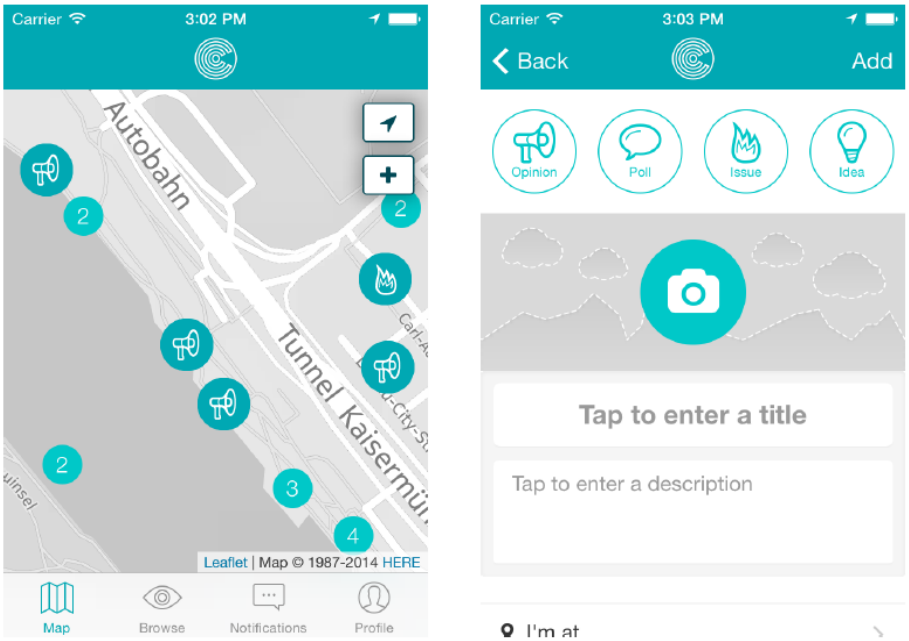

Figure 48. Mobile Participation Tool "Community Circles" (see Thiel et al., 2015, p. 167)

Another example of Participatory Design is called "Love your City". It includes an AR-based interface to accomplish participation activities between citizens and professionals (in this case local governments) at the citizens' current location (Stembert and Mulder, 2013). Depending on the situation and complexity of tasks, either citizens or the professionals can perform actions within the participation process. The process generally starts by initiating an issue, leads to a stage of diverging and converging and finally ends up in visualized solutions and results. Again, user actions are rewarded with points and are tracked within a user profile (Thiel, 2016).

The participation platform "Nexthamburg" shows great potential to foster collaborative processes between stakeholders. It is used to mutually create a vision of the city of Hamburg by the use of various participation tools. It not only provides a GIS-based map of Hamburg that can be used by citizens to post ideas, but also offers a commentary and rating section for these contributions. Moreover, not only citizens are able to express their opinions in regard to an idea, e.g. by becoming a

fan, but also professionals (in cooperation with the editorial staff) can rate whether the contribution is coherent, innovative or convertible. Additionally, the platform organizes workshops ("future camps") for further discussing and implementing popular and feasible contributions. This makes it a hybrid approach by combining both on- and offline activities. The hybrid approach seems to be succesful for commercial businesses like "Zebralog" as well.

The online platform "Nextsuisse" gathers concepts on the future of the Suisse by letting users propose text-based ideas or play a web-based scenario game in which users can create a scenario of their hometown by simply placing urban elements (e.g. institutions, vegetation) on a virtual city framework. Adding urban elements reasonably is rewarded with positive feedback and influences the stated overall satisfaction level of the city. In a second step, the developed scenarios are published on the platform and can later be discussed and rated by other participants. Additionally, the results of this gamified crowdsourcing process are elaborated via road shows and later provide the basis for further dialogue between citizens and other stakeholders.

By extending the strict and sometimes difficult distinction between gamification, serious games and playful design and instead focus on whether a process makes an activity more game-like, another Urban Design tool has to be mentioned. In regard to serious games, the platform "Play the City" builds and uses physical games that engage multiple stakeholders to resolve complex urban challenges. These games are designed to answer the questions of clients in the context of specific challenges.

More specifically regarding Urban Design, the Betaville Project offers a "massive participatory online environment for distributed 3D design and development of proposals for changes to the built environment". Multiple actors can be connected to the same virtual city and "fly through it", model new structures, leave comments and engage a real-time discussion (Skelton, 2013). The interaction interface is supported by the standard computer screen and mouse.

Immersive technologies are showing great potential in enabling collaboration activities in new ways. For example, Basile and Terrin (2009) present a mixed reality solution that uses a traditional Urban Design table on which a 2D plan is projected and physical objects representing build structures are placed on the top. The physical blocks are linked to 3D models that are displayed on a side screen that represents the real scene of the urban place being designed. Modifications on the table are visible in real time on the screen and furthermore, annotations or drawings can be added directly on the screen.

Another example is the "City I/O" project, which proposes a table with an urban model on top build out of lego pieces (Changing Places[11]). One can see the representation of the urban model in 3D on a screen that is directly linked to the physical model with extra textures added like trees and building shapes. Two modes of interaction are possible: one by adding/removing lego blocks on the table and seeing the change on the screen; or by interacting with the virtual model for softer actions like

[11] MIT Media Lab: http://cp.media.mit.edu/cityio/

changing building colors or adding a comment. The virtual scene can be visualized either on a TV screen or on a mobile device using an AR application.

"Interactor" (van Heeswijk, 2017) is a software-based tool that helps its users create their own three-dimensional world through manipulation of objects and textures. 3D objects can be modified through a 2D touch interface in which users can draw, paint or cut. In various projects that used this tool, output provided by non-professional participants was used by professionals for professional design.

In addition to the academic research-driven projects in Urban Design cited above, there is a number of commercial products already available in the market.

"UN-Habitat" used the Mojang AB's video game "Minecraft" to build proposals in a virtual city using the Minecraft tools (Westerberg and von Heland, 2015). Feedback tools such as commenting on produced design proposals are also available. The graphical model is accessed with a traditional PC screen and mouse. On the server of GeoCraft[12] of the Science center of GeoFort, The Netherlands is already entirely build in Minecraft: every school, library, police station, fire station and even houses. Also trees, roads and rivers are stored on the server. Everyone can build on this virtual version of the Netherlands.

Finally, "Terf"[13] is a multiplayer virtual world used for remote collaboration between several stakeholders within a company for construction management. It offers several points of view (first person, third person, seen from above, ...) to manipulate 3D elements or 2D images. These items can be imported by the user or retrieved from a database internal to the software. Additional features are available such as microphone and message-based communication, video conferencing, 360-degree audio source placement and embedding of external software such as Microsoft Word, Excel and PowerPoint. The software is also linked with professional 3D design programs like SketchUp or ArcGis. Although this tool does not explicitly target Participatory Design, it can be easily adapted to support collaboration between citizens and professionals.

Even more examples of cutting edge approaches to Urban Design and city planning can be found at https://www.slimcity.nl/voorbeelden and http://www.gamesforcities.com/database/.

5.4 Conclusion

The review on participatory tools and methods revealed a wide spectrum of possibilities that can be used in regard to Ucodesign. Informing the citizens is a necessary continuous activity along the entire U_CODE Minimal Viable Process, therefore the tools and methods labeled as 'information' should be looked into by the developers of U_CODE. Tools and methods on the level of 'consultation' are a source of inspiration for ranking and voting, as well as the so-called harvesting-tools within the U_CODE toolset. Special focus should be on User-Centered Design tools (like LocaLab). Tools and methods on the level of 'collaboration' foster in-depth interaction between all stakeholders and

[12] https://geocraft.nl/
[13] 3D Immersive Collaboration: www.3dicc.com

range from Participatory Design to pure Co-Creation. An example of pure Co-Creation, including its principles (as defined in this chapter 2.4) on a massive scale has not (yet) been identified online.

1. U_CODE should consist of a set of tools from different participation levels to cover and support the entire Minimal Viable Process.

Since Urban Design processes are diverse and consist of several phases, it is advised to include varying tools out of the entire range of possibilities. Ideally, those tools facilitate different aspects of the participation process and have already been proven to be effective in previous cases.

2. The U_CODE tools should be a hybrid set of both on- and offline tools.

The aim of U_CODE should be the inclusion of the whole society, which is why online and offline participation tools should not only be used at the same time but also be reasonably linked together.

3. Harvesting tools will require a translation of citizen output into meaningful input for the professionals.

When developing the so-called harvesting tools based on the principles of User-Centered Design, it should be considered that the citizens' output only becomes meaningful for the Professionals once it is analyzed, interpreted and translated. This is typically done by a researcher. In some cases the translation to meaningful insights can be done by the participants themselves, e.g in reverging activities like clustering.

4. Regarding Creative Facilitation within Co-Creation processes, the Ucodesign tools should match or surpass "Stormz".

Stormz[14] digitized a wide variety of commonly used *integrated Creative Problem Solving* tools, enabling asynchronous workshops with a facilitator:participant ratio beyond 1:8, while respecting the basic principles of Creative Facilitation.

5. Regarding 3D modeling of Urban Design, the Ucodesign tools should match or surpass "Vectuel"

Vectuel[15] offers 3D city models combining 3D renderings of cities and the creation of 3D media. The city models are accessible on touch-screen interfaces, PC, iPad, in augmented reality, on the Cloud or even using immersive displays (immersion rooms, Cardboard, Oculus etc.). Vectuel integrates BIM data and has 3D models of most major French cities stored and ready for project integration.

6. Regarding Urban Co-design platforms, the Ucodesign tools should match or surpass Nexthamburg.

Nexthamburg allows collecting and collaboratively working on ideas of citizens on textual level. Actual 3D Co-design is not integrated on the platform. Nexthamburg shows great potential for Ucodesign activities.

[14] https://stormz.me/
[15] http://www.vectuel.com/

Requirements for the development of the U_CODE platform and tools:

1. *U_CODE should consist of a set of tools from different participation levels to cover and support the entire Minimal Viable Process.*
2. *The U_CODE tools should be a hybrid set of both on- and offline tools.*
3. *Harvesting tools will require a translation of citizen output into meaningful input for the professionals.*
4. *Regarding Creative Facilitation within Co-Creation processes, the Ucodesign tools should match or surpass "Stormz".*
5. *Regarding 3D modeling of Urban Design, the Ucodesign tools should match or surpass "Vectuel".*
6. *Regarding Urban Co-design platforms, the Ucodesign tools should match or surpass "Nexthamburg".*

6 Methodologies, Mindsets and Culture

6.1 Introduction

As explained in the tools pyramid of Sanders (2009, see chapter 5), tools and methods are not a "stand-alone" matter. Often they are organized in methodologies, based on certain mindsets and depending on a certain culture. An example of a methodology is "integrated Creative Problem Solving", which was discussed in chapter 3. This chapter will focus on some relevant mindsets that were encountered during the literature and field research for tools and methods, which are, again, carried out through methodologies. Also, mindsets that were mentioned in the proposal will be discussed, like poldering: a mindset on which a lot of Dutch tools and methods are based. Some examples of tools within this mindset will be shared as well.

The bottom of the tools pyramid (the foundation) is 'culture'. In the original U_CODE proposal the importance of cultural differences was already emphasized. Therefore, this chapter will also cover the cultural dimensions that have to be considered when applying certain tools and methods.

This chapter will be completed by describing the legal frameworks of three European countries, which are currently closely involved in U_CODE: Germany, France and The Netherlands. The choice to embed it here is because often legislation is a result of a country's culture and mindset as well.

6.2 Polder Model

The Polder model is not a tool or a method. It seems to be a methodology, but is much more a mindset. In the Netherlands the 'poldering' refers to the process of consensus decision-making that aims to lead a group to mutual agreement. Consensus tries to address all concerns of the group, meaning: everybody who wants to share his or her opinion about a certain topic or issue should be taken into account in the decision-making process. This approach is often challenged, because not everyone is an expert regarding the topic or issue at hand, meaning that his or her perception could be qualified as irrational.

Poldering is embedded in most of the Dutch politics and legislation. Dutch legislation knows multiple moments of formal participation ("inspraak") at several stages of the Urban Design process. The public can share their views on policies and intended decisions, which has to be considered by the policy and decision makers. More about the Dutch legislation can be found in chapter 6.5.

An example of a tool based on the Polder model is the website www.platformparticipatie.nl, part of the Dutch Ministry of Infrastructure and the Environment (figure 49). At this website all infrastructural project (national level) are displayed. The website informs when the public can share their opinions through a formal 'perspective' (zienswijze) and after a decision is made, a

formal ‘appeal’ (beroep). The website contains all kinds of relevant documents from the project and are accessible for the public. This tool is not really a Co-design tool, but rather an informing tool.

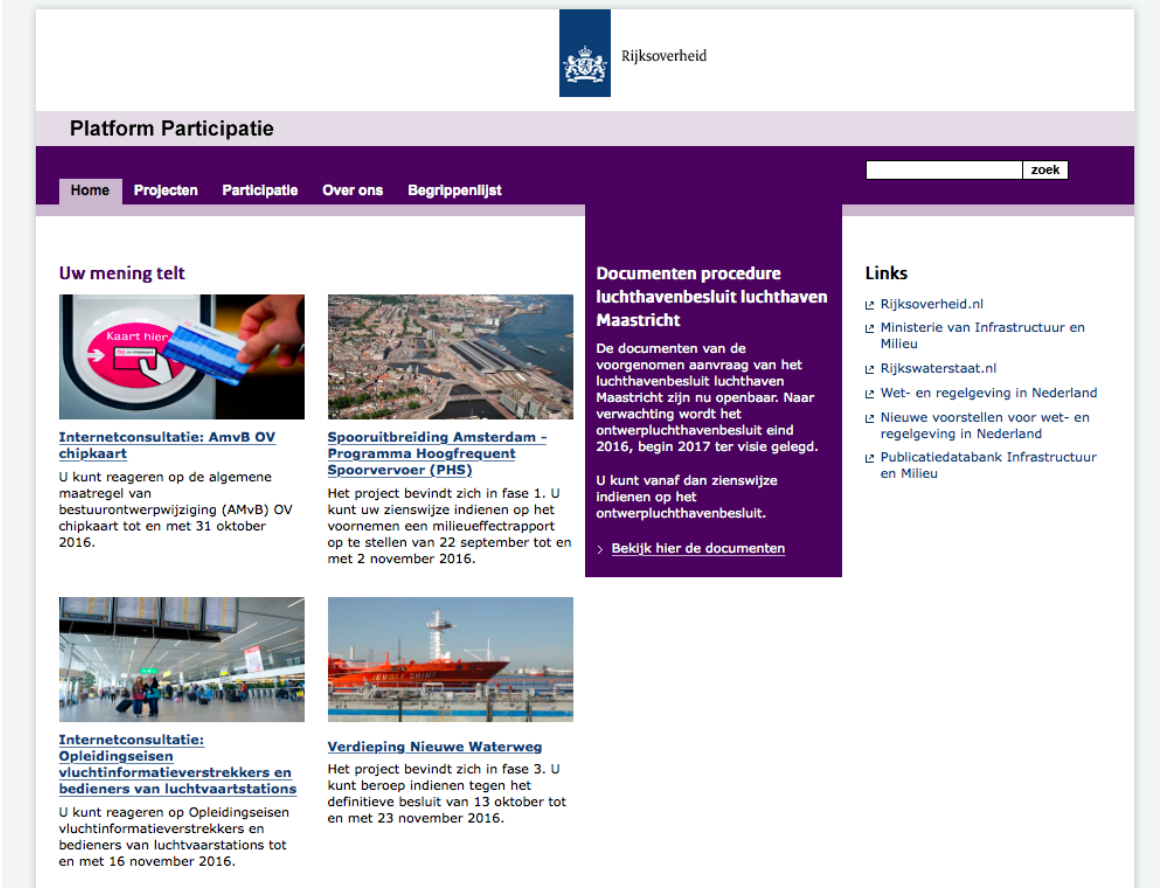

Figure 49. Screenshot www.platformparticipatie.nl (retrieved October 29th, 2016)

Within the Dutch Ministry of Infrastructure and the Environment, there is a subdivision called “Directorate for Public Participation”. Their goal is to act as consultant, facilitator and organizer of public participation for the whole ministry with an emphasis on engaging and involving citizens, businesses and non-profit organizations. An example of an approach they use is the council of Infrastructure and the Environment[16]. In this council businesses, non-profit organizations and interest groups are consulted about intended policies and decisions. This is an example of a consulting tool. In addition they have a Linked-in group for public participation, which is mainly used as an informing tool currently.

Another example of Poldering is a certain job-title at the Dutch Ministry of Public Works and Waterways (Rijkswaterstaat) called ‘environs-manager’ (omgevingsmanager). Rijkswaterstaat is the executive agency of the Ministry of Infrastructure and the Environment and is responsible for

[16] *„Het Overleg Infrastructuur en Milieu“ - http://www.platformparticipatie.nl/over_ons/overlegorgaan/index.aspx*

the design, construction, management and maintenance of the main infrastructure facilities in the Netherlands. This includes the main road network, the main waterway network and water systems.

The main tasks of an environs-manager are networking, building relationships and connecting local authorities, users (citizens) and interest groups in every stage of an Urban Planning project. The aim is to identify interests and sentiments in an early stage of a project in order to anticipate on that and create the right circumstances for a smooth rollout of the project. One of the approaches that is used by the environs-managers is called SOM (to be translated as „Strategic Environment Management"). SOM (Wesselink, 2011) is based on the Mutual Gains approach (Fisher, Uri and Patton, 2011) and aims to combine stakeholder- and issue-management, but also considers emotions and behaviors of persons and organizations. An example of an online tool for SOM is SOM SET[17].

Even though SOM SET is a tangible tool, based on the SOM methodology, still it depends largely on the mindset or attitude of the actual environs-manager. As one of the experts at the Dutch Ministry of Infrastructure and the Environment put it: "participation depends on the type of person. Some environs-managers engage and involve citizens and other stakeholders just more than others." All experts agree that a tool for analyzing sentiments through Social Media would be a huge gain for their effectiveness.

Poldering is a specific Dutch approach that stems from the Dutch culture e.g. Feminine and low Power Distance (Cultural Dimensions will be elaborated in chapter 6.4). The tools used in the Polder model will need a substantial cultural adjustment to fit in other European countries and cultures.

The 'Poldering-tools' described in this section so far are all on an informing and consulting level. Although the SOM SET tool is about the involving level, actual Ucodesign is not reached. However, there are some forms of Poldering which aim for more collaboration, like Living Labs. In a separate report (Criollo, 2016) you will find a summary of our findings of this phenomenon based on the original U_CODE research by Paulina Criollo on the academic literature and the internet on Living Labs. The main conclusions of this specific piece of research are based on in depth analysis of 7 European cases of Living Labs and are not very hopeful: "the number of citizens involved were only on a small scale". Additionally, the methods used in Living Labs are "traditional participatory methods that were not successful in motivating and engaging citizens" (Criollo, 2016). For now the findings of the practices found in the Living Labs are merely a serious warning for U_CODE to improve on the tools used in these experiments.

6.3 Cultural Dimensions

As mentioned already in the U_CODE Grant agreement: Based on the TUDelft experience the success of user centered design and Co-design depends on the characteristics of the teams working with the design tools. The ideal team (also known as Multi X Team; Buijs 2007, 2012) should operate "ego-less". In more feminine cultures like the Dutch this "egoless" operation is supposed to

[17] *http://.somset.nl*

be far more common practice than in more masculine cultures like the German (Hofstede, 2001). This section will explain this and other aspects related to cultural dimensions in more detail and compare the cultures of the countries participating in the U_CODE team: Germany, France and The Netherlands.

As explained in the iceberg analogy by Selfridge and Sokolik, (1975) the strategies, systems, and procedures used in organizations or even whole sectors are indicative of the values, attitudes, and beliefs that are held within them; the organizational culture. With Ucodesign being just such a system or procedure, its use or non-use should also be explainable by accounting for the differences between cultures in countries. In countries where this culture is somehow more in line with values underlying Ucodesign practice, it can be expected that Ucodesign tools and methods are used more frequently. For example, Norwegians are more likely to engage in Ucodesign programs in Urban Design as they have a culture where transparency and participation are expected (Healey, 1997). Abram and Cowell (2004) mention how the level of integration of Co-design methods in Urban Development projects may be culture-specific.

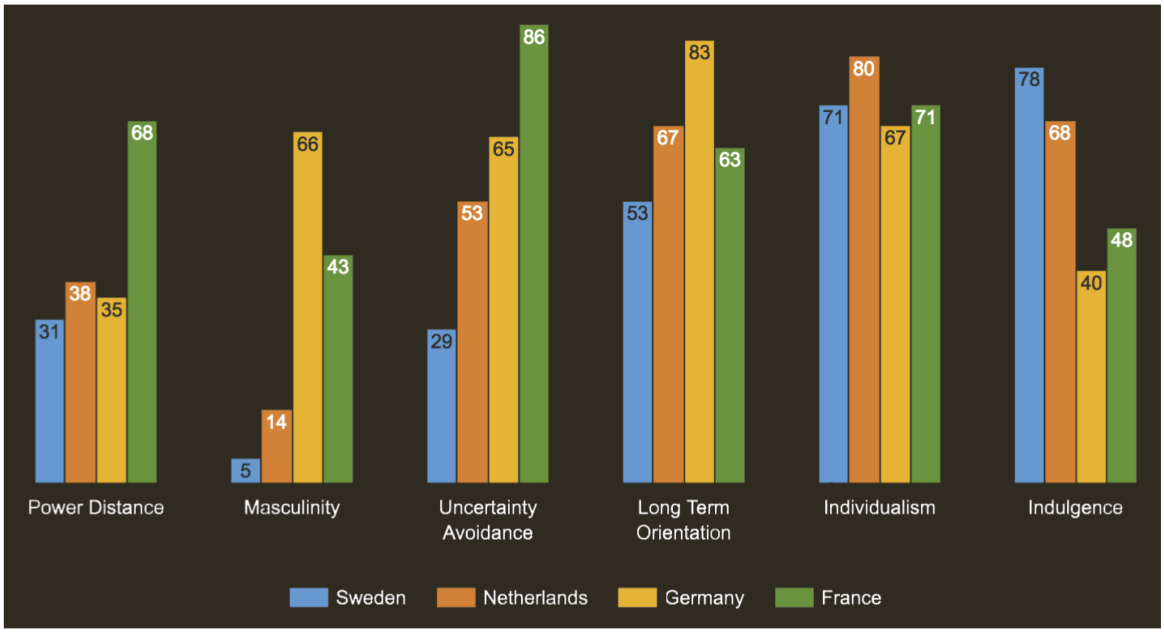

Figure 50: Hofstede's Cultural Dimensions, comparison of Sweden, The Netherlands, Germany and France.

For analyzing such cross-cultural differences, Hofstede's cultural dimensions are often used. These six factors describe key values held by cultures. A comparison of these factors of Sweden, The Netherlands, France, and Germany can be seen in figure 50, as reported by Hofstede, Hofstede and Minkov (2010). Sweden was included to hold as a 'reference point', as according to Denters and Klok (2013) it has the highest level of party and citizen democracy in Europe. When comparing these factors, interesting conclusions can be made.

Power distance

As defined by Hofstede et al. (2010), in societies with low Power Distance, people strive to equalize the distribution of power and demand justification for inequalities of power. In societies with high Power Distance, hierarchical order and an unequal distribution of power is more accepted and expected. Whereas Sweden, The Netherlands, and Germany score similarly low in this regard, France has a significantly higher Power Distance score. In the context of Participatory Design, this indicates that French people might not be very driven to strive for their right to participate, as it is more accepted that power is shared unequally.

Masculinity versus Femininity

As defined by Hofstede et al. (2010), feminine cultures hold a preference for caring for the weak, quality of life, and cooperation and consensus. Masculine countries have a higher preference for achievement, expertise, assertiveness and competitiveness. In the context of Ucodesign, the low scores of Sweden and The Netherlands indicate that involving all people to reach a consensus is much more true to the nature of their cultures than to those of the French and especially the Germans. Involve (2005) also touches on this point when stating that especially in countries or sectors where training and expertise are held in high regard, these values can be a barrier to the adoption of participatory tools and methods.

Uncertainty Avoidance

As defined by Hofstede et al. (2010), uncertainty avoidance indicates the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity; Countries with low scores are more relaxed with uncertainty, ambiguity, and not being in full control over the future, while countries with high scores are more likely to want to control the future and follow principles, rules and regulations, while generally being more intolerant of unorthodox behavior and ideas. While all countries (except for Sweden) score relatively high in this regard, especially the score of Germany indicates that the German culture might be very uncomfortable with using Co-Creation. Inherent to the practice of Co-Creation, results of such processes cannot be predicted or controlled, something that goes much against their nature.

Long Term Orientation

As defined by Hofstede et al. (2010), low Long Term Orientation scores indicate that a society prefers to maintain time-honored traditions and norm, while those with high scores are more encouraging of societal change and pragmatism. In the context of Ucodesign, the relatively high scores of all four countries indicate that they might be open to adoption of such 'new' ways of governance, instead of being suspicious of them.

Individualism and Indulgence

These two dimensions appear to hold less relevance for explaining differences in the adoption of Ucodesign tools and methods. As defined by Hofstede et al. (2010), collectivistic societies favor tight group and family loyalty, while individualistic societies expect people to take care and responsibility of themselves. The differences between countries in this aspect are most likely too small to account

for a difference in adoption of Ucodesign tools and methods. Furthermore, non-indulgent cultures favor restraint and suppressing gratification of needs, while indulgent cultures encourage them. This aspect cannot obviously be linked to the use or non-use of participatory tools and methods.

Conclusion

The differences in adoption of Ucodesign tools and methods can be explained by reviewing the cross-cultural differences between countries. It can be concluded that some countries are culturally more predisposed towards using Ucodesign tools and methods. This insight might inform a strategy and country-specific branding for release of a product or service. This should be based on the individual characteristics of cultures and the level of resistance that can be expected from potential clients before a necessary ‚attitude change' is achieved. The size of the necessary change is smaller in some countries than others however. This does not mean that in more challenging countries, a change cannot be achieved as Involve (2005) mentions how the use of Ucodesign methods can successfully challenge assumptions and values of organizations. An introduction in more favorable countries such as The Netherlands and Sweden will be more straightforward however, as a smaller number of such assumptions need to be challenged in order to convince people of the benefits of adopting the use of these methods.

The purpose of this chapter was to provide awareness on how cultural aspects may affect the U_CODE project, using cultural dimensions of several countries as an example. However, it must be noted that within each country cities may differ to a high extent as well, similar to how company cultures may vary.

6.4 Legal Framework for Participation on European and National Level

6.4.1 International and European Framework

Main International legal commitments on public participation

1998 UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, adopted by the fourth "Europe for Environment" conference in Aarhus, Denmark, on 25 June 1998.

The Aarhus Convention stands on three "pillars": access to information, public participation and access to justice, provided for under its articles 4 to 9. The three pillars depend on each other for full implementation of the Convention's objectives. The second pillar of the Aarhus Convention is the public participation pillar. It relies upon the other two pillars for its effectiveness—the information pillar to ensure that the public can participate in an informed fashion, and the access to justice pillar to ensure that participation happens in reality and not just on paper.

The public participation pillar is divided into three parts. The first part concerns the participation of the public that may be affected by or is otherwise interested in decision-making on a specific activity, and is covered by article 6. The second part concerns the participation of the public in the

development of plans, programmes and policies relating to the environment, and is covered by article 7. Finally, article 8 covers participation of the public in the preparation of laws, rules and legally binding norms.

1991 UNECE Convention on Environmental Impact Assessment in a Transboundary Context, adopted at Espoo, Finland, on 25 February 1991. The Convention sets out the obligation of Parties to assess the environmental impact of proposed activities that are likely to cause significant adverse transboundary impact prior to a decision to authorize or undertake such activities. The Convention shows the link between public participation and environmental impact assessment (EIA), since public participation is an essential element of the transboundary EIA procedure. In particular, Article 2(6) of the Convention provides that "[t]he Party of origin shall provide […] an opportunity to the public in the areas likely to be affected to participate in relevant environmental impact assessment procedures regarding proposed activities and shall ensure that the opportunity provided to the public of the affected Party is equivalent to that provided to the public of the Party of origin."

2003 Protocol on Strategic Environmental Assessment to the 1991 UNECE Convention on Environmental Impact Assessment in a Transboundary Context. The Protocol was adopted by an extraordinary Meeting of the Parties to the Espoo Convention, held on 21 May 2003 during the Ministerial Conference “Environment for Europe” in Kyiv. The Protocol entered into force on 11 July 2010. The Protocol augments the Espoo Convention by ensuring that individual Parties integrate environmental assessment into their plans and programmes at early stages. The Protocol also requires that Parties endeavour to ensure that environmental concerns are integrated in the preparation of policies and legislation. The Protocol provides for extensive public participation in decision-making process.

Europe Level

Since 1970 the Council of Europe Conference of Ministers responsible for Spatial/Regional Planning (CEMAT) has played an invaluable role in promoting efficient and sustainable territorial development policies on the European continent. The Conference advocates the subsidiarity and reciprocity principles to ensure an active involvement of European regions and municipalities in territorial development policies as a mean of preserving the unity in diversity bequeathed to Europe by its history and geography.

1985 Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment. Article 6 of the Directive sets out modalities for public participation in the EIA procedure.

1985 European Charter of Local Self-Government, adopted in Strasbourg, France, on 15 October 1985. In its preamble the Charter states that “the right of citizens to participate in the conduct of public affairs is one of the democratic principles that are shared by all member States of the Council of Europe” and that “it is at local level that this right can be most directly exercised.”

1986 Council of Europe Resolution No. RES 171 (1986) of the Standing Conference of local and regional authorities of Europe on "Region, environment and participation", adopted in Strasbourg, France, on 14 October 1986.

1999 Council of Europe Recommendation 1430 (1999) of the Parliamentary Assembly on access to information, public participation in environmental decision-making and access to justice – implementation of the Aarhus Convention, adopted in Strasbourg, France, on 4 November 1999. Paragraph 2 of the Recommendation emphasises that "Sustainable development in Europe will only be effectively achieved if the public becomes an active and full partner in decision-making at all levels; access to environmental information, public participation and access to justice are therefore prerequisites to involving the public in environmental decision-making."

- In paragraph 10.3 (c) the Parliamentary Assembly further calls on all member state governments "to take into account public participation requirements in the early process of preparing legislation, policies and programmes, when these may have consequences for the environment."

Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment. Art (15) In order to contribute to more transparent decision making and with the aim of ensuring that the information supplied for the assessment is comprehensive and reliable, it is necessary to provide that authorities with relevant environmental responsibilities and the public are to be consulted during the assessment of plans and programmes, and that appropriate time frames are set, allowing sufficient time for consultations, including the expression of opinion.

2003 Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC. The objective of this Directive is "to contribute to the implementation of the obligations arising under the Aarhus Convention, in particular by: (a) providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment; (b) improving the public participation and providing for provisions on access to justice within Council Directives 85/337/EEC and 96/61/EC."

2003 Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC

- Art (8) It is necessary to ensure that any natural and legal person has a right of access to environmental information held by or for public authorities without his having to state an interest.
- Art (9) It is also necessary that public authorities make available and disseminate environmental information to the general public to the widest extent possible, in particular by using information and communication technologies. The future development of these

technologies should be taken into account in the reporting on, and reviewing of, this Directive

2009 the European Institute for Public Participation (EIPP) with the Headquarter in Germany was founded.

- „Successful public participation therefore needs to be more strongly based on a clearly defined constitutional framework for public participation. Only through an explicit, shared understanding between politicians and citizens can confidence be developed and public participation realise its democratising potential." (EIPP, June 2009 Public Participation in Europe, p.4)

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment amended by Directive 2014/52 /EU of the European Parliament and of the Council of 16 April 2014

- Art (29**) When determining whether significant effects on the environment are likely to be caused by a project, the competent authorities should identify the most relevant criteria to be considered and should take into account information that could be available following other assessments required by Union legislation in order to apply the screening procedure effectively and transparently. In this regard, it is appropriate to specify the content of the screening determination, in particular where no environmental impact assessment is required. Moreover, taking into account unsolicited comments that might have been received from other sources, such as members of the public or public authorities, even though no formal consultation is required at the screening stage, constitutes good administrative practice.
- Art (16 *) Effective public participation in the taking of decisions enables the public to express, and the decision-maker to take account of, opinions and concerns which may be relevant to those decisions, thereby increasing the accountability and transparency of the decision-making process and contributing to public awareness of environmental issues and support for the decisions taken.
- Art (17*) Participation, including participation by associations, organisations and groups, in particular non -governmental organisations promoting environmental protection, should accordingly be fostered, including, inter alia, by promoting environmental education of the public

6.4.2 National Framework

For the general understanding of the different cultures in the administration the study of Newman and Thornley (1996) helpful. They "contrast the legal legal and administrative families of Europe. The existence of four legal families is assumed as follows:

- England, Wales and Ireland,
- France, Italy, Spain, Portugal, the Netherlands, Belgium and Luxemburg,

- Norway, Sweden, Denmark and Finland,
- Germany, Switzerland, Austria, and possibly Eastern Europe."

The "analysis of the characteristics of these legal and administrative families shows how the characteristics of these legal families at the constitutional level impregnate central-local government relations and planning systems. […]

- In the Napoleonic family, there is a tendency to prepare a national code of planning regulations and to create a hierarchy of plans, starting from higher level going down to more detailed plan of smaller scale and zoning approach in the land uses. […]
- Planning regulations in Germanic countries tend to be very strict. They also ensure a strong regional level of planning with its own laws, plans, guidelines and agreements in order to achieve consensus between and within different tiers of government. This results in considerable variation in the planning process between regions but within a strong national framework." (Jong et al. 2002)

National Level Germany

Most official activity to engage citizens is restricted to the local and municipal level. At the federal level, referenda, for example, are constitutionally prohibited. Within the constitutional constraints, participation at federal level is focussed on consultation and information. Most innovative methods are to be found at local level.

On national and regional level the land use planning law (Raumordnungsgesetz) regulates the participation.

- §10 „The public has to be informed of the preparation of a land-use plan. If an environmental assessment is carried out, the draft of the land-use plan and the environmental report has to be publicly displayed for one month. Written comments can be submitted.

On local level, the building code (Baugesetzbuch BauBG) regulates the planning procedures of the development plan.

For more information see the U_Code document *Leitlinien und Methoden der Partizipation in der Stadtentwicklung.* (Document name: Stelzle_Diplomarbeit_part_Stadtentwickl.pdf).

National Level France

- The Law of 2 February 1995 called the "loi Barnier ", and subsequently the law on "Democracy and Proximity" of 2002 created the Commission Nationale du Debat Public (CNDP) (National Commission on Public Debate)
- The 1999 Framework Law on spatial planning and development ("Loi d'orientation pour l'amenagement et le developpement du territoire (LOADDT)") as from its first article recalls that citizens must be included in the development and implementation of spatial planning and sustainable development policies.

- The “Loi Vaillant ” from 2002 on local democracy (“democratie de proximite ”) foresees the setting up of neighbourhood councils (“conseils de quartier ”) in municipalities of over 80,000 inhabitants and allows for the appointment of representatives for one or several districts. The text also modifies public inquiry regulations, specifically where municipal development projects or works are concerned which exceed a certain financial threshold.
- Urban Planning Code (constantly supplemented / revised), specifically article L 300-2 of the Urban Planning code, amended by the Access to Housing and Urban Renewal Act (“Loi pour l’acces au logement et un urbanisme renové ” or “loi ALUR ”) of 21 February 2014.

In France, some specific processes have been set up, such as public enquiries, public debate and public consultations.

- According to Law n ° 2010-788 of 12 July 2010 - art. 236 amending Article L123-1 of the Environment Code: "The public inquiry aims at providing information and ensuring public participation as well as taking into account the interests of third parties when drawing decisions that affect the environment."
- Public participation can take the form of a public debate. It relates to opportunities, objectives and main features of the project. It also covers modalities of informing public and of public participation after the debate (art. L. 121-1 of the French Environmental Code).
- As defined in Article L. 300-2 of the Town Planning Code, consultation is a mandatory procedure which associates to the project residents, local associations and other concerned publics throughout the development period.

Institutional framework

The National Programme for Urban Renewal (PNRU), established by the Act of 1 August 2003 provides an unprecedented national effort to transform the weakest areas classified as Sensitive Urban Zones (ZUS). The effort is directed towards housing, public and urban facilities. Its implementation was entrusted to the National Agency for Urban Renewal (ANRU) . 490 districts spread throughout France, metropolitan France and overseas, are currently under renovation.

For more information see the U_Code documents *Legal Framework for public involvement in France;*(Document name:France_legal_framework.pptx.) and *Framework for public participation in France;*(Document name: Legal Framework for public participation in France.docx).

National Level Netherlands

Currently, there is a transition going on to simplify the legislation regarding Spatial Planning in the Netherlands. 26 laws (a.o. regarding spatial planning, housing, infrastructure, environment, nature, water) will be merged into one new law: “Omgevingswet”, which could be translated as “Environmental Planning law”, although the Dutch word “Omgeving” refers to ‘the surroundings’, establishing a broader meaning than the English word “Environment”.

The *Omgevingswet* is planned to be commissioned by January 2021 (Ministry of Infrastructure and the Environment, October 2017). However, all authorities and stakeholders already anticipate to this new law by acting in the spirit of the *Omgevingswet,* which has the following ambitions:

- integrate all current (spatial planning) laws into one law.
- stimulate more public participation in an early stage (resulting in better quality decisions; broader acceptance; shorter lead time).
- aim to create more beautiful, cleaner and safer environments, by connecting better to the wishes of the local citizens, businesses and authorities.

Regarding U_CODE there are some advantages of the Omgevingswet which are of interest:

- Broad participation from the start: Authorities are obliged to report how citizens, businesses and stakeholders participated in the establishment of spatial strategies (a.o. *omgevingsvisies, omgevingsplannen en programma's*) (Ministry of Infrastructure and the Environment, August 2017). On a high level the procedure is:
    1. Problem: what is the problem statement?
    2. Participation: who are the stakeholders and interest groups and how can they think along?
    3. Alternatives: What are the alternatives and options, how do they affect stakeholders and interest groups?
    4. 'Supported' decision making: Decision is made which should be broadly accepted.
- Mandatory participation in "Projectbesluit" (Project decision): A "projectbesluit" is needed for complex projects with large impact and public interest. For such projects authorities are committed to participation in an early stage of the project. (Ministry of Infrastructure and the Environment, April 2016). The aim is to improve decision-making and broader acceptance, by clarifying the necessity of the project and exploring several options (instead of imposing directly a solution). The procedure of *Projectbesluit* can be found in Appendix 4. More information about procedures are summarized on the *Omgevingswet* website.[18]
- How participation exactly should be established is not bound in regulations (except for projects with *Projectbesluit).* This means that there should be enough freedom to use tools like U_CODE.
- Easy access to data of the physical environment and legislation: The *Omgevingswet* will be digitally supported by an interactive map of the Netherlands, containing all information regarding the physical environment and legislation.[19]

The *Omgevingswet* is still in transition, therefore any up to date information can be found on https://www.omgevingswetportaal.nl (from the Dutch Ministry of Infrastructure and the Environment) and https://aandeslagmetdeomgevingswet.nl (a partnership of municipalities (VNG), counties (IPO), water boards (UvW) and the Government (het Rijk)).

[18] https://aandeslagmetdeomgevingswet.nl/omgevingswet/stelsel/omgevingswet-0/procedures/
[19] https://aandeslagmetdeomgevingswet.nl/digitaal-stelsel/

6.4.3 Conclusion regarding Legal Framework

As it can be seen, that the specifications on the legal framework very widely on every European, national and regional level. Each country made huge efforts to promote participation supported by the legal framework. It is important to see, that the approach to Urban Planning is different in France and the Netherlands to Germany. In the Napoleonic family, there is a tendency to prepare a national code of planning regulations and to create a hierarchy of plans. On the other Hand planning regulations in Germanic countries tend to be very strict. They ensure a strong regional level of planning. This results in considerable variation in the planning process between regions but within a strong national framework. There will be a new law commissioned in the Netherlands, that will sum up all current planning laws.

For the implementation of U_Code the possible access and problem points within the legal frameworks on spatial are important. Overall all countries have defined at least low level participation processes in their Urban Planning laws. In Germany, where only informational participation is mandatory, the main problem is, that all other participation made is not legally binding. It is to assume, that the responsible politicians respect the decision made with U_CODE, but the missing legal security undermines the integrity of the process. In France the Town planning law and the neighborhood councils ensures a legally binding decision which can be made by U_CODE. The best preconditions are in the Netherlands with the new Omgevingswet. It should be possible to align the MVP with the procedure. After the official publication of the law it should be checked, how U_CODE can be best sold.

On the other hand, in no country there are any restrictions, that would affect U_CODE. Only the direct decision making (so the empowerment) of citizens is forbidden in germany. But there is the possibility of public petitions, which could be included in the decision support process of U_CODE.

Apart from Urban Planning, the regulation regarding Data Security should be considered: U_CODE will be in line with new (2018) EU General Data Protection Regulation[20].

6.5 Conclusion

Tools and methods are always embedded in methodologies, which are based on mindset and culture. This chapter focused particularly on mindsets and culture. The impact of mindsets was discussed along a Dutch example (polderding). Through these examples some typical characteristics of the countries are revealed. When comparing the cultural dimensions the differences between European countries became even more visible. It was concluded that some countries are culturally more predisposed towards applying Ucodesign. This insight might affect specific tool requirements per country, as well as inform a strategy and country-specific branding for release of a product or service. Deliverable *D7.2 Cross-cultural comparison study* will proceed with this topic to assess whether one tool could be transplanted throughout all European countries with its different

[20] https://www.eugdpr.org/

cultures. Regarding mindsets and cultural differences, the following requirement should be considered:

1. Prepare the mindsets of the Professionals and the Citizens for a certain 'task'.

It is important to prepare both the Professionals and the Customers for a certain 'task' on the U_CODE platform by promoting the right mindsets at the right stage. E.g. for a diverging stage (i.e. generating options), a mindset of postponing judgement and hitchhiking is desired. For cultures with a high score on the cultural dimensions *Masculinity* and *Individualism*, stimulating this mindset of divergence is desired in particular.

Culture and mindsets are often reflected in a country's legislation. On European level there are no detailed descriptions about public participation in urban development. On a national level, the legislation varies. In the Napoleonic countries (France, Italy, Spain, Portugal, the Netherlands, Belgium and Luxembourg), there is a tendency to prepare a national code of planning regulations and to create a hierarchy of plans, starting from higher level going down to more detailed plan of smaller scale and zoning approach in the land uses. Planning regulations in Germanic countries tend to be very strict. They also ensure a strong regional level of planning with its own laws, plans, guidelines and agreements in order to achieve consensus between and within different tiers of government. This results in considerable variation in the planning process between regions but within a strong national framework.

The aim of the U_CODE platform and tools is to let Professionals and Citizens Ucodesign urban projects, in order to improve the quality of the actual design and increase the Acceptance Finding process. The legislation is not restricting U_CODE in that goal. Empowerment of the citizens should be avoided, since it may conflict with legislation in some countries. A requirement resulting from the investigation in legal frameworks

2. Ensure a smooth fit of the U_CODE process with the country's needs for public participation

Ideally, the U_CODE platform and tools should support the professionals in complying with the requirements for public participation within their country, since professionals are not looking for additional work and parallel processes. Any conflicts with legislation should obviously be avoided. This smooth fit is not necessarily about customizing the U_CODE platform and tools to a specific country, but rather about sales and communication. It should be clearly explained what the benefit of U_CODE is and how it can be used as part of the whole participation trajectory.

Requirements for the development of the U_CODE platform and tools:

1. *Prepare the mindsets of the Professionals and the Citizens for a certain 'task'.*
2. *Ensure a smooth fit of the U_CODE process with the country's needs for public participation.*

7 Recommendations for the U_CODE Platform and Tool Development

The aim of this report is to establish a list of requirements and desires for the designers and developers of the U_CODE platform and tools. In the previous chapters a wide variety of topics was explored and relevant principles were discussed. This chapter will capture all learnings and principles in one big list of 40 requirements.

One of the tasks within *Work Package 7: Testbeds and Evaluation* will be to translate this list of requirements into a testable checklist, which will be used for reviewing the tools by the U_CODE team. Any U_CODE tool has to pass this checklist, before it will be accepted for usability testing in Work Package 7.

The requirements are clustered, but not prioritized (yet). We will start with a recap of what Ucodesign is (figure 51).

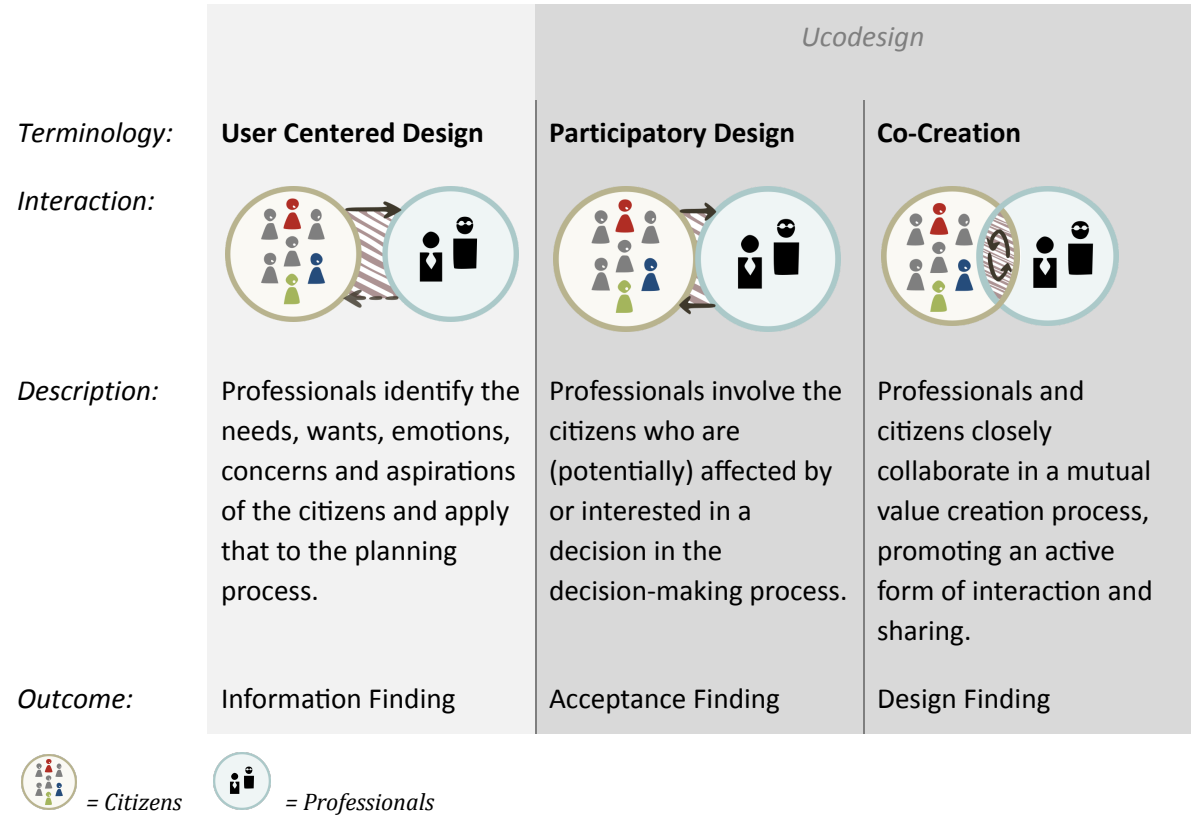

Figure 51. Three types of professional-citizen interaction.

Requirements regarding Ucodesign in general

1. Always provide feedback on how citizens' input is used in the decision-making process.
2. Ensure that the issue under consideration is still addressable by multiple approaches or solutions.
3. The public opinion must be reflected correctly through U_CODE tools, without selection bias.
4. Ensure appropriate balance in plasticity and robustness of the Boundary Objects.
5. Combine different communication channels to deliver each Ucodesign activity.
6. Start the initial Ucodesign activity with "dissatisfaction with the present status quo".
7. At least one of the U_CODE tools should aim at establishing "a shared vision of a better state".
8. Gamified applications should be used throughout the whole Ucodesign process.
9. A gamified Ucodesign tool should always provide immediate and constructive feedback to the user.
10. Stimulate external motivation of the citizens through social feedback, badges and points.
11. The threshold of participation should be minimized as far as possible.
12. The SuperModerator should be neutral and acting independently.
13. Prepare the mindsets of the Professionals and the Citizens for a certain 'task'.
14. Ensure a smooth fit of the U_CODE process with the country's needs for public participation.

Regarding Creative Facilitation, the Ucodesign activity should:

15. Ensure role clarity and rigidity (i.e. Who is the Facilitator?, Who is the Problem Owner?).
16. Be facilitated by an independent party.
17. Be started with a clear problem statement (i.e. SPARK).
18. Embed the Golden Rules for Diverging (see frame).
19. Embed the Golden Rules for Reverging (see frame).
20. Embed the Golden Rules for Converging (see frame).
21. Be balanced in Content Finding, Acceptance Finding, Information Finding.
22. Put a smile on the face of every participant.

The 3 Golden Rules per stage:

Diverging	**Reverging**	**Converging**
1. Quantity breeds quality	1. Active participation	1. Use affirmative judgment
2. Postpone judgement	2. Responsive listening	2. Protect originality
3. Hitchhike on other's ideas	3. Move circular	3. Have action in mind

Regarding a positive experience, the Ucodesign activity should:

23. Ensure a clear goal.
24. Ensure a challenging task.
25. Ensure a clear vision.

26. Provide the feeling to the participants that the task can be completed.
27. Ensure that participants skills are fully utilized.
28. Stimulate that participants are able to concentrate.
29. Establish the feeling of control of the situation.
30. Make sure all participants will receive immediate feedback.

Requirements regarding the development of tools:

31. U_CODE should consist of a set of tools from different participation levels to cover and support the entire Minimal Viable Process.
32. The U_CODE tools should be a hybrid set of both on- and offline tools.
33. Harvesting tools will require a translation of citizen output into meaningful input for the professionals.
34. Regarding Creative Facilitation within Co-Creation processes, the Ucodesign tools should match or surpass “Stormz”.
35. Regarding 3D modeling of Urban Design, the Ucodesign tools should match or surpass “Vectuel”.
36. Regarding Urban Co-design platforms, the Ucodesign tools should match or surpass “Nexthamburg”.

Requirements specifically for Co-Creation activities. Within Co-Creation activities…:

37. both professionals and citizens should provide valuable input into the joint space of creation.
38. the output should create value (of any kind) for both professionals and citizens.
39. professionals and citizens are partners and working on an equal level.
40. ensure an active form of interaction and sharing between professionals and citizens.

8 Conclusion and Discussion

D2.3 is the final version of report *"Survey on Co-design Methodologies in Urban Design"*. Within this report a deeper understanding of the dynamics of Co-creation processes was established, resulting in a specific U_CODE approach, named "Ucodesign". Special attention was paid to transplanting this process to a mass-scale Urban Design context, resulting in five implications which were investigated further. A systematic research of tools and methods for collaboration in Urban Design helped to gain an insight in the state of the art and the challenges that these tools and methods still face.

All research, reviews, interviews, analysis, case studies and discussions finally led to a list of 40 requirements that the developers and designers should take forward in the development of the U_CODE platform and tools. However, not all bullets are written as testable requirements yet. Following up this deliverable a translation of this list should be made into a checklist for assessing the tools. This will be one of the tasks within *Work Package 7: Testbeds and Evaluation*.

Although D2.3 is the final version of the report *"Survey on Co-design Methodologies in Urban Design"*, the U_CODE project itself is still in progress. This means that some activities within the scope of D2.3 should be continued beyond this deliverable, since it may affect or support the U_CODE project. Therefore, we will continue:

- Covering any upcoming significant developments in the fields of Co-design, Co-creation and Gamification.
- Our search for emerging tools and methods relevant to Ucodesign.
- Extending and updating the MethodBank.
- Covering any changes in legislation in the EU that may affect the implementation of the U_CODE platform or tools.

This report briefly touched upon the topic of cultural differences. *D7.2: "Cross-cultural comparison study"* will proceed with this topic to better understand how the different tools can be implemented in the different countries and whether specific requirements are needed.

9 Glossary

The definitions in this Glossary are provided to gain consistency about commonly used terms within the U_CODE team. These definitions are integrated in the online U_CODE Wiki[21]. These definitions are specified for the U_CODE context, unless stated otherwise.

Architectural Design	The activity by which architects are designing individual buildings or building complexes, integrating elements like construction, shape, form, materials and detailing. This process typically takes 2-5 years and and involves a wide variety of stakeholders like clients, landscape architects, engineers, constructors, construction authority and specific user groups.
Citizens	In the context of this report the term "citizens" refers to the end-users of the U_CODE platform and tools: mainly citizens, but can also be local authorities, interest groups, local businesses, etc.
Co-Creation	Professionals and citizens closely collaborate in a mutual value creation process, promoting an active form of interaction and sharing. *(Note: Co-Creation is written with capitals when referring to the U_CODE definition of Co-Creation. Otherwise, it is written as "Co-creation").*
Co-Design	See Ucodesign.
Convergence	Focusing options: selecting the most promising ideas and solutions.
Creative Facilitation	professional task in organising and leading creative sessions.
Creative Session	Formally organized professional meeting according to a CPS way of working to get new and useful ideas for a given open problem.
Creativity	Creativity is the process that leads to novel and useful solutions to given open problems.
Culture	The customs, arts, social institutions and achievements of a particular nation, people, or other social group; a set of learned beliefs, values and behaviors shared by a group of people. (Sanders, 2009).
Divergence	Generating options, finding many alternatives.

[21] http://wiki.u-code.eu/mediawiki/index.php/Glossary

Gamification	"Game design elements in non-game contexts" (Deterding et al. 2011). Gamification is "usually intended to create gameful and playful user experiences, motivate desired user behaviours and generally, increase joy of use" (Deterding et al., 2013).
Methodology	A system of methods used in a particular area of study or activity (Sanders, 2009). An example in this report is *integrated Creative Problem Solving.*
Method	A particular form of procedure for accomplishing or approaching something. (Sanders, 2009).
Mindset	The established set of attitudes held by someone; one's frame of reference. (Sanders, 2009). Within the context of U_CODE this can also refer to a country's frame of reference. An example in this report is *Poldering.*
Minimal Viable Process (MVP)	A participation process of minimum complexity and effort invested in tools and resources, that yet fulfills all standards of high quality participation. A MVP comprises phases and feedback loops for: project initiation, co-brief, co-design, professional design, public feedback, sentiment and discourse analysis, design integration, approval, and legal assessment.
Minimal Viable Tools	A set of tools that needs to be developed first within the U_CODE project. This set of tools enables a participation process of minimum complexity and effort invested in the development of tools, that yet fulfils all standards of a high quality participation. Minimum Viable Tools include tools that 1) are permanently used throughout the process, 2) tools that support specific project phases and activities.
Participants	All groups and persons who passively or actively make use of the U_CODE platform and tools. This includes both professionals and citizens. See also "users".
Participatory Design	Professionals involve the citizens who are (potentially) affected by or interested in a decision in the decision-making process in the context of Urban Design. *(Note: Participatory Design is written with capitals when referring to the U_CODE definition of Participatory Design. Otherwise, it is written as "Participatory design").*
Professionals	In the context of this report the term "professionals" refers to any professional from Urban Planning, Urban Design and

	Architectural Design involved in the project, ranging from urban planners, to authorities, to architects, etc.
(the) Public	All ordinary people who are not engaged in politics, administration or as professionals within the specific Urban Design project. The term "citizens" refers to the (potential) end-users of the U_CODE platform and tools. "The public" however, refers to the broader group of individuals who participate in everyday life.
Public Participation	Any process that involves the public in problem-solving or decision-making and that uses public input to make better decisions (IAP2, 2013).
Tool	A device or implement used to carry out a particular function (Sanders, 2009).
Ucodesign	Co-Design as defined by U_CODE. It is a process built on a mindset based on collaboration and refers to Participatory Planning and/or Co-Creation. Ucodesign always involves two-way communication between Professionals and Citizens.
Urban Design	The activity by which professionals (i.e. designers) creatively generate – on the basis of a regular design methodology – proposals for the outlook of an urban area. This process typically takes 5-10 years. The scale of Urban Design is limited to a number of buildings within a defined area (urban quarter, neighborhood, compound etc.).
Urban Planning	The activity by which professionals (i.e. planners) generate – on the basis of statistic, engineering and other methodologies – proposals for the development of the built urban and infrastructural environment. This process typically takes 10-50 years. The scale of Urban Planning may extend well beyond individual urban quarter or neighborhood, and include complete cities and urban infrastructures.
Urban Projects	Any projects in the context of Urban Planning, Urban Design and Architectural Design.
User-Centered Design	Professionals identify the needs, wants, emotions, concerns and aspirations of the citizens and apply that to the planning process. *(Note: User-Centered Design is written with capitals when referring to the U_CODE definition of User-Centered Design. Otherwise, it is written as "User-centered design").*

Users	All groups and persons who passively or actively make use of the U_CODE platform and tools. This includes both professionals and citizens. See also “participants”.

Abbreviations

CC	Co-Creation
CF	Creative Facilitation
CPS	Creative Problem Solving, the name of the academic domain of applied creativity
iCPS	Integrated Creative Problem Solving: TU Delft’s expansion of the Classical CPS-approach
MVP	Minimal Viable Process
MVT	Minimal Viable Tools
PD	Participatory Design
UCD	User-Centered Design

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Appendix 1: List of interviewees

Several expert interviews were conducted in the field of Urban Design, Urban Planning, Public participation, Co-creation and Creative Facilitation. The purpose of these interviews were: exploratory, to deepen understanding and/or to assess our research insights and findings. Find below the list of interviewees.

Bauerfeind, B. (2016, August 4th). Chair of International Urbanism and Design at Institute for Architecture, Technische Universtät Berlin. Also project leader of U_Lab

Bourrisoux, M. (2016, May 10th) association « Arènes » - professional facilitator of urban participatory projects

Cloyan, V. (2016, June 1st) Euroméditerranée – professional in charge of contact with public - informing and involving citizens in Euroméditerranée projects, France

Confortini, V. (October 2017) -"Bloc Paysage" - a professional landscape designer who uses participatory methods, France

David, A. (2016, August 30th). Architect and PhD candidate, Germany

Eisenchteter, A. (2017, November 20th). Collaboration Designer, Facilitator and Co-founder of Stormz: an agency providing digitized Creative Problem Solving tools, which can be used to facilitate work sessions and use the power of collaboration to improve ideas and make better decisions, France

Grapeloup, M. (2016, May 10th) blogger, creator of a Facebook page Marseille à la loupe that discusses ongoing and future urban projects, more than 20K followers, France

Peet, G. (2016, March 16th). Expert in urban and regional planning and former member of the city council of Rotterdam, The Netherlands

Serrurier, F. (June 2017) "Connexion Sport Urbain" – a professional urban designer who uses participatory methods, France

Tan, E (2017, March 10th). Founder/Director of *Play the City*, Pakhuis de Zwijger, Amsterdam, The Netherlands

Verheule, R. (2016, March 30th). Coordinator and facilitator at LEF Future Center, Rijkswaterstaat, The Netherlands

Visch, M.W. and Everaars, R. (2016, May 30th). Directie Participatie, Ministry of Infrastructure and the Environment, The Netherlands

Visch, M.W. and Shaib, S. (2017, March 22nd and April 26th). Directie Participatie, Ministry of Infrastructure and the Environment, The Netherlands

Van Winden, R. (2016, April 15th). Coordinator environment and asset management, Rijkswaterstaat, The Netherlands

Appendix 2: Database tools and methods

The Database contains all the Methods described in Chapter 5 (about 70 different methods). Not all methods are yet described in detail. There is a blank form to add new methods, pictured below. With this blank, it is also possible to search in the existing methods for a suitable method for a specific project. This possibility will be described detailed in the subsequent report.

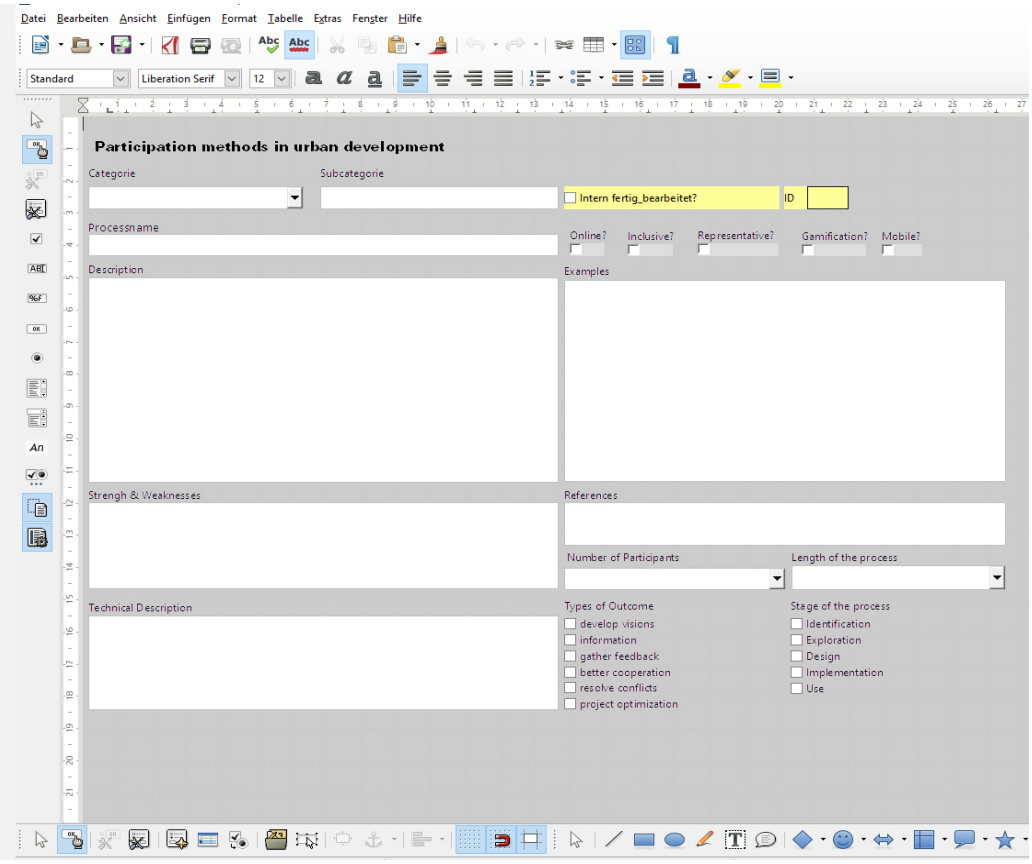


Figure i. Blank in the Database to add new methods and research

There is also the possibility to create a report with all methods and informations included. One example can be seen in figure ii.

The Database can be accessed through: http://www.u-code.eu/methods.

Participation methods in urban development

Categorie	Consultation		
Subcategorie	Surveys, Polls & Votings		
Name of the process	**Activating interview**		
Description	Personal survey of citizens about their optinion to an approach and encouragement to advocate active for their interests. Ahead to the survey some interviews are untertaken to locate the area of enquiry and to capture the range of the topic. The actual interviews get announced beforehand and get performed in the appartment of the participant with a trained interviewer in a personal diskussion. The conversations are near the daily routine and explorativ, i. e. it does not only follow a questionnaire, but a conversation is conducted, which process both partners can influance. Appropriate for difficult accessible goups.	Examples	no specific
		Technical Description	Select the participants, develop an interview, a trained interviewer perform the interview with the citizens evaluate the results
Strengh & Weaknesses	+ clear group of participants - expensive	Lenght of the process	longer/ongoing
		Number of Participants	up to 100

Gamification	x
Inclusive?	✔
mobile?	x
Online?	x
Representative?	✔

References	Zentraler Immobilien Ausschuss; Arbeitsgruppe Leitlinien Bürgerbeteiligung Bonn Feb. 2014; Arbter 2012

Types of Outcome	
better cooperation	✔
develop visions	x
gather feedback	✔
information	✔
project optimization	x
resolve conflicts	x

Stage of the Process	
Identification	x
Exploration	x
Design	✔
Implementation	x
Use	x

Figure ii. Example Method out of database

Appendix 3: Stormz: digitized Creative Facilitation

Stormz has a very impressive list of 56 digital tools (find below) which support facilitators in online Creative Problem Solving activities. This list includes diverging, reverging and converging tools.

Some of these tools are particularly interesting for U_CODE and as such selected to potentially use in the Dummy testbed. These tools will be described in more detail, namely:

i: Benchmark *harvesting* tool: CPS Step 2 - Gather Data
ii: Benchmark *Design Storming* tool: Brainsto'KISS
iii Benchmark *moodboard* tool: Mood Board
iv: Benchmark *ranking/voting* tool: Like/Dislike

To find more information about the remaining tools, please visit: https://stormz.me/templates/

List of 56 digitized Creative Problem Solving tools:

1. $100 - Select the best options
2. 2x2 Matrix - Categorize your ideas
3. Brainsto'KISS - Quickly find new ideas
4. Brainstorm like a Superhero
5. Brainstorming - Find wild ideas
6. Brainwriting 6-3-5 - Write down your ideas
7. Business Model Canvas - Design your business
8. COCD Box - Select wild ideas
9. CPS Step 1 - Explore the Vision
10. CPS Step 2 - Gather Data
11. CPS Step 3 - Formulate Challenges
12. CPS Step 4 - Explore Ideas
13. CPS Step 5 - Formulate Solutions
14. CPS Step 6 - Formulate the Plan
15. Collaborative Cheating - Improve your answer by looking at other's
16. Collaborative Quiz: From testing to learning
17. Crawford Slip Method - A simple brainwriting
18. Customer Empathy Map - Put yourself in their shoes
19. Develop Your Team! Use LEGO® Visuals to Improve Your Team
20. Fun with Tetrads - Extend, Flip, Obsolesce and Retrieve a Concept
21. Go / No Go - Validate options
22. History of the Future
23. KnoWonder - List What We Know and What We Wonder
24. Learning History - Get students to list, organize and analyse historical events
25. Let's imagine the most amazing hamburger!
26. Like/Dislike - Show your opinion
27. Live Stream - Capture the Highlights of your Event
28. Mood Board - Visually illustrate the overall "feel" of an idea
29. Need validator - Validate assumptions about users' unmet needs
30. New, Useful, Feasible - Evaluate ideas, prototypes or strategies

31. Open Space Technology - Collaborate with purpose
32. PESTEL - Analyse your business environment
33. POWER - Power-up your ideas!
34. Persona - Give a life to your ideal customer
35. Photostorming - Share a postcard with your team
36. Post Lesson Reflection - Boost Learning by Reflecting Together on an Exercice
37. Problem solving - Look at the root causes of your problem
38. Prototyping - Make ideas or strategies tangible
39. Questions and Answers
40. Retro'KISS - Quickly reflect on the past
41. Retrospective - Learn from the past
42. Reverse brainstorming - Imagine the worst to find new solutions
43. SWOT - Analyse your business
44. Scamper - Find creative ways to improve your project
45. Score Voting - Weigh your support
46. Six thinking shoes - Change your point of view
47. Stakeholders - Identify Assistors and Resistors
48. Starbursting - Ask the good questions
49. Stop / Keep / Start - Make choices for the future
50. Surprised, delighted, concerned - Gather a feedback from your audience
51. The Top 3 - Elect the best options
52. Think, Pair, Share - Co-design the answer to a question
53. Value Board - Define who you are
54. Visual brainstorming - Find inspiration by analogy
55. Wall of Time - Quickly list and organize the tasks of a project
56. Weather report - Assess the group's mood

i: Benchmark *harvesting* tool

Description of harvesting tool: CPS Step 2 - Gather Data by Stormz.me

Gather Data is the second step of the *Clarify* stage of the *Creative Problem Solving* process. Its purpose is to **describe and generate** data to enable a clear understanding of the challenge.
In this activity, the team will use the *Know / Wonder* technique to identify **what they know** and **what we wonder** about our challenge. Then they need to take time to gather the missing data.

About the CPS process.
There are many models of the Creative Problem Solving process. Though, as recommended by the Creative Education Foundation, Stormz has chosen to focus on an evolution of the Osborn-Parnes CPS called the CPS Learner's Model.
The basic structure is comprised of four stages with a total of six explicit process steps. Each of these process steps is available in Stormz as a template.

1. List what we know and what we wonder

In the previous step of the CPS process (*Step 1 - Explore Vision*), we identified our most important wish.
Now, we need to gather as much data as possible!
So let's list:

- all the **facts** that **we know** about this wish,
- **anything** that **we might wonder** about this wish.

Don't forget to follow these rules:

- *Use invitational stems*: start all your contributions with either **IKT** (I know that) or **IAWI** (I am wondering if...)
- *Be as broad as possible*: we want a 360 view of the context, ask yourself about *who*, *what*, *when*, *where* and *how*...
- *Be as explicit as possible*: create one card per *know* or *wonder* and use between 7 to 15 words to craft your sentences
- *Be collaborative*: listen to others and comment on their contributions

2. Identify key critical data

Not all the data has the same importance...
Let's select the data that is really critical to our challenge!
Review both the *knows* and the *wonders* and give 1 to 3 points to:

- **known facts** that are really important to consider,
- **questions** that we really need to find answers to before going further.

You can also comment on your choice.

3. Discuss and plan data collection

Let's make a plan to collect the missing data!

Let's have a look at the most important items:

- **Wonders**: how can we answer the question?
- **Known facts**: is there anything we should do to learn more about this?

You can also comment and vote on the different actions.

Once the action plan is done, you can move on to the next step.

For your information, there are many ways to collect data. For example, you can:

- search over the internet or your internal knowledge base,
- order some existing studies,
- observe users, customers (or stakeholders),
- interview users, customers (or stakeholders),
- ask experts on the topic,
- ...

4. Update with new information

Let's collect our missing data!

We can now implement the plan and collect the data.

As soon as we have new knowledge, we can add new cards or update existing cards with more information.

Important! Sometimes, you will see that with new knowledge there are new questions. This is OK and is, in fact, a very good sign, just add the wonders and collect data again.

As soon as you feel that you have enough knowledge, move on to the next step.

5. Congratulations!

Congratulations, we have finished the second step of the CPS process!

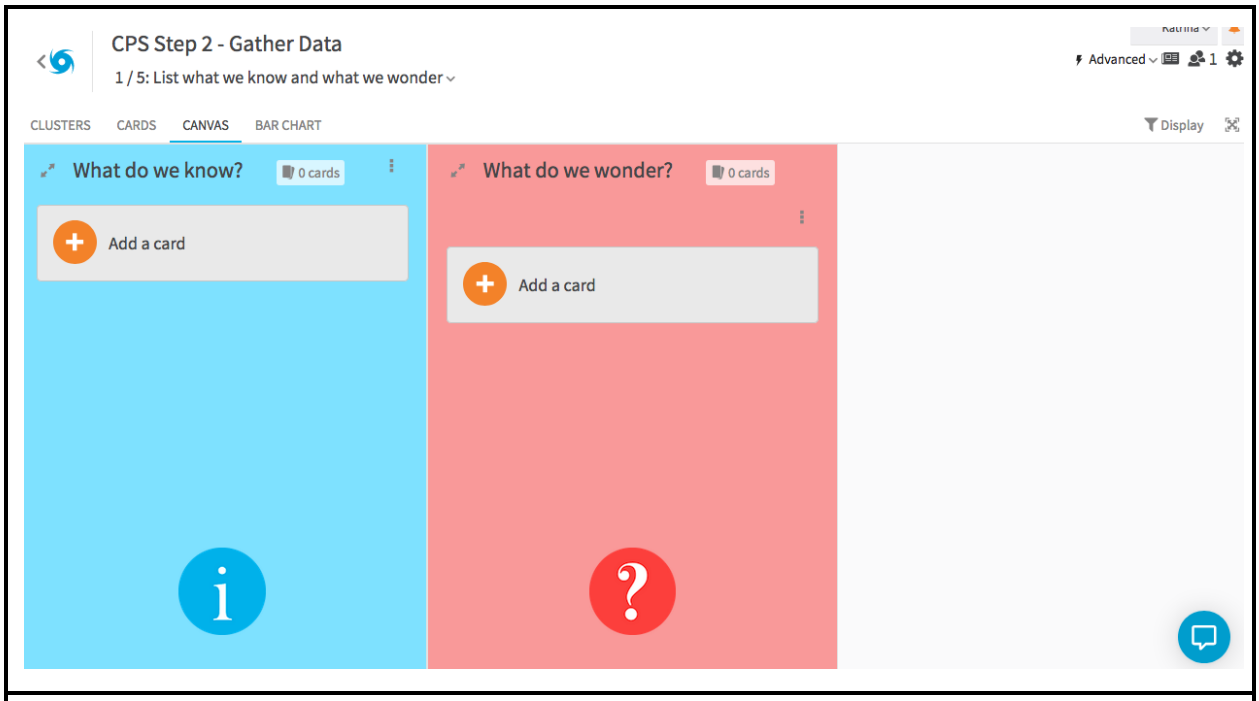
Let's celebrate that by adding a second serie of steps to our little victory dance ;-)

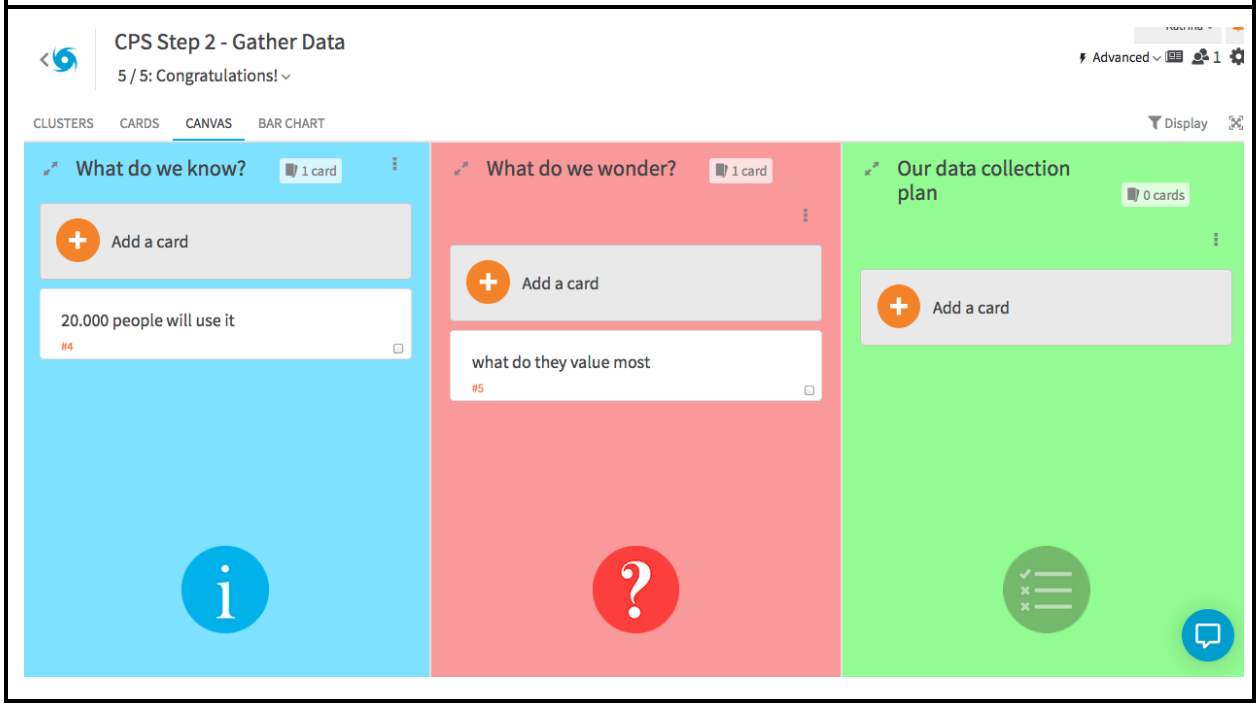
Once done, take a little time to reflect on what we should do next.

Are we still OK with our wish statement?

- If yes, we can launch the third step of the CPS process: *Formulate Challenges*.
- If no, it is OK to go back to the first step *Explore the Vision* and use our newly acquired knowledge to iterate again on our wish

Screenshots of harvesting tool: CPS Step 2 - Gather Data by Stormz.me

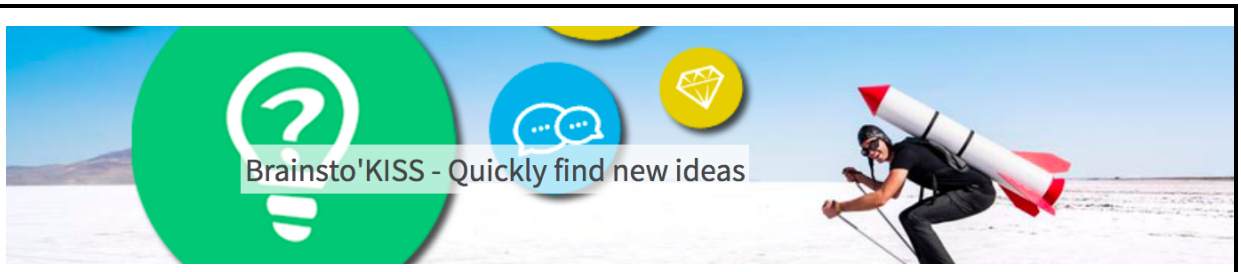




Derived on November 22nd 2017 from https://stormz.me/templates/cps-step-2-gather-data

ii: Benchmark *Design Storming* tool

Description of Design Storming tool: Brainsto'KISS by Stormz.me



Brainsto'KISS is the simplest ideation activity that you can find in Stormz. It enables a team to generate, comment and select new ideas that can solve our challenge.

If you need a more sophisticated ideation technique, have a look at our collection of Brainstorming templates.

This workshop is part of our **KISS** (Keep it simple and stupid!) collection: simple and straightforward sessions that you can run in no time.

These templates are also well adapted for running asynchronous online sessions.

1. Generate, develop and select ideas

Write down all your ideas!

TLDR:

1. Contribute your own ideas
2. Read other's ideas
3. Vote and comment on them.
4. Start again: contribute your own ideas...

Want more detailed instructions?

How to vote?

Click on an idea and give it points.

The more the potential of an idea, the more points (max 5) you should give it.

Some guidelines:

For creating ideas:

* *Go for quantity*: write down as many ideas as possible (one card per idea)
* *Combine and Build*: Use one idea as a springboard for another. Build, combine, and improve ideas
* *Encourage wild ideas*: do not stick to top of the head ideas

For commenting and selecting ideas:
* *Consider Novelty*: do not dismiss novel or original ideas. With your comments, consider ways to tailor, rework, or tame the idea
* *Look for potential*: not all ideas are workable solutions. Even promising ideas must be honed and strengthened. Think that we will take the time to improve the ideas
Brainsto'KISS is a quick and simple ideation activity that will enable us to generate, comment and select new ideas that can solve our challenge.

Note to the facilitator:
Before starting, take the time to formulate the challenge with one of the following invitational language stems:

- "How to ..." (H2),
- "How might I ..." (HMI),
- "In what ways might we ..." (IWWMW).

Then copy this challenge in the title of the workshop.

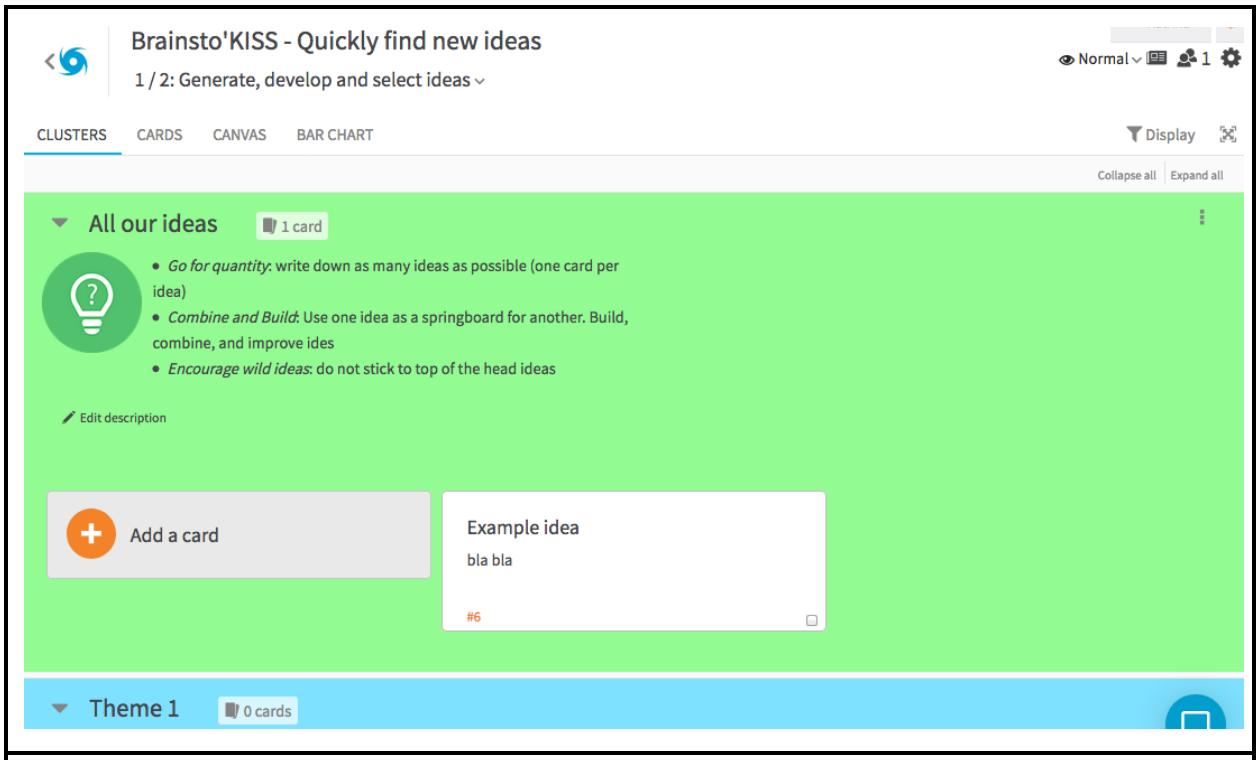
2. Step back and reflect!

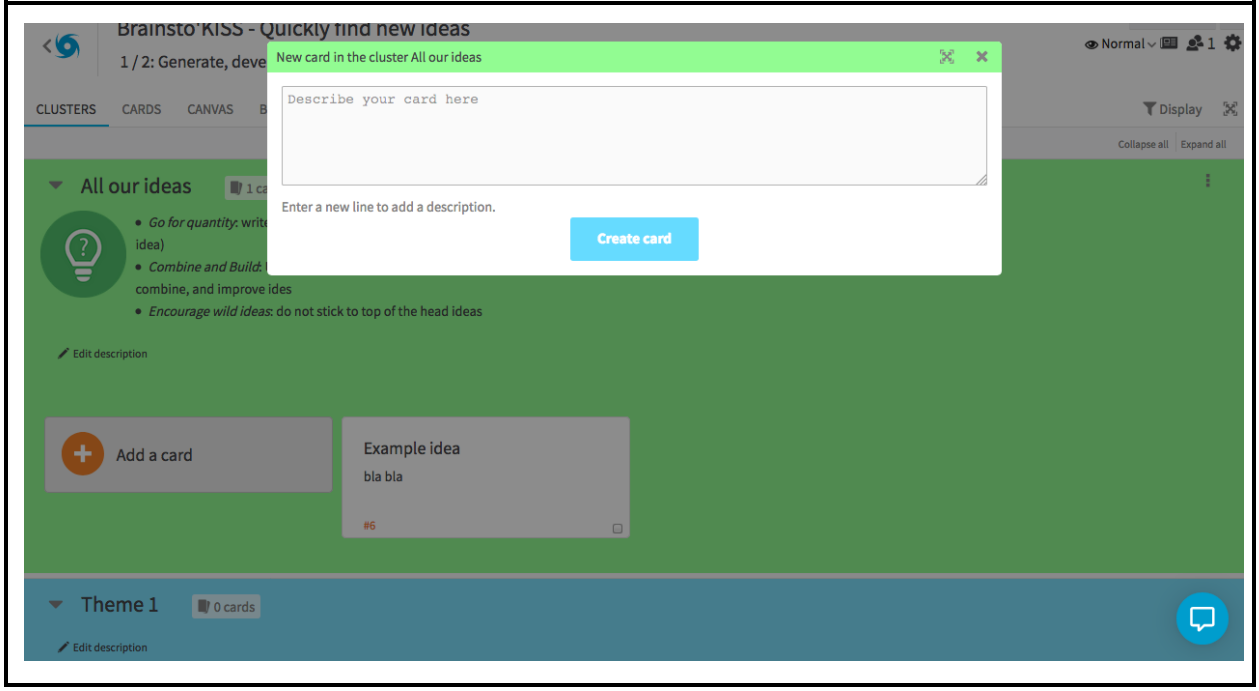
The brainstorming is closed, now what?
TLDR: Take a close look at the outcome... Which ideas are we going to select?

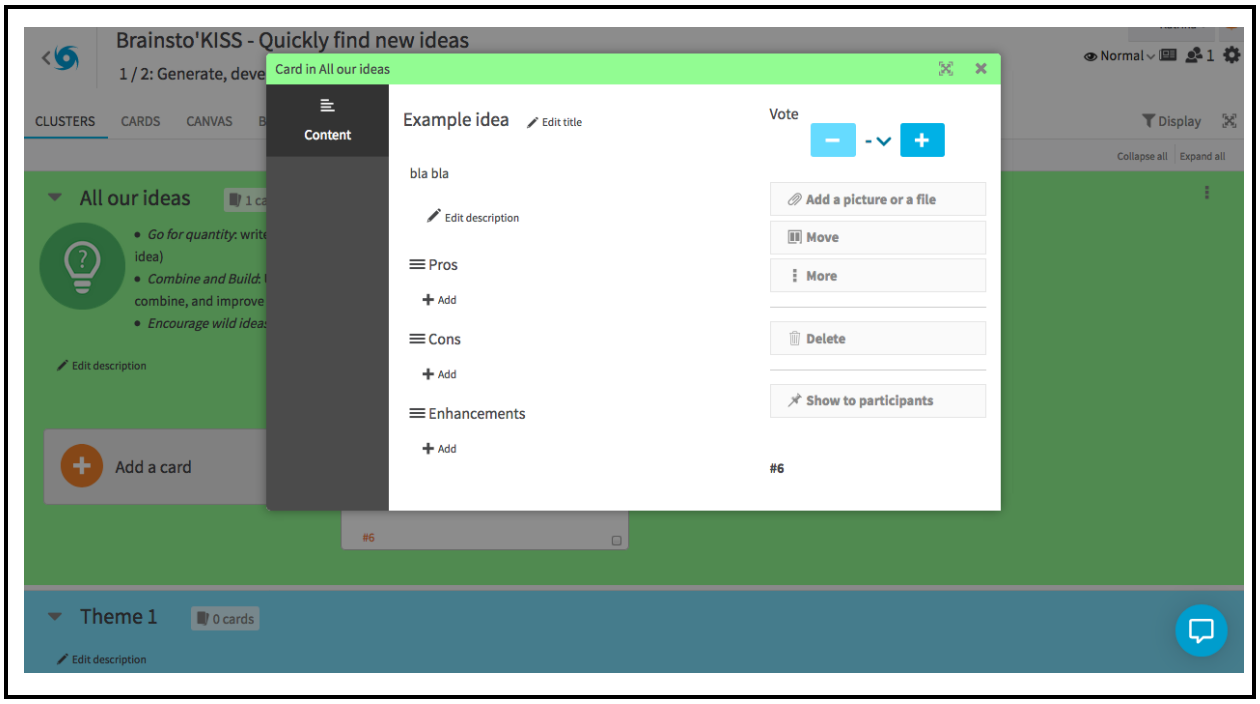
Want more detailed instructions?
Take the time to discuss around the following questions:

- Does the final ranking make sense?
- Is there any idea with few points that you would like to save?
- Do we still have some wild ideas in our selection (good) or only safe ideas (bad)?
- How can we improve the final ideas?
- What are the next steps?

Screenshots of Design Storming tool: Brainsto'KISS by Stormz.me



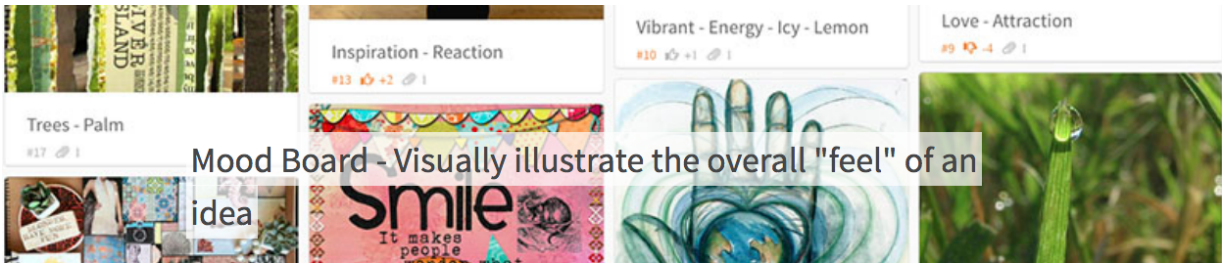




Derived on November 22nd 2017 from https://stormz.me/templates/brainstokiss

iii Benchmark *moodboard* tool

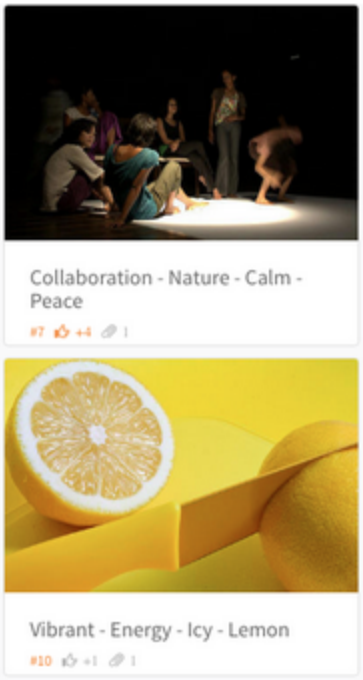
Description of moodboard tool: Mood Board by Stormz.me



Mood Board is a collaborative and creative activity that will enable a team to **visually represent the feel of an idea** (or challenge or trend or solution) with colours, photos, collage and drawings.

This activity is great to **develop a rough and intangible idea or concept**. Therefore it is generally used in:

- The *Explore the vision* and *Formulate the Solution* phase of a **Creative Problem Solving** project
- The *Ideate* phase of a **Design Thinking** project
- An *Energizer* or a *Closing* activity of an **Interactive Event** or meeting



1. Create the items of the mood board

Outside Stormz, create or pick **4 items** that would represent the "feel" of the idea (or challenge or trend or solution) that we would like to apprehend:

- 1 drawing
- 1 photo
- 1 object
- 1 color

When ready, upload them into Stormz:
1/ Create one card per item: as the title of the card, write down several **keywords** that best describe the feel.
2/ Attach a photograph of the item to the card
See the example on the left of this instruction.

Note: in this step, you cannot see other's items.

Note to the facilitator: you should now present to the group the idea (or challenge or trend or solution) that will be

represented. Clarify the meaning if necessary. When done, you can move on to the next step.

2. Discover all mood items

Now we can discover all the mood items from all the groups...
Let's discuss:

- What is the overall feel?
- Is there any need for clarification about one of the items? If needed you can edit or comment the item.

Note to the facilitator: you can also display all the keywords by showing *the insight cloud** to the participants. If you don't know how to do that, you can learn more about the insight cloud in our help manual.*

3. Select most relevant mood items

For each category select your preferred items by giving them out positive points:

- **[+3]** Definitely and totally relevant to the idea (or challenge or trend or solution)
- **[+1]** Partially relevant

... and reject your least preferred items by giving them negative points:

- **[-1]** Not really relevant to the idea (or challenge or trend or solution)
- **[-3]** Absolutely not relevant

You have a budget of **16 positive points** and **16 negative points**

4. Discover the group's moodboard

We can now discover our final mood board!

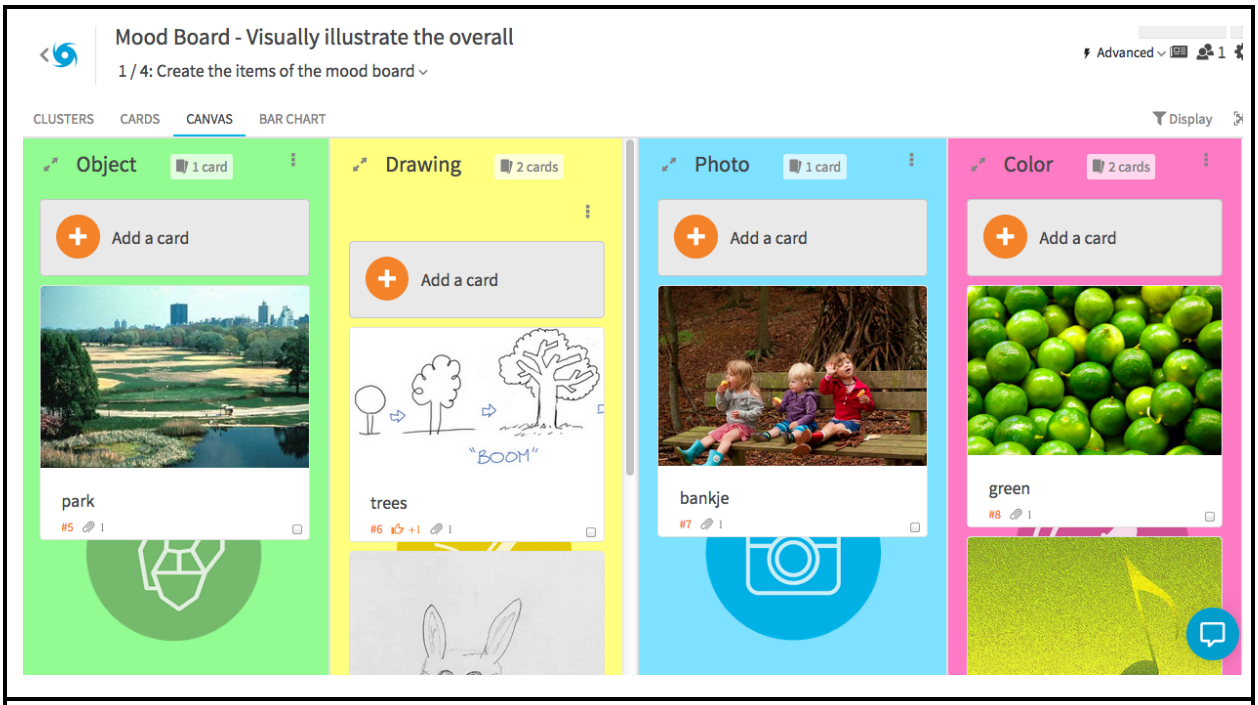
Let's discuss:

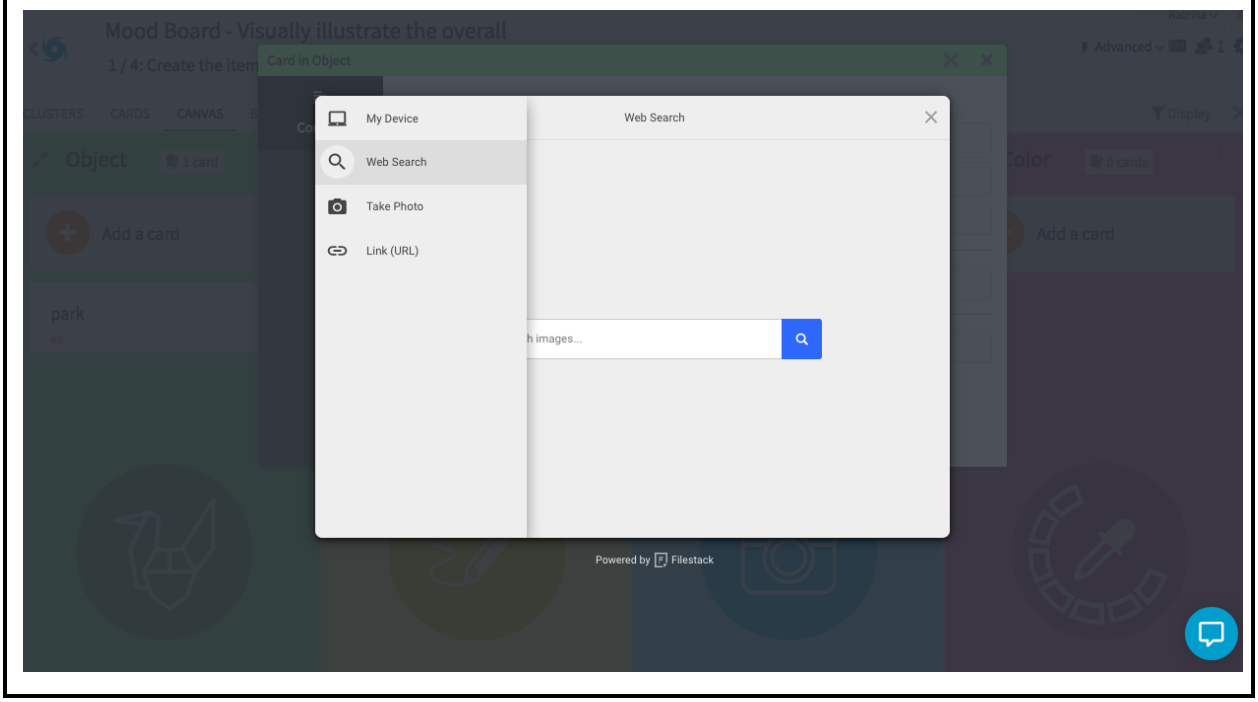
- What is the overall feel?
- Is something missing? It yes, you can fine tune your mood board by adding new items.
- Do we learn something new about our idea (or challenge or trend or solution)?
- What are the next steps? What new ideas or new thinking do we want to pursue after this workshop?

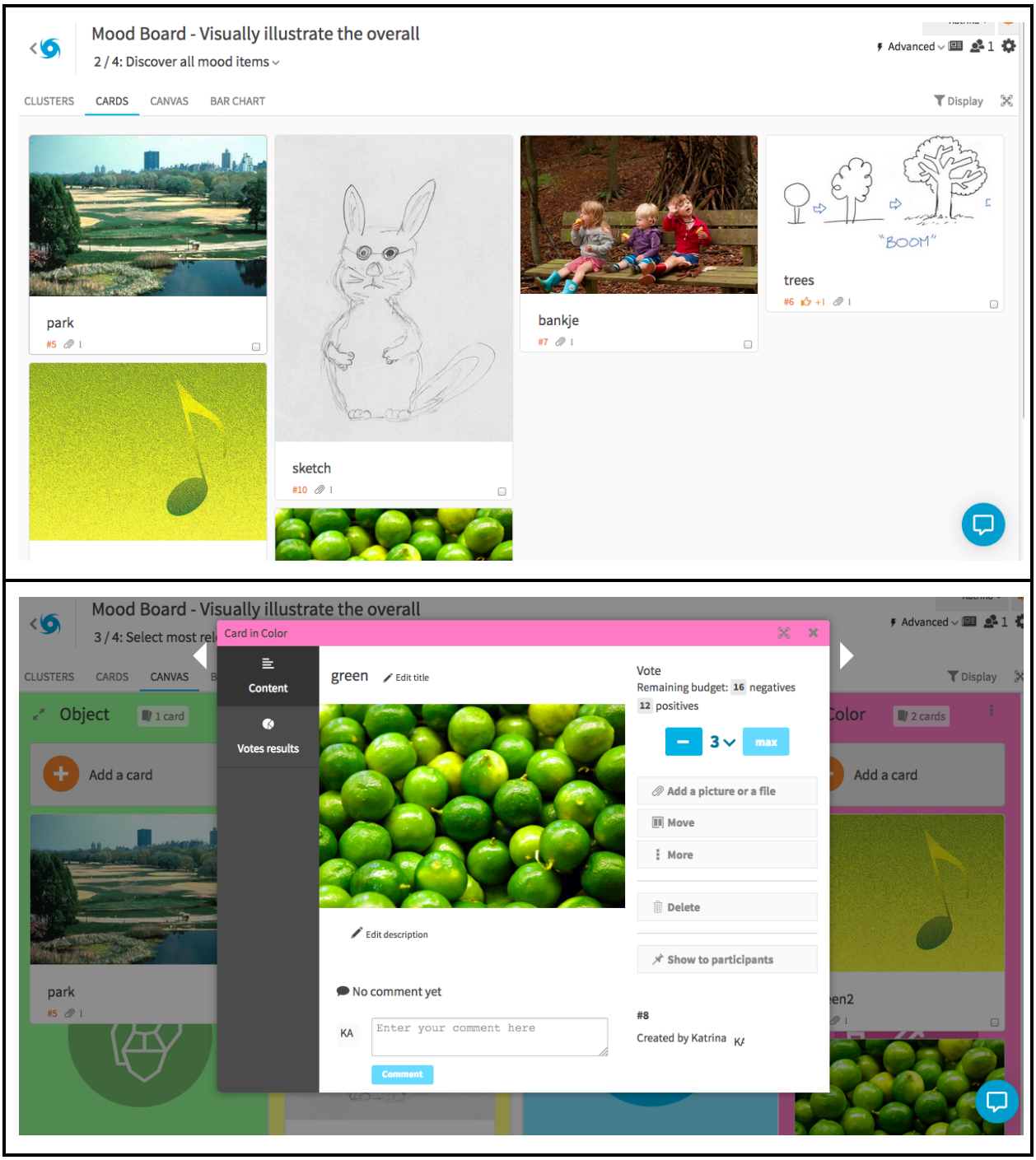
Some ideas for the next steps:

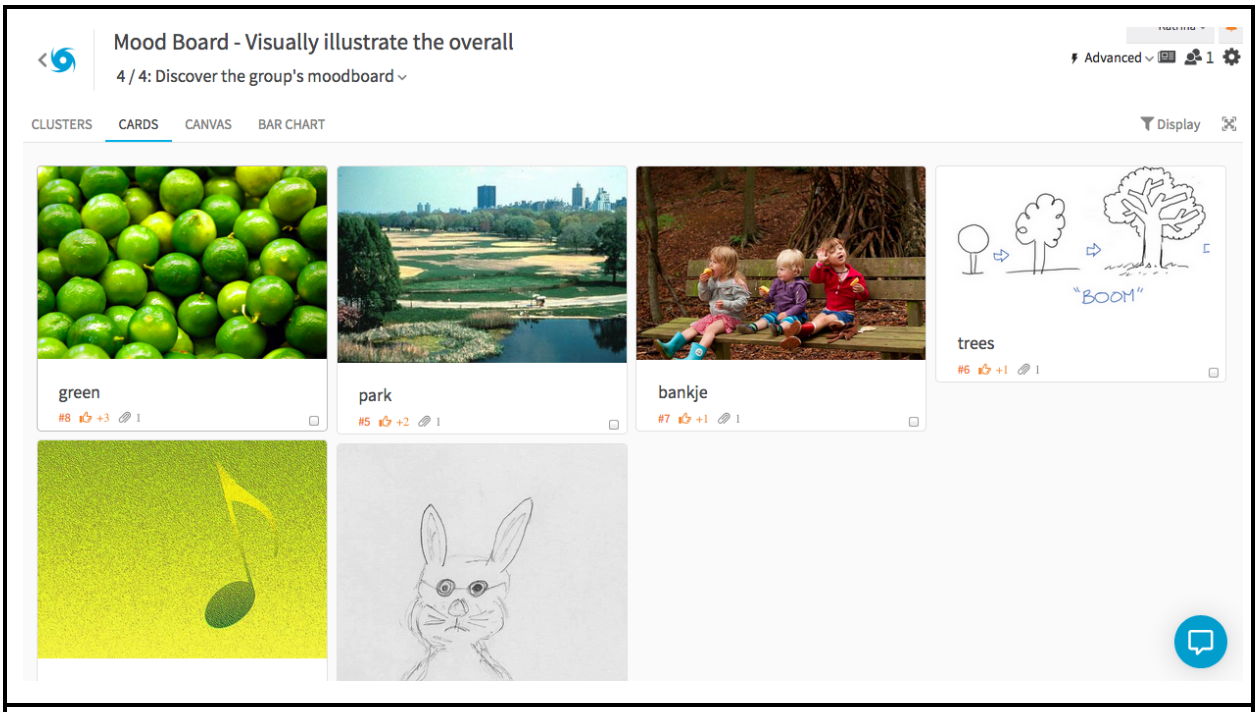
- You can further develop your ideas by building a prototype
- You can gather data to validate some hypothesis
- You can power-up your solution with POWER

Screenshots of moodboard tool: Mood Board by Stormz.me





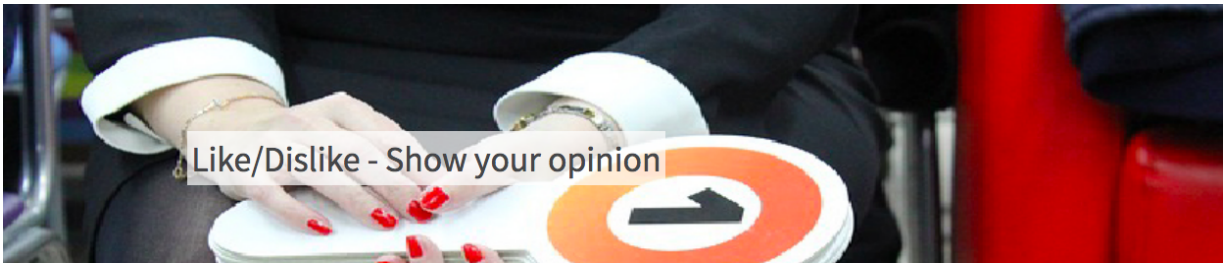

Mood Board - Visually illustrate the overall
2 / 4: Discover all mood items
Advanced
1
CLUSTERS
CARDS
CANVAS
BAR CHART
Display
park
#5
sketch
#10
bankje
#7
trees
#6
"BOOM"
Mood Board - Visually illustrate the overall
3 / 4: Select most rel
Card in Color
Content
Votes results
green
Edit title
Vote
Remaining budget: 16 negatives
12 positives
3
max
Add a picture or a file
Move
More
Delete
Show to participants
Edit description
No comment yet
KA
Enter your comment here
Comment
#8
Created by Katrina
Object
1 card
Add a card
park
#5
Color
2 cards
Add a card



Derived on November 22nd 2017 from https://stormz.me/templates/moodboard

iv: Benchmark *ranking/voting* tool

Description of ranking/voting tool: Like/Dislike by Stormz.me



A simple vote session. Add your own options and ask people if they're positive, neutral or negative about a statement.
This three fundamental positions are also useful for a Go / No Go session.

1. Vote

Basically, you can have three positions about a statement: positive, neutral and negative.
For each card:

- - Give +1 points if you agree
- - Don't vote if you feel neutral
- - Give -1 points if you disagree

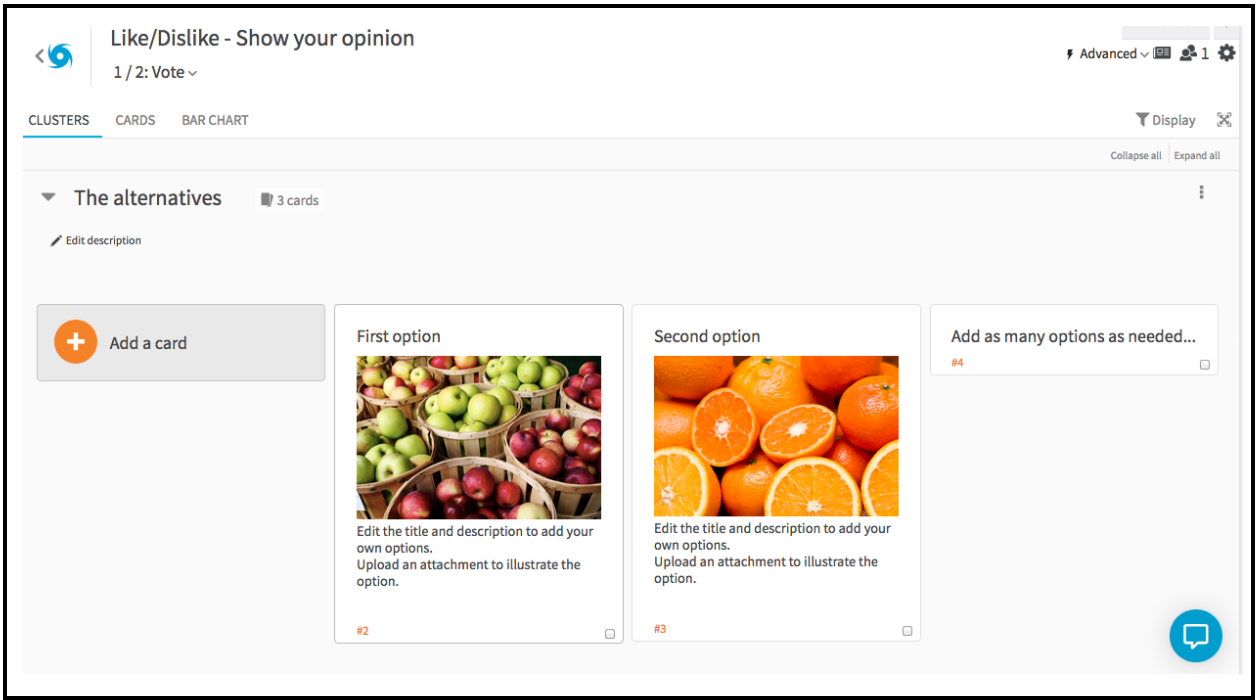
Try to allocate a score for each card.

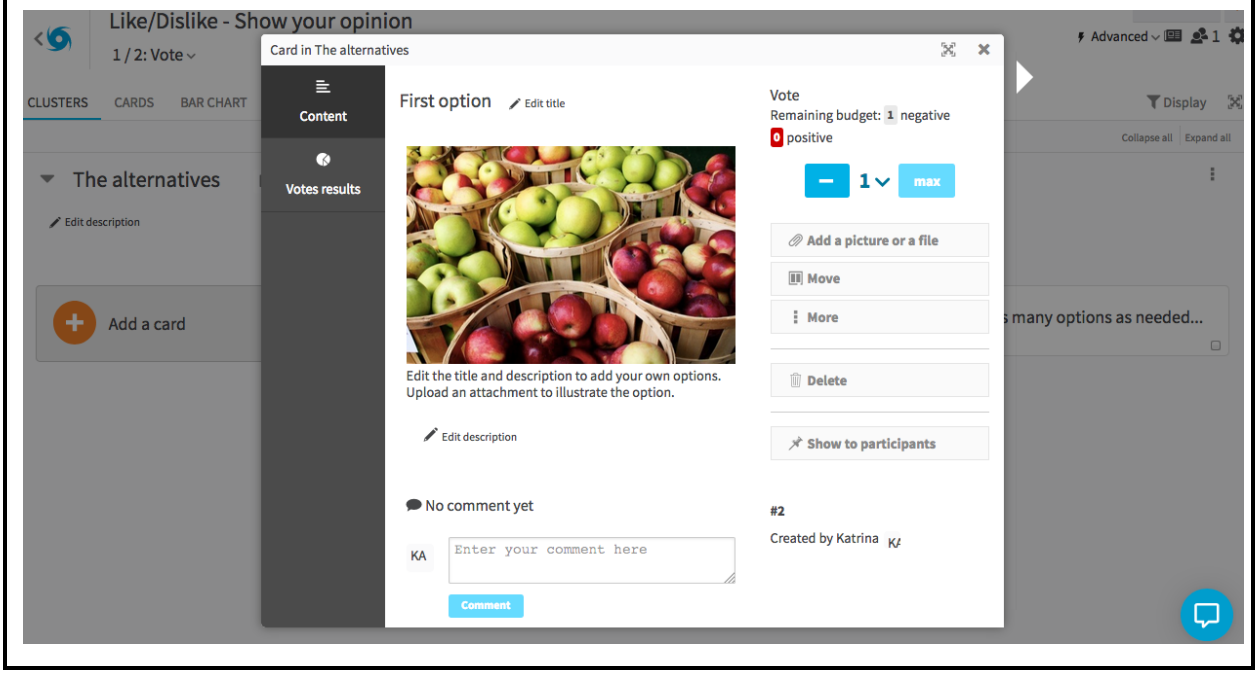
Note for the facilitator:
You must define as many options as needed before the vote. It can be done with an ideation step.

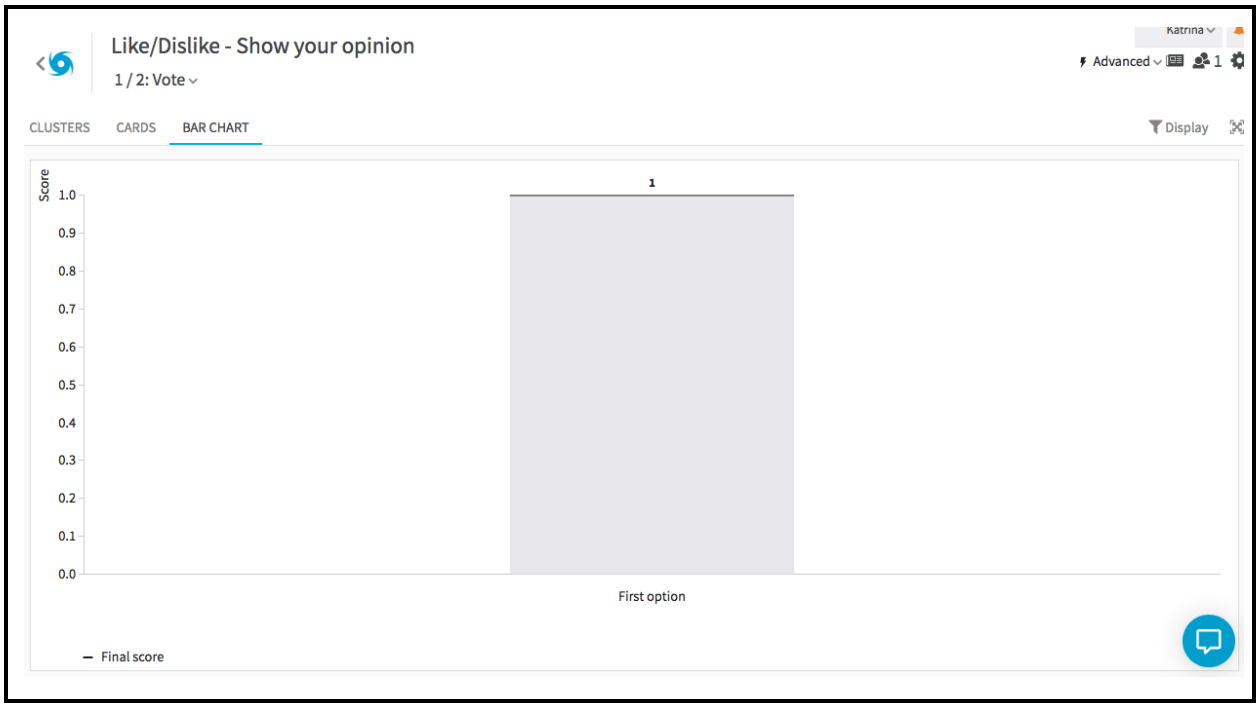
2. Discuss results

Here are the results.
The options are sorted by the total number of votes.

Screenshots of ranking/voting tool: Like/Dislike by Stormz.me







Derived on November 22nd 2017 from https://stormz.me/templates/like-dislike

Appendix 4: Procedure Projectbesluit (Dutch spatial planning law)

Procedure of a *Projectbesluit*, a legal document which is required in case of complex projects with large impact and public interest. (In Dutch).

Doel van het projectbesluit is om als Rijk, provincie of waterschap, slagvaardig te kunnen inspelen op ingrijpende en complexe projecten waarbij een publiek belang een rol speelt. Het kan bijvoorbeeld gaan om de aanleg van een weg of het versterken van een waterkering. Maar ook om het aanleggen van hoogspanningsleidingen of windparken, in samenwerking met een private initiatiefnemer. Het gaat alleen om projecten waarmee een rijks-, provinciaal of waterstaatsbelang gemoeid is.

De procedure van het projectbesluit omvat de volgende stappen:

1. Kennisgeving van het voornemen een projectbesluit te nemen
2. Kennisgeving over de beoogde participatie
3. Verkenning
4. Het nemen van een voorkeursbeslissing met de mogelijkheid tot indienen zienswijzen (alleen in die gevallen waarbij dit in de kennisgeving van het voornemen was opgenomen of bij de gevallen die zijn aangewezen in de Omgevingsbesluit)
5. Het maken van een ontwerp-projectbesluit, waarop zienswijzen kunnen worden ingediend
6. Vaststellen van het projectbesluit door het bevoegd gezag
7. Tegen het projectbesluit staat de mogelijkheid van beroep open
8. Eventueel later verlenen vergunningen (bevorderlijk voor flexibiliteit en fasering van het project)

Retrieved on November 6th 2017 from
https://www.omgevingswetportaal.nl/binaries/omgevingswetportaal/documenten/brochures/2014/06/informatiebladen/informatieblad-projectbesluit/informatieblad-projectbesluit.pdf

Appendix 5: LEF Future Center

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 688873

LEF Future Center

Summary of interview with Robert Verheule and guided tour through LEF Future Center on March 30th 2016. Report by Katrina Heijne and Han van der Meer – TU Delft

Content

Figure 1: Impression of LEF Future Center

1

1. Introduction

LEF future center is a facility that aims to provide an inspiring environment where employees of the Dutch Ministry of Public Works and Waterways (Rijkswaterstaat) gather to find innovative solutions for complex challenges in the area of transport, infrastructure and water management. LEF is situated Utrecht, The Netherlands.

Interviewee Robert Verheule is facilitator at LEF Future Center and has a lot of experience with creative problem solving and decision-making. He is specialized in interventions based on nonverbal communication and human interaction principles within groups. He experimented a lot with the specific LEF Future Center tools and techniques over the years and facilitated creative problem solving sessions for all kinds of groups and innovation challenges. During the interview he shared his findings with us.

2. LEF methodology

Robert describes LEF as a wedding planner: it is not about who is getting married, but it is all about facilitating the process. LEF enables the experience of an Awayday: people are drawn from their daily environment into a new world with different rules and standards, which supports a different mindset and should lead to different ideas. The fact that there is a timeslot allocated (i.e. at a certain point people will leave the facility) also benefits the process.

The goal of the LEF facility is to challenge the visitor to adopt a different mindset, whatever mindset is needed in a certain phase of the creative process, e.g. diverging, converging, conforming, acceptance finding or decision-making. In order to "shape" the mindset of the participants, the facilitators of LEF make deliberate use of cognitive communication principles by using basically 3 tools:

1) *Empty spaces*: As Robert explained: "in certain rooms people cannot diverge well, in others it is more difficult to converge."
2) *Visualizations*: Every room is equipped with wide projection screens and beamers to show tailor-made projections. In addition LEF has an effective image database that can be used to trigger very specific emotions. Robert shared an example about using these pictures: "when people see people on pictures, they start to conform. When they see children, it may stimulate creativity (because they feel allowed to be as open-minded as children are) and when they see a landscape they can become dreamy and start thinking visionary".
3) *Portable furniture*. To illustrate the impact of furniture Robert used the following example: "if you want to have a tough discussion, make sure people are 'protected' by a table in between the people, if you want to conform, make sure people are sitting next to each other on a bench, preferably within arm reach."

Since each phase in a creative process requires a different mindset, in LEF each phase is executed in a different space. And each time the visualizations and portable furniture are adapted to meet the specific wishes of the user-group. This way an endless variation in atmospheres and settings can be formed.

The mindsets that have to be 'shaped' are about divergent versus convergent and individual versus collective. These mindsets will be explained in more detail in the next section.

3. Individual vs Collective and Divergent vs Convergent

As mentioned before, different mindsets are needed in different stages of the creative process. If a collective mindset is needed, it is important to have people close to each other, preferably within arm reach. For an individual mindset people need some more space without having the feeling of interference with others.

Diverging is about generating options; therefore a divergent mindset is about openness, postponing judgment and getting inspired. Converging on the other hand is about narrowing down options; therefore a convergent mindset is about being goal-oriented, evaluating and selecting.

This section will describe the 4 different mindsets in more detail and the typical activities in a creative process that are related to each of the 4 mindsets. It will also elaborate on how LEF's tools (space, visualizations and furniture) are being used to support the specific mindset.

3.1 Individual Divergent

Key in individual divergent is that a person does not feel limited or embarrassed by ideas or opinions of other people. He/she feels free to think, fantasize and generate ideas.

Activity: => Exploring, free thought association, fantasizing, playing.
Space: => High, open, spacious, bright, lots of daylight, large windows, not intimate.
Visualizations: => Light, many distractions (e.g. views through window, objects, pictures)
Furniture: => Standing tables. Preferably people are standing or walking.

Figure 2: Example of individual divergent space in LEF Future Center: Conservatory

3.2 Collective Divergent

Generating ideas and using each other's ideas as stepping-stones for new ideas is key in this mindset. It is important to have a feeling of trust in order to feel free to share ideas.

Activity: => Brainstorming, elaborating on (others') ideas, getting inspired.
Space: => Spacious, daylight, high, open views.
Visualizations: => Light, blue, views (either open view through window, or pictures with e.g. landscape)

Furniture: => Intimate, benches, sitting next to each other or in a circle. Or walking next to each other.

Figure 3: Example of collective divergent spaces in LEF future center: Boat with benches in conservatory, or the "blue room"

3.3 Collective Convergent

In a collective convergent setting a group works towards a goal or solution by choosing from several options. Once a collective mindset is created, people will automatically start to conform, which will benefit convergent thinking. However, creating a collective mindset is more difficult in large groups of people (>20), than in small groups. A trick that some presenters use when trying to deal with a large conference room full of people is to ask the people to perform a little task or discussion in little groups for just 3 minutes. Afterwards, people tend to behave more socially.

Activity: => Conforming, empathically decision-making, scoping, cooperating, defining frameworks, reaching consensus.
Space: => Small, a bit darker, intimate.
Visualizations: => Warm colors, not too much distraction, peaceful.
Furniture: => Sitting in an intimate setting, opposite of each other. Robert explained that as long as people are not yet within arm's reach, people are able to have opposite opinions, and a tough discussion. The discussion is done easier when there is a table in between the people as sort of protection. To promote conformism, the tables should be removed and an intimate setting should be created where people are sitting within arm's reach.

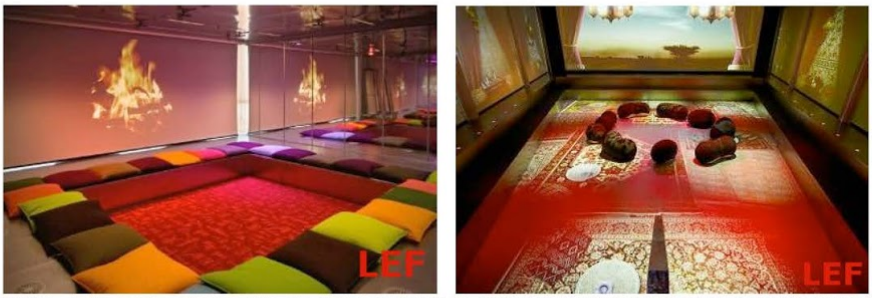


Figure 4: Example of collective-convergent spaces in LEF future center: the pit and the theater

3.4 Individual Convergent

For this mindset it is about focusing and not getting distracted by others. People are working towards a goal without taking feelings or opinions of other people into account.

Activity: => Focusing, self-centered decision-making, Concentrating, Isolating.
Space: => Size depends on number of people, people should have enough space around them for not feeling the urge to behave "socially".
Visualizations: => No visual distractions.
Furniture: => Sitting behind a desk, an egg-chair (partly shielded). Or at a large table where interactions with others is not a necessary socially desired behavior: which basically means that the space between two people is beyond arm's length.

Figure 5: Example of individual convergent space in LEF future center: lunch space

4. Additional tools and techniques

The three main tools (space, visualizations and furniture) have been discussed. However, LEFs facilitators have experimented with more tools. Some were more successful then others and up till today they are still experimenting and learning how to use their tools in an optimal way. As an example: LEF experimented with sounds and music, but concluded that this is difficult to use

effectively as a tool due to the different associations people have with music. The same applies for smell. In addition, smell is problematic because it will linger.

Clustering is often used by LEF facilitators between a diverging and converging phase. As Robert explained it: Clustering is about stimulating part of the brains to make connections and see the bigger picture. It is difficult for people to do that by heart without performing the actual activity.

LEF is also experimenting with integrating smart phones in their sessions, e.g. by letting participants sending messages, which will appear on large screens. This can be used for diverging: e.g. sharing (anonymous) ideas, or for converging: e.g. in a poll.

Co-creation with the public is still a rather new topic for LEF to explore. A reason why they have been keeping it off so far is because of the complicated political issues that will emerge when involving one group of stakeholders while ignoring another group (since LEF belongs to the Dutch Ministry of Public Works and Waterways). However, they are currently looking into Part-up: a market place for teamwork. This is a crowdsourcing platform that matches ideas (e.g. within a business) with teams through an algorithm.

5. Design principles for U_CODE based on LEF experiences

Based on our discussion with Robert we have identified a few design principles that can be of relevance for U_CODE.

- Each phase of a creative process requires a different mindset (e.g. diverging, converging, reaching consensus, searching for opposites, seeking collaboration, etc.). This change of mindset can be promoted by creating a different atmosphere for each phase.
- Collective converging with a massive group is difficult, especially when reaching consensus is needed. For converging it seems necessary to be physically close to the other participants in order to "read body language". Enablers for the convergent mindset are:
    - Creating small groups (for a period of time) where people get to know each other a little bit, in order to let them think more empathically; (note: whether people will behave differently after having a small 'discussion' about e.g. choosing option A or B is not officially researched by LEF, but would be interesting to explore).
    - Giving people the feeling they are sitting within arm's reach. As soon as people can 'touch' each other, conformism starts to appear. Then, it is more difficult to have an opposite opinion.
- A person who is browsing on his desk computer or laptop is typically in an individual divergent mindset. The person does not feel the need to behave "socially" or to conform, since he/she is not directly interacting with others. He/she feels free to think, fantasize and generate ideas in his/her own (safe) environment.
- A tool in itself is no guarantee of success. The user of the tool should really understand the principle in order to use it in an optimal way. (even within LEF the facilitators are still learning everyday how to apply their tools more effectively.)

6. Further reading & Discussion

Robert mentioned some references that may be of interest for U_CODE to explore further. This section provides a summary of those references, plus discussion topics for potential U_CODE use.

i) Interventions based on posture:

LEF facilitators are trained in observing peoples postures or body language to understand their mindsets. Based on those observations, they may decide to move a group of people to a different room in order to help people reach the goal of the phase. Apparently, when people have an active posture, they are cognitive more flexible. Pentland (1999) is explaining such principles in more detail.

- Pentland, A. & Liu, A. (1999). Modeling and Prediction of Human Behavior. *Neural Computation*, Vol. 11, pp. 229-242. This article can be downloaded at: http://www.mit.edu/~amliu/Papers/PentlandLiu_NeuralComp99_v11n2.pdf

Discussion: Would it be possible through U_CODE to identify someone's 'posture'? Maybe through sentiment analysis?

ii) Conformism:

There is a heavy debate on differences in the human condition on cognitive style (Kirton, 1994) and conformism (for instant Nijstad) on creative behavior in groups.

- Kirton, M. J. (Ed.). (1994). *Adaptors and innovators: Styles of creativity and problem solving.* London: Routledge.
- B.A. Nijstad (2009), Group performance, 2nd edition, New York: Psychology Press.

Discussion

Large groups will consist of a N(0,1) distribution of Adaptors and Innovators (as relevant aspect for cognitive style) as well as Conformism. Therefore, the instruments in the U_CODE toolbox should accommodate a high Adaptive style and the high Conformist since Innovators (or Non-Conformist) do not mind a structured approach but Adaptors (or Conformists) really get annoyed by a lack of structure and predictability.

iii) Intuitive reasoning vs logical reasoning:

Kahneman (2011) did some interesting work on the way people think (he won the Noble prize for it so others think it is "interesting" too). His basic assumption is that people think in two modes. The intuitive fast one where our brain makes a decision in a split of a second and the logical deep thinking were our brain takes the effort to think deeply on the logical steps to base a decision on. A nice example is the baseball bat and ball experiment.

Think of a baseball bat and bal
A baseball bat with ball costs € 1,10
The bat costs € 1 more than the ball
What is the cost of the ball?

No not € 0,10. That is system 1 thinking. System 2 will reason €.....
Since the human brain according to Kahneman is lazy we will always start with System 1 thinking.

- Kahneman, D. and Klein G (2009) Conditions for Intuitive Expertise – A failure to disagree. American Psychological Association. Vol. 64, No. 6, 515–526
- Kahneman, D. (2011). Thinking, Fast and Slow. Farrar, Straus and Giroux.
- Kahneman, D., & Tversky, A. (1983). Extensional Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment. American Psychological Association, Inc.

Discussion:
In the instruments we will design for the U_CODE toolbox we should take System 1 thinking as the basis and if we want people to do deep System 2 thinking we should provide for it. Extensive testing of the tools to see whether people use System 1 or are able to reach System 2 thinking (when needed) is needed.

iv) Cognitive sensitivity to visualizations:
LEF developed an effective image database that can be used to trigger very specific emotions. The effects of the pictures were researched by Lamme et al (2011). The 4 mindsets (individual, collective, divergent and convergent) are all related to a specific area of the brain. The brain activity in all these areas was measured in each test subject (using MRI) when he or she was exposed to each image.

- van der Leij, A., Scholte, S. and Lamme, V. (2011) Cognitive sensitivity to visual atmosphere - automatic responses to photos measured using fmri. This article can be downloaded at: https://staticresources.rijkswaterstaat.nl/binaries/Cognitive%20Sensitivity%20to%20Visual%20Atmosphere_tcm21-39431.pdf
- Neurensics. (2013). Breinvalidatie Fotoselectie. Utrecht.

Discussion: when selecting pictures for U_CODE it may be interesting to understand the general impact of such pictures on the user.

v) Influencing conformism:
Cialdini (2000) argues 6 possible ways/strategies/principles to influence people's opinions and decision making (this is from Wikipedia but rather correct):

1. **Reciprocity** – People tend to return a favor, thus the pervasiveness of free samples in marketing. In his conferences, he often uses the example of Ethiopia providing thousands of dollars in humanitarian aid to Mexico just after the 1985 earthquake, despite Ethiopia suffering from a crippling famine and civil war at the time. Ethiopia had been reciprocating for the diplomatic support Mexico provided when Italy invaded Ethiopia in 1935. The good cop/bad cop strategy is also based on this principle.
2. **Commitment and Consistency** – If people commit, orally or in writing, to an idea or goal, they are more likely to honor that commitment because of establishing that idea or goal as being congruent with their self-image. Even if the original incentive or motivation is removed after they have already agreed, they will continue to honor the agreement. Cialdini notes Chinese brainwashing on American prisoners of war to rewrite their self-image and gain automatic unenforced compliance. See cognitive dissonance.
3. **Social Proof** – People will do things that they see other people are doing. For example, in one experiment, one or more confederates would look up into the sky; bystanders

would then look up into the sky to see what they were seeing. At one point this experiment aborted, as so many people were looking up that they stopped traffic. See conformity, and the Asch conformity experiments.

4. **Authority** – People will tend to obey authority figures, even if they are asked to perform objectionable acts. Cialdini cites incidents such as the Milgram experiments in the early 1960s and the My Lai massacre.
5. **Liking** – People are easily persuaded by other people that they like. Cialdini cites the marketing of Tupperware in what might now be called viral marketing. People were more likely to buy if they liked the person selling it to them. Some of the many biases favoring more attractive people are discussed.
6. **Scarcity** – Perceived scarcity will generate demand. For example, saying offers are available for a "limited time only" encourages sales

- Cialdini, R. B. (2000). *Influence: Science and practice*. Fourth edition, Boston: Pearson Education.

Discussion: Behavioral science has numerous techniques to influence thinking and behavior of people. Advertisers already make full use of these techniques. It may be beneficial in urban planning as well, e.g. for local residents who have difficulty with change or landowners who see no reason to contribute. Using techniques from behavioral psychology could make communication with these groups more effectively. In U_CODE we can use Cialdini's principles if we are in a stage to convince people on certain decisions like taking part in a dialogue on urban planning. For example: will people choose for collective benefit as apposed to individual benefit, after looking at a certain picture (e.g. a picture with people)?

vi) More about LEF Future center:

Some further reads about LEF Future center:

- https://staticresources.rijkswaterstaat.nl/binaries/LEF%20future%20center%20-%20A%20breaktrough%20in%20itself%202013_tcm21-39435.pdf
- www.rws.nl/lef
- YouTube channel: LEFfuturecentermedia

Appendix 6: Evolution of D2.3 through EU review

Feedback from EU-reviewers

On March 3rd, 2017, the first formal EU review for project U_CODE was held in Delft, the Netherlands. The constructive feedback from the EU reviewers was captured and used amongst others as input for elaborating and sharpening this report D2.3.

Find below an overview of how the specific input from the *Letter of Results of the First Review of Project 688873 U_CODE* was digested.

1) *"A coherent protocol for user engagement should be developed" (p. 1)*

In chapter 4.6 the topic of user engagement through gamification is explored in depth. In addition, a parallel activity to the writing of this report is the *Dummy Testbed* to investigate the overall U_CODE process and how to engage people in a feasible and suitable process. During the *Dummy Testbed,* started in Jan 2018, an activity protocol ("choreography") for the complete U_CODE process was developed, and is being tested currently.

2) *"guidelines for recruitment, including mechanisms to ensure balance of biases and diversity" (p. 2)*

Chapter 4.3 is dedicated to the concept of the so called "Selection Bias" and concluding with three potential routes for participant selection for U_CODE that should be explored further.

3) *"definitions of terminologies used e.g. regarding the use of public, user, citizen and crowd" (p. 2)*

Consistency in terminology is essential in effective communication. Both, within the U_CODE team as well as beyond. Therefore, a *Wiki* was established, containing all U_CODE related terminology[22]. In this report all relevant terms are listed in a Glossary. In this report the use of the right terms in each specific situation was also made consistent.

4) *"*'Citizens interested in Urban Design projects' *ought to be enlarged to '*Citizens who are not, but who could be made interested in Urban Design projects'*, which would be much more ambitious and much more valuable." (p. 2)*

This topic is related to citizen motivation and depends a.o. on the degree to which citizens are informed and involved. Also, it is key to select the right communication channel for the right purpose. Chapter 4.4.2 is dedicated to the considerations of choosing the right communication channels. A hybrid model is suggested where U_CODE tries to reach the unreachable with low threshold design games and online participation, but also local and stationary interaction, easily

[22] http://wiki.u-code.eu/mediawiki/index.php/Glossary

accessible touch tables, etc. In the background, a communication strategy for "briefing calls", "co-design calls", "Ranking or voting calls" is developed.

5) *"Involvement of the creative industries" (p. 2)*

Creative industries should be involved along all stages of the U_CODE project. In the context of D2.3 we actively involved several creative agencies (e.g. Stormz) and experts from the game industry (e.g. Play the City), especially for conceiving the co-design procedures and current tools and methods. Visualisation and trailer video materials were created by visual artists.

6) *"The database of co-design and gamification tools referred in the deliverable should be made available to the public and in the project (e.g. through the Wiki)". (p. 3)*

A MethodBank was compiled which is explained in detail in chapter 5. Meanwhile, this MethodBank has become publicly available at http://www.u-code.eu/methods. Currently, the wiki (http://wiki.u-code.eu) is for internal use only, but will become publicly available in the nearby future.