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SISCODE CO-DESIGN FOR SOCIETY IN INNOVATION AND SCIENCE

DELIVERABLE 1.2:

CO-CREATION IN RRI PRACTICES AND STI POLICIES

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Glossary of used terms

Acronym	Definition
BSE	Bovine Spongiform Encephalopathy
DCLG	Department for Communities and Local Government
EU	European Union
ExCiteS	Extreme Citizen Science
IA	Impact Assessment
ICT	Information and Communication Technologies
NGO	Non Governmental Organization
OECD	The Organisation for Economic Co-operation and Development
PTA	Participatory Technology Assessment
PRS	Private Rented Sector
ROAMEF	Rationale, Objectives, Appraisal, Monitoring, Evaluation, Feedback
RRI	Responsible Research and Innovation
RtD	Research through Design
STI	Science, Technology and Innovation
SSI	Strategic Stakeholder Involvement
STS	Science and Technology Studies
WP	Work Package

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Executive Summary

The governance of emerging science and innovation is a major challenge for contemporary democracies. While science is producing new knowledge on a continuous basis, innovation emerges to fulfil needs or solve problems perceived by the innovator, either for him/herself or for a target group. A key question to agree on is who should be the legitimate actor to decide which kind of innovation could be developed and rolled out. This begs questions of who invests, who makes the effort and who benefits. In this context, two trends are emerging that are specific to future Science, Technology and Innovation (STI) policy practice. The first trend is the growing influence of Responsible Research and Innovation (RRI)[1], which relies on broad public engagement in STI policy making, with the idea of moving from "traditional" forms of consultation towards co-creation, as a way of more deeply involving society in contributing to informing and directing policies. The second trend concerns the attempt to apply design knowledge in policy formation and implementation, with a view to create policies that are more open to participation, experimentation, as well as being more responsive to the local contexts, agile and effective. This report explores and connects the two trends, which have been so far treated as separate streams of research and experimentation, with the twofold aim of providing a conceptual basis for the development of the SISCODE project, and a system of methods and tools for its experimental approach to co-creation.

The report is based on two interrelated research activities, and combines reviews of literature respectively dedicated to: i) a comparative analysis of co-creation in policy making at large, and in STI policy making in particular; ii) a comparative analysis of co-creation methodologies and tools that can be applied in RRI practices.

With this overall purpose in mind, this report is organised in five chapters dedicated to a review of literature in the above-mentioned fields, and an operative appendix in which the ratio applied to the selection of the methodology and the tools to be adopted during the project's experimentation is presented. The chapters are interlinked but at the same time self-standing and include a number of findings and conclusions, some of which are

[1] Or other similar concepts that will be embedded in National and European policies and programmes, most notably within Horizon Europe.

synthesised in this executive summary to throw light on key questions to be considered in the future steps of the research and innovation project.

Chapter one, entitled "**The policy making process between ideal and real**", analyses the structural gap between the ideal policy making process and the real one, showing that the policy cycle is a theoretical construct based on a rational approach quite far from what is empirically observable in reality. In particular, the chapter highlights how the reality of policy making contradicts: i) the supposed linearity of the policy process; ii) its neutrality with respect to politics, which is sometimes difficult to achieve, also in the STI field; and iii) its capacity to predict and manage consequences. Moving from the debate around the gap between policy formation and implementation, the chapter critically analyses the policy design perspective, and introduces the recent idea that policies can be "objects" of co-design.

Chapter two, entitled "**Co-creation for policy making: state of the art, criticalities and perspectives**", examines the introduction of co-creation in policy making, focusing in particular on the fields of public services and welfare innovation, urban planning and territorial development. It provides an account of the early experimentations, of the possible roles of citizens, of the strategies for their engagement, as well as the motivation and tactics in place to stimulate organisations to introduce co-creation. Moreover, the chapter examines how co-creation is applied in different practices, connecting different streams of research and drawing comparative understanding and insights. In a similar vein but with a more specific focus, **chapter three**, entitled "**Co-creation in sti policy making: state of the art, criticalities and perspectives**", examines how the introduction of co-creation in STI policy making has been described in literature. It highlights that literature is still limited and focused on the few experimental initiatives of public participation and engagement conducted so far. Despite the many calls for extending public participation in STI policy making, the chapter also highlights that literature often displays a negative tone in assessing the experimentation conducted so far, in favour of a "science to the rescue" perspective that considers the knowledge and opinion of experts much more valuable than social knowledge. Moreover, the chapter draws a number of lessons learned, offering stimuli for further reflection and introducing questions to be further investigated and verified throughout the project. **Chapter four**, entitled "**Design for policy making**", introduces design for policy as an emerging approach, which tries to overcome some of the identified criticalities of the policy making process and that holds promises that should be verified through its adoption beyond the limited number of cases that have been

documented so far. The chapter makes the case for design for policy and presents a theoretical framework that describes its characteristics. It then shows a synthetic review of cases across Europe and beyond, and finally enters into a comparative analysis to draw initial findings, to describe drivers and barriers and to perform a critical review of the tools used, as an introduction to the second part of the document.

Chapter five, entitled "**Co-creation methodologies and tools in rri practices and beyond**" is devoted to examining the historical development of the notion of co-creation, and its implementation in the RRI framework. In particular, the chapter emphasises how in the domain of RRI the notion of co-creation with citizens and stakeholders is often interpreted as a synonym of the broader concept of participation, which can also refer to forms of passive involvement. Moreover, the chapter provides an overview of RRI toolboxes, primarily devoted to support participation and communication among citizens, stakeholders and diverse governmental bodies and decision-making authorities, as well as an overview of co-design toolboxes, primarily devoted to support the engagement of citizens and stakeholders in the design of new solutions in different fields and sectors. The chapter compares these two sets of toolboxes, highlighting the main differences and suggesting the adoption of an open and living repository of co-design tools for the experimentation to be conducted in SISCODE's co-creation labs.

Finally, **annex one**, entitled "**The SISCODE toolbox**" extensively illustrates the ratio behind the development of the SISCODE toolbox, which is meant to support the design and implementation of the "Co-Creation Journeys" of SISCODE's co-creation labs, which will be carried out in WP3. In particular, the overall ratio that underpins the SISCODE Toolbox is to leverage existing toolkits instead of designing a (yet another) new one, with a focus on balancing the need to customise the set in accordance to the diversity of the local challenges and contexts and the need to have a certain degree of homogeneity that allows for comparison of the different experiments. As the idea that "context matters" is at the core of the SISCODE project, and has also been confirmed by the review of literature, the proposed model avoids a "one-size-fits-all" approach and suggests to combine for each lab a customised set of co-design tools with a limited number of pre-selected synthesis tools, which will grant the possibility to define common milestones and produce comparable results. This living toolbox will support the development of the design process from the problem analysis to the ideation of a solution, the development of a prototype and its experimentation in situated contexts. The customised selection will integrate the practices already in use in the different labs, granting flexibility and adaptation to the specificities of

the challenge and the context. In this perspective, the SISCODE Toolbox works at a meta-level, in order to combine metadata that may guide people in making sense of existing tools.

The main lessons learned and key questions to be considered in SISCODE are listed in the following:

- **Bridging the gap between policy ideation and implementation calls for combining top-down and bottom-up approaches.** The gap between ideation and implementation is a long-standing question in policy making, intrinsically bound to the complexity of problems, which does not allow for the easy identification of causal links, or the interaction of multiple actors with possibly diverging goals and mindsets across different levels of governance. Some of the approaches proposed to bridge this gap, which suggest avoiding complexity and establishing authoritative top-down relations, have not proven successful due to the very nature of some of the issues to be handled, and to the emerging need of better including the voice of citizens and other stakeholders. Other approaches consider almost impossible to forcefully align micro-implementation with intentions elaborated at higher levels of governance, and suggest that proceeding "backwards" and assuming the point of view of citizens and service deliverers may provide great help in increasing the success rate of policy implementation. Both approaches respond to specific logics, but taken in isolation they prove insufficient and unfit for the complexity of today's policy landscapes. The idea that political goals and intentions can be smoothly operationalised and turned into policy objectives and programmes through a more systematic control of policy processes and tools is over-simplistic. On the other hand, assuming the implementers' perspective alone and involving citizens and other stakeholders in the policy design process may introduce risks associated with the transformation of empirical difficulties in normative statements, or rather a defensive preservation of the status quo (we'll do only what is feasible with current knowledge and resources), and the underestimation of the possibility to overturn legitimate political intentions. Relevant advice for the forthcoming activities of the SISCODE project is that there is a need to constantly balance top-down and bottom-up approaches, recognising their respective shortcomings and combining them in an intermediate interactive layer, in which strategic visions and high-level political goals and intentions can meet with practicalities embedded in existing institutions and grassroot initiatives. This interactive layer, already foreseen in the project, will determine an intermediate playground that will offer the opportunity to experiment with new processes and tools meant to integrate forward and backward (or downstream and upstream) trajectories. In such a playground, policy makers will be

able to meet with grassroots initiatives in which RRI is being concretely implemented with the involvement of citizens, civil society and other organisations that aim at making society meet with scientific and technological advancements.

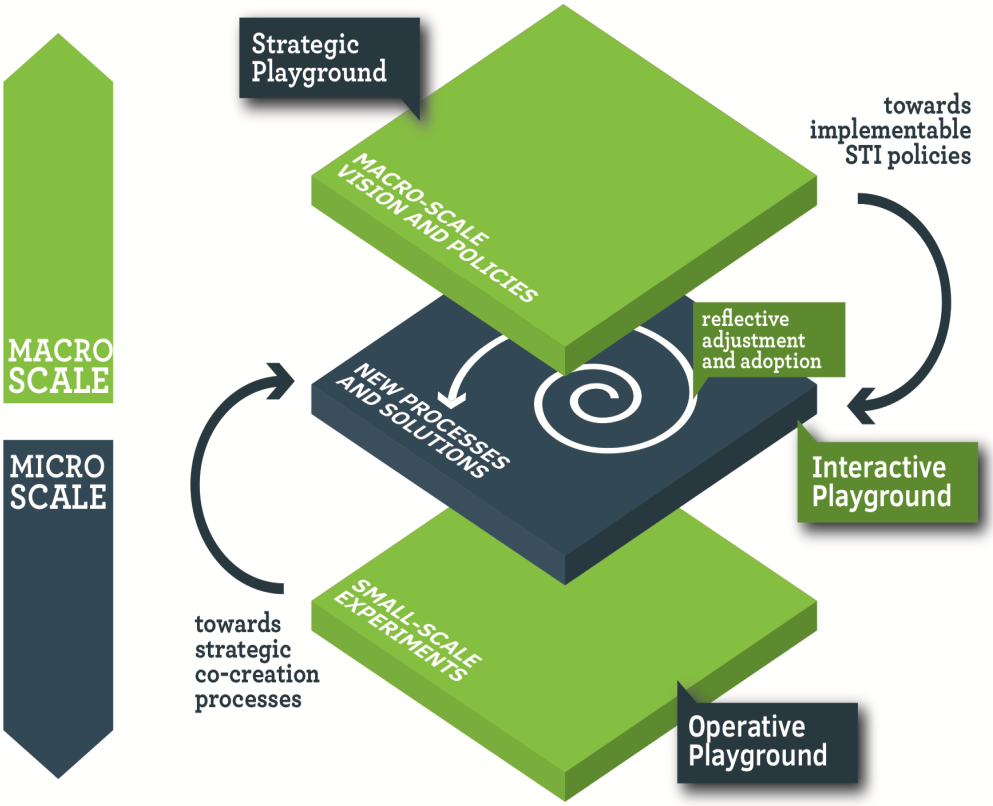

Figure 1. Interaction between policy making and implementation

- **Policy cycles are ideal models of the policy process meant to achieve efficiency and effectiveness but far from reality.** Sequential policy cycles are part of a "textbook conception" that introduces an ideal representation of the policy making process. In reality, a quite nuanced separation among phases and a complex interaction among actors impedes the mechanical adoption of input-output principles in the transition from one step to the next, as well as the identification of causal relationships in the interaction among factors and agents. The idea that policies can be rationally driven from the identification of problems, to the development of solutions, to their implementation has led to the strengthening of monitoring and evaluation frameworks and tools, with a focus on deviations that does not correspond to real reactivity and flexibility. In reality, the long time required to achieve impacts, the 'stickiness' of policies, as well as factors that are at play during implementation most often prevent a reactive redesign of policies. Relevant advice for SISCODE is to be constantly aware that the process models used to manage policy making may be useful methodological frameworks but that they do not correspond to the reality of policy making. The real process may not necessarily

follow the sequence proposed by ideal models, the rationality of actors is often bounded and their interaction is often the source of compromises that may neglect some of the initial assumptions and goals.

- **Context matters: policy models and approaches, as well as programmes and measures, cannot be freely moved from one domain/place to another.** Cultural and organisational factors may frequently hamper the implementation of policies. Structural questions bound to established cultures, mindsets and practices of diverse sectors, places, systems and typologies of organisations must be considered, while policy implementation may require sectoral, systemic and organisational transformation, which must be carefully handled. Relevant advice for SISCODE is that the project should not only aim at identifying solutions and best practices, but also at understanding how they could be modified, appropriated and embedded in new contexts, and finally diffused and scaled-up. Context-dependency must be carefully considered when evaluating the transferability of approaches, practices and tools.
- **Co-creation requires cultural and organisational transformation.** Co-creation can change knowledge and assumptions about who is responsible for the definition of solutions and policies, challenging established practices and calling for a shift in power. In this perspective, cultural and organisational factors play a fundamental role in driving or hindering co-creation. Financial incentives do not seem to be effective in boosting citizen and stakeholder engagement, while social motivations on one hand, and the capacity to manage change on the other hand are often at the core of successful co-creation practices. Relevant advice for SISCODE is that co-creation and co-design are political acts, because they introduce a set of practices and tools which directly challenge the established order. Particular caution must be placed in managing this natural tension towards transformation in situations that are most often characterised by resistance to change.
- **Citizens and other stakeholders may assume different roles in the co-creation process.** If we look at the policy formation and implementation process, citizens and other stakeholders may assume different roles, that range from the better identification of problems, to the design of innovative solutions and, to the participation in their concrete implementation. The range of possible roles corresponds to a complex landscape of co-creation and design, in which there is the need to integrate and balance different perspectives, considering the scope of the co-creation activity and the context in which it takes place. Relevant advice for STI policy making and for SISCODE is that public needs be involved in defining and framing problems to be solved/questions to be answered. The early engagement of

the public is necessary in the perspective of overcoming potential misunderstandings, frustrations and failings, as public participants feel that they are simply being asked to market test the acceptability of technologies and of the outcomes of their application, and Institutions appear to see public participation as an opportunity to gain trust for a predetermined approach, rather than to rethink their policies and practices. It is thus vital that the problems be solved and the kind of solutions sought are framed by public participants at the start, such that the problems and solutions are co-created.

- **Work needs to be done to establish the credibility and value of public perspectives and inputs.** Co-creation requires the interaction of people with different cultures, beliefs and forms of knowledge within a frame of collaboration, which enacts policy making as a nonlinear, open-ended and iterative process. In performing such an interaction, co-creation enables a learning process in which knowledge is shared in a peer-to-peer way. In this framework, citizen 'lay knowledge' must be considered a complementary experiential source of critical insights to be rendered actionable in (re)designing solutions and policy measures. Nevertheless, if we examine co-creation experiences to date, there have also been indications that policymakers do not consider social knowledge as equal to 'expert' technical knowledge such that the role of the public is limited to discussion questions of values and ethical issues, rather than exposing 'expertise' to scrutiny. Relevant advice for SISCODE is that establishing the credibility and value of public perspectives and inputs represents a challenge for which the experimental adoption of specific processes and tools is necessary. In this respect, the project plans to experiment continuous interaction among diverse local actors as a way to develop context-based solutions, and to actively involve policymakers in the participatory process, so that they will be more willing to take account of the outcomes, allowing greater policy impact.
- **The outputs of participation and co-creation need to 'fit' within the machinery of policymaking.** There is a paradox within the move towards co-creation: on one hand, for co-creation to offer genuine alternatives to politics as usual, it needs to be distinctively different from other modes of policy advice; on the other hand, if they are too 'alternative' they risk being ignored. Public participation tends to generate a variety of views that are difficult to synthesise into clear outcomes or conclusions that would be policy relevant and a basis for collective decision making. Relevant advice for SISCODE is that it is necessary to provide support and tools meant to incorporate the results of co-creation into the machinery of policymaking. In this respect, the intermediate layer between grassroots initiatives and high-level political visions and goals that the project plans to set up (playground for policy making) will

be the arena in which to experiment processes and tools meant to enable effective participation and create actionable policy advice.

- **Policies may be seen as objects of co-design.** In a moment in which the need for more open and flexible programmes is emerging across diverse fields of policy making, design sciences offer already experimented practices and tools meant to increase the degree of participation of citizens and stakeholders. Looking at policies as objects of design gives the possibility to have actors cooperate in a more structured manner and improve results considering the diversity of local conditions and circumstances. Designerly approaches emerge as being particularly interesting in today's policy landscapes because they seem apt at handling wicked and undefined problems, because they introduce an experimental and flexible approach that uses iteration and prototyping as ways of verifying, selecting and honing possible solutions, because they propose a human centred perspective while considering other factors, because they go beyond a pure utilitarian and problem-solving attitude, and because they suggest a new practice-based approach to co-creation. Given all these characteristics, design for policy is emerging not just as an addition to the repertoire of policy tools but as a new framework that offers a whole new way for policy-making to be done. Nevertheless, as policies are new and complex objects of design, for which experience is still limited, particular caution must be adopted in making promises and anticipating results. Relevant advice for SISCODE is to consider not only the promises that design holds for policy making, but also the caution that is needed to deal with new actors and objects of design. In particular, the quite different ways in which designers and policymakers deal with problems must be carefully managed throughout the project. Moreover, even though the adoption of co-design processes and tools is meant to support participation, some of them may require competences that are not in place.
- **There is a need for making sense of existing co-creation tools more than for developing new ones.** Even though the very notion of "tool" may be questioned, and seems to be different in the field of RRI and in the field of co-design, research shows that in both fields many toolkits meant to support participatory processes are already available. More than the need to create new tools and toolkits, what emerges is the need to facilitate the access to the existing ones, and to organise them in reasonable sequences depending on the objectives and the capacities at hand. Relevant advice for SISCODE is that the project should not aim to create new tools, but rather to work at a meta-level, in which to support users in making sense of existing tools and toolkits.

- **Effective co-creation processes and tools must fit in their context of use.** A standard process and set of tools to support co-creation is likely to be difficult as the way in which public participation is embraced by policymakers, citizens and other actors and stakeholders appears to be context specific. It is thus essential to understand and analyse the specificity of each context and issue to be handled to better define what sort of tools to use in co-creation processes. Relevant advice for the activities that SISCODE will conduct across diverse sectors, issues and places, is that in the experimentation it is necessary to find the right balance between the need to allow for comparison and the need to adopt context-based processes and tools. Satisfying the first need would suggest the adoption of a single process and set of tools, while satisfying the latter would require a situated approach, supported by customised processes and different sets of tools. Therefore, SISCODE plans to manage the trade-offs between the two approaches with a mixed-up solution: on one hand a co-creation process characterised by common macro-phases that can be freely organised in sub-phases, and on the other hand the adoption of a limited set of common tools that synthesise the outcomes of each phase, combined with customised sets of tools bound to the different problems to be handled and the characteristics of the local contexts. Moreover, the project plans to experiment diverse combinations of "generative" co-design tools, primarily focused on co-creating new solutions and networks, with tools that come from the field of RRI, primarily focused on "extracting" knowledge from the public and on building consensus among actors.

1 The policy making process between ideal and real

1.1 Introduction

Public policy making is traditionally seen as a task of politicians and civil servants, who act respectively as the main actors in the phases of construction and implementation of policies. In recent years, a growing demand has emerged in various fields opening up the policy making process to citizens, civil society and other actors, who in the past had operated mainly indirectly in addressing political decisions, within various institutional frameworks, characterized by more or less structured and explicit ways of influencing policy making. This demand is placed within a delicate phase of transition of representative democracy, which has been questioned in favour of forms of direct democracy, potentially supported by new technologies. The latter, however, have shown many limitations and problems with respect to the main expectations they had raised: greater transparency, more informed and participated decisions, respect for the will of the citizens, etc.
In this context of ongoing transformations, the historic debate on policy making has been enriched with new contents, has taken new vigour and has expanded to new fields. In particular, the drive towards more participatory approaches has been extended to areas of policy making that more than others have traditionally been considered the domain of experts. Policies concerning science, technology and innovation in particular have emerged as areas in which closeness to society, or a higher degree of involvement and participation of citizens in decisions, could guarantee a more balanced development, and a better control of unexpected and unwanted consequences. Despite many obstacles and difficulties, different programmes have been developed across Europe over the last two decades to increase the permeability between STI (Science, Technology and Innovation) and society, trying to make participation the norm and to render the former three better oriented towards the needs, demands and expectations of the latter (Saurugger, 2010).
Starting from the Lund Declaration ('The Lund Declaration', 2009), which underlined the importance of addressing societal challenges and ethical questions in research and development, many other initiatives have called for a comprehensive review of the role of citizens in science, innovation and STI policy making in the EU. More recent frameworks proposed a broader integration of future-oriented technology analysis (Boden, Johnston, & Scapolo, 2012) to better respond to grand challenges and introduce a new approach for STI policy making which is intrinsically more responsible. The concept of RRI has powerfully emerged in recent years in Europe and across the world (von Schomberg, 2013), and some

studies have suggested the possibility of moving from a model in which scientific and technological advancement is the result of actors working in a mainly autonomous way to a cooperative model, with a view at arriving at the diffusion of a model of co-creation, in which knowledge and solutions are co-produced by different actors working in synergy, in an inclusive process for civil society and citizens (Regeer, Bunders, & Hedges, 2009).

In reality, the debate about the limits of the traditional approach to policy making and the need to make it more open, flexible and close to the needs of society is not new in the consolidated fields of policy studies, particularly in political sciences and in the study of public policies. This chapter tries to synthetically analyse some aspects of this debate, recognising that some of the issues that have characterised it are transversal, and that some reflections on the criticalities of policy making can usefully inform the transformation of policies for science, technology and innovation. In particular, the chapter will highlight some of the main dilemmas and challenges of policy making, with particular attention to public policies, with the aim of drawing general guidelines. In this respect, the chapter does not intend to produce a comprehensive review of literature, which is very broad and has already been analysed systematically by several studies (Matland, 1995; Hill & Hupe, 2002; Balla, Lodge, & Page, 2015), but rather to draw attention to a few specific themes, which are of particular interest in the study of how co-creation can be approached in STI policies.

We are fairly aware of the fact that part of the literature on public policies highlights the difficulty of generalising the validity of the results obtained in specific fields and of shifting approaches and tools from one sector to the other. This is also the case for national and even local contexts, as the diversity of institutional and cultural frameworks, together with the different configuration of local systems of actors, impedes the mechanical transfer of successful policy making formulas. In this regard, we are also aware that special caution is needed to distinguish the findings that can be generalised from those that are sector/site specific, and that it is quite difficult to find the right balance between the need to define processes and tools that can be codified and replicated and the need to tune them with the institutional, organizational, social and cultural context in which they must be implemented.

1.2 Top-down vs. bottom-up approaches to policy making

A structural problem of the policy making process, which has been widely discussed and has given rise to different orientations, is the difficulty in managing the implementation phase. In this regard, several authors have highlighted how deviations between intentions and results are frequent due to multiple factors that condition the connection between formation and implementation of policies. Two main schools of thought have emerged, which look at the policy making process in a top-down or bottom-up perspective.

The debate around the implementation of policies from which the two perspectives/approaches emerged started in the '70s, and inevitably led to positions that tried to mediate the different perspectives (Matland, 1995; Hill & Hupe, 2002). The debate is primarily rooted in the idea of a dialectic relationship between politicians and civil servants, as well as between central and local governments: in this perspective the fact that policy formation and policy implementation are respectively dominated by the first and the latter frequently poses problems of misalignment, which are bound to different intentions, cultures and forms of accountability. Policies are frequently designed without a clear knowledge of the mechanisms that reside in their concrete implementation, which often depend on the rules, procedures and capacities of local administrations or street-level bureaucrats. In turn, a mismatch between high-level intentions and practicalities embedded in existing institutions can frequently lead to results that are far from the expectations of central administrations and the mandates of politicians.

The top-down school argues that the policy implementation phase should be aligned with the formation phase, which governs the policy making process that establishes not only the goals but also the means though which they should be achieved. From this perspective, the implementation phase is analysed in terms of possible and real difficulties, which should be prevented to have an effective policy. In particular, the degree of complexity of the system of actors involved and the need to have all of them aligned (Pressman & Wildavsky, 1973), as well as the quest for organisational transformation (Van Meter & Van Horn, 1975), emerge as problematic issues that could seriously hamper the implementation phase. In particular, Van Meter & Van Horn build on Pressman and Wildavsky's study of the factors that may hamper policy implementation to provide a model of the implementation process.

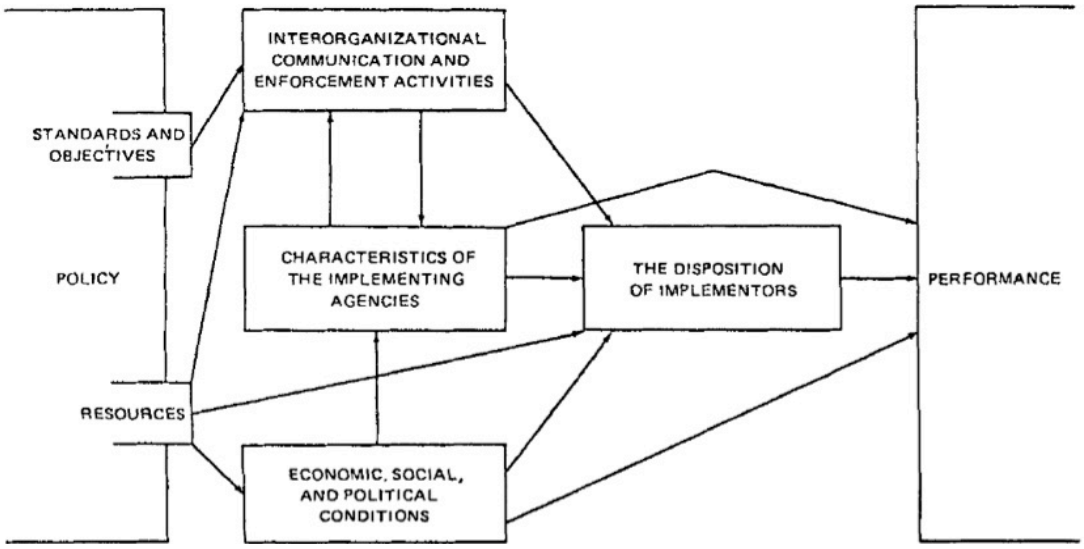

Fig. 2. Variables influencing the policy implementation process (Source: Van Meter & Van Horn, 1975)

The model connects public policy implementation with studies on organisational management and change and on intergovernmental relations, concluding that the degree of participatory consensus and the extent of change required by the policy must be considered in order to achieve successful implementation. In particular, the model includes six independent variables to be considered: standards and objectives; resources; inter-organisational communication and enforcement activities; characteristics of the implementing agencies; economic, social, and political conditions; and disposition of implementers. The interaction among these variables, and the capacity to consider them during the policy formation phase, conditions the degree of implementability of a policy. We must underline that, even though this is not always explicitly said, the early "top-down" policy studies tend to assert that the route towards efficiency and effectiveness is to avoid complexity and changes to the ways in which things are done: an attitude that stands at the core of the silo approach and the strong resistance to change characterising the PA as well as many large organisations.

Later studies (Sabatier & Mazmanian, 1980) individualise a wider range of variables, with a focus on the role of street-level bureaucracy in determining the success or failure of policy measures. Here, the idea is that controlling the combination of conditioning factors can provide the opportunity to manage the acceptability of the policy for local administrators and street-level bureaucrats, and thus define to what extent it is feasible.

According to Matland (1995), the top-down perspective formulates a set of four major recommendations, which are based on the idea that policy makers operating in central government have a predominant role and that all other actors intervene primarily as impediments: i) make policy goals clear and consistent; ii) minimise the number of policy actors; iii) limit the extent of change necessary; and iv) place implementation responsibility with an agency sympathetic to the policy's goals.

In his review, Matland (1995) synthesises the three main sets of criticism met by the top-down school: i) it fails to consider the significance of actions taken earlier in the policy-making process; ii) it sees implementation as a purely administrative process either ignoring the political aspects or trying to eliminate them; and iii) it places exclusive emphasis on the statute framers as key actors. In other words, the top-down school depicts an ideal policy making process, ruled by politics and central administrations that see local administrations as pure implementers.

With regard to the first criticism, Winter (1986) notices that policy–making and implementation have usually been treated as two distinct disciplines, while in his study of the decentralization of the disablement pension administration in Denmark he shows how implementation is deeply affected by the prior policy–making process. His thesis is that implementation problems often are caused not only by behaviour in the implementation phase, but also by the character of the policy-making process prior to the passage of a law or other kind of political decision.

With regard to the second point, critics notice that it is difficult to separate politics from administration (e.g. making policy goals clear and consistent may be very difficult in situations that frequently occur in which legislation requires to hold together coalitions), and that decisions are often based on mediation. As Matland notices "*Attempts to insulate an inherently political subject matter from politics do not necessarily lead to apolitical actions. They instead may lead directly to policy failure.*" (Matland, 1995, p. 148) This introduces a fairly different perspective than the one based on the rational decision-making model, opening up the way for the conflict-bargaining model, rooted in different studies of war and international relations, as well as in Cyert and March's theory of organisations (Cyert & March, 1992), which postulates that organisations are essentially bargaining coalitions.

With regard to the third point, critics argue that local service deliverers often have expertise and knowledge of the true problems, and therefore are in a better position to propose purposeful policy. In this respect, we must take into account that the debate on the

interaction between central and local policy is a long-standing one. If we look at the EU, multi-level governance has been adopted as a key approach to integration and there has been a call for a wider participation of regions and local actors in policy making[2], but many concrete problems in putting it in practice and making it work still exist. In particular, while on one hand, there is a quest for wider participation of local and regional authorities, on the other, the transfer of sovereignty between national and supranational entities is at the core of rising tensions.

Considering all these streams of criticism, a competitive model, commonly identified as 'bottom-up' approach or 'backward mapping', has been proposed in the aim of providing a more realistic understanding of policy implementation and better recommendations for its successful management. The idea that most of the problems that affect policy implementation stem from how local authorities interpret and execute centrally-designed measures is common in the top-down and in the bottom-up perspective. Nevertheless, the latter considers it almost impossible to forcefully align macro- and micro-implementation (Berman, 1978), and suggests that assuming the point of view of the target population and the service deliverers may provide great help in increasing the success rate of policy implementation.

In his description of previous contributions that established the 'backward mapping' or 'bottom-up' approach, Lester (1987) explains that the "*bottom-up approach starts by identifying the network of actors involved in service delivery in one or more local areas and asks them about their goals, strategies, activities, and contacts.*" (Lester et al., 1987, p. 204) Backward mapping is thus the activity of reconnecting these actors and their goals with the overall policy framework and actors that operate at previous stages of the policy formation process: in this perspective, policies can be driven from the bottom to the top, assuming the attitude and the factors that are at play in the implementation phase as initial constraints. The approach is similar to the one that design sciences apply to consider from

[2] Building on the "Better Lawmaking" resolution, adopted by the European Parliament, the Council and the European Commission in 2003, 344 members of the Committee of the Regions approved a resolution on a "European Union Charter for Multilevel Governance" in 2009, with the aim of taking full account of the contribution that local and regional authorities can give to more democratic policy making (see The Committee of the Regions' White Paper on Multilevel Governance, 2009).

the very beginning issues and limitations that may hamper the process of development of new products and services, which is commonly identified as 'concurrent engineering'.
Mégie (2010) confirms that the discrepancy between policy intentions and results stems from the role played by the diverse actors involved in the implementation. In particular, public servants emerge as particularly critical actors, as their personal tendencies (ideologies, interests, thinking, etc.) can influence their perceptions and even their intentions when it comes to implementing a policy. In fact, quite a few studies underline the crucial role of "street-level bureaucracy" (Lipsky, 1971; Maynard-Moody, Musheno, & Palumbo, 1990; Hill & Hupe, 2002) in determining the success or failure of policies and programmes. These studies recognise that public servants have a general mindset and behaviour, but that they are also conditioned by their belonging to a specific organisation, which can powerfully influence their behaviour, since organizational culture transmits beliefs as well as ways of doing things.
Berman (1978) and other scholars move from the individual and organisational level to a broader view, insisting on the role played by contextual factors, which are most often unknown to those who designed the policy, in determining implementation. The bottom-up perspective thus calls for giving to local level implementers the possibility to adapt broad policy measures and programmes to the conditions and needs that characterise specific contexts. In this view, implementation is based on the interaction between policy and context. It cannot be context-free, and it widely relies on the cooperation and the initiative of micro-level actors that should be usefully engaged in the policy making process. This usually calls for the redesign of organisations or organisational change, shifting the challenge of policy implementability from forcing the adoption of centrally-designed measures to supporting the transformation of organisations with the aim of rendering them more open to include suggestions from the lower and more peripheral levels of governance: "*the positive aspects of the street level influence can be maximized and the negative aspects minimized when service organizations are designed to engage, rather than mute, street level worker perspectives on how policies should be implemented.*" (Maynard-Moody et al., 1990, p. 833)
The most relevant criticism to the bottom-up perspective is based on the excessive role and influence attributed to street-level bureaucrats and local administrators, to the point that policies must be designed according to their will rather than to that of elected representatives. In this perspective, autonomy and flexibility are good when the overall goals of those who designed the policy are the same as those who are supposed to

implement it, while they might overturn legitimate political intentions when they differ significantly. Referring to extant literature, Lester observes that "*this approach received a great deal of criticism for assuming that policy implementation occurs (or could occur) in a decentralized policymaking. (…) Thus, the 'bottom-up' approach errs in accepting an empirical difficulty as both a normative statement and the sole basis of analysis of a complex organizational and political problem.*" (Lester et al., 1987, p. 205)

Recalling the few previous attempts to combine top-down and bottom-up perspectives, Matland (1995) proposes a synthesis in his policy ambiguity/conflict model, with four implementation perspectives based on a policy's ambiguity and conflict level (see Figure 3). The model is purposely simple, as one of his critiques to previous studies and models is their intrinsic complexity bound to the too wide set of variables to be controlled.

In Matland's view, ambiguity of the objectives and conflicts among actors are structural characteristics of policies, which happen to be low or high depending on specific contextual conditions. The matrix combines low and high degrees of ambiguity and complexity, which in reality move along a continuum, to obtain four implementation perspectives: i) Administrative Implementation: Low Policy Ambiguity and Low Policy Conflict; ii) Political Implementation: Low Policy Ambiguity and High Policy Conflict; iii) Experimental Implementation: High Policy Ambiguity and Low Policy Conflict; and iv) Symbolic Implementation: High Policy Ambiguity and High Policy Conflict.

Matland's variables seem to be partly interdependent, while in truth they are, at least to some extent, independent: for example, policies can be fairly ambiguous and vague, but at the same time raise high levels of conflict as they touch upon issues that are sensible for specific groups or for the entire society.

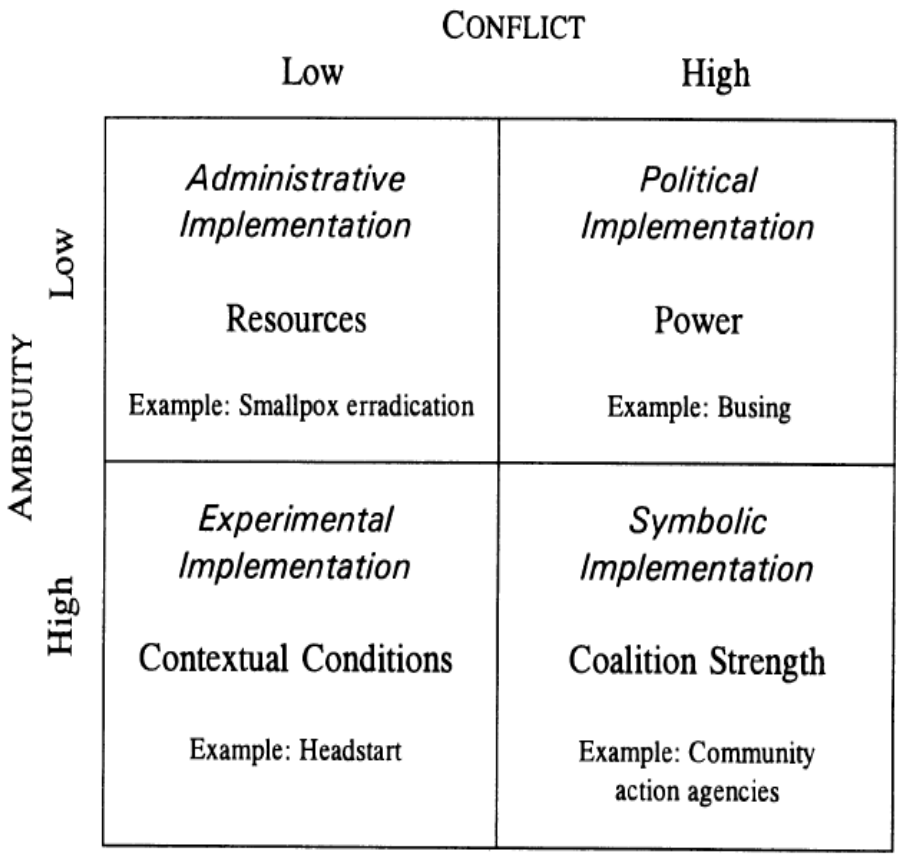

Fig. 3. Ambiguity/conflict matrix of the policy implementation process (Source: Matland,1995)

1.3 The quest for efficiency and effectiveness of policies

The need to develop a more efficient approach to policy making has historically been part of the policy implementation debate (Hill & Hupe, 2002), but re-emerged significantly in the last decades of the twentieth century, and in the years to follow has been connected more or less explicitly with various attempts to reform the public sector with the imperative of rationalising public spending.

The push towards increasing the efficiency and effectiveness of policies has led to the formulation of different models of the policy making process, which are presented as rational, based on objective information and able to guarantee measurable results. This is what Nakamura (1987) defines as the "textbook conception" of the policy process, attributing to Harold Lesswell (1956) the first attempt of codification, subsequently developed by himself and by several scholars in the field of political sciences.

Lasswell developed the concept of policy cycles, which he broke down into seven fundamental stages in decision-making. In more recent formulations, the cycle has been

divided into four major stages: agenda-setting, policy formation (formulation and decision-making), policy implementation and policy evaluation (Howlett & Ramesh, 1995). According to Nakamura, the policy making process models that underpin policy cycles have common characteristics. In particular, they are all sequential, differentiated functionally and cumulative: "*Sequential in the sense that each stage leads to the next. Differentiated functionally in the sense that each stage represents a distinctive activity required by a system to move to the next stage. And cumulative in the sense that each round of activities produces results that are fed back into the process.*" (Nakamura, 1987, p. 142) Nakamura is also among the first to point out the abstract nature of the rationalist approach to policy making and its detachment from reality, even if criticisms of the difficulty to practically apply the rationalist approach were already contained in the first formulation of the incrementalist perspective (Lindblom, 1959) and in the idea of 'muddling through', which will be briefly discussed in the following paragraphs. In particular, Nakamura highlights how the separation among phases, which are presented in the different cycles as clearly distinct, is very nuanced, and how the interaction among actors is very complex. In his opinion, this prevents the possibility to mechanically apply input-output principles in the transition between phases, as well as to determine causal relationships in the interaction between factors and agents.

1.4 The ROAMEF policy cycle

Despite the criticism that, as we have seen, has already concerned initial attempts to systematise the policy making process, particularly in the Anglo-Saxon context, various codifications have spread that take on a cyclical form and are at the core of manuals for public servants. In particular, in the United Kingdom, the so-called ROAMEF (Rationale, Objectives, Appraisal, Monitoring, Evaluation, Feedback) policy cycle (see Figure 4) constitutes the structure of the Green and Magenta books (HM Treasury, 2011, 2018), which represent one of the most explicit attempts to codify the policy making and assessment processes for public servants.

The idea behind these manuals is that policy making can and should be rationalised and provided with tools to support its different phases. In short, the model assumes the idea that the policy making process can be split into two macro-phases: one dedicated to the preparation and definition of the policy (ROA) and one dedicated to its implementation and evaluation (MEF).

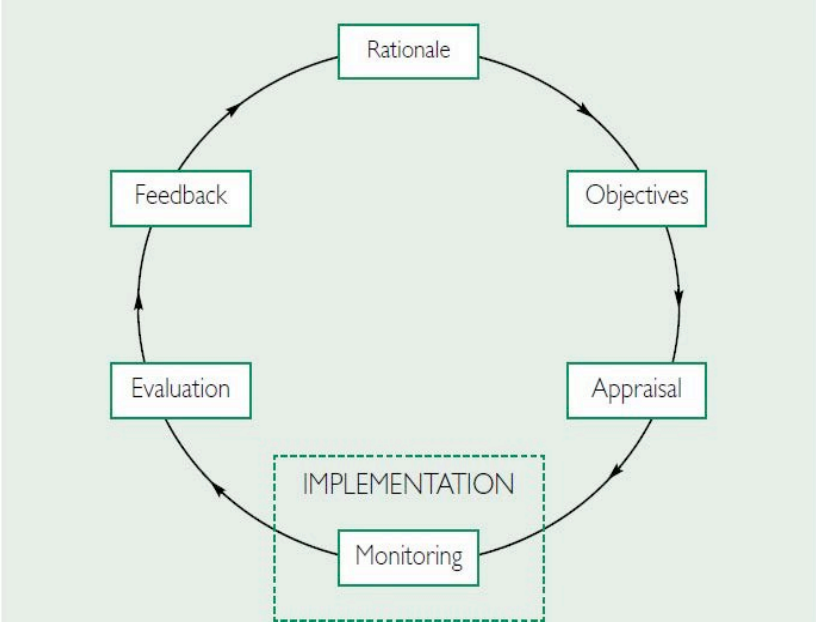

Fig. 4. The ROAMEF policy cycle (Source: HM Treasury. The Green Book - Appraisal and Evaluation in Central Government, 2011)

Monitoring activities, which overlap with the implementation phase, should theoretically allow for quick identification of any deviations between defined objectives and intermediate results achieved, and allow for actions meant to adjust the undertaken measures.

The overall model rests on a quite traditional perspective on political economy, which assumes that all actors behave rationally, i.e. reduce costs and maximize benefits. This cultural background also clearly transpires in the language used, which often refers to efficiency and cost reduction, and identifies the problems that may arise in the implementation of policies in terms of externalities and unexpected consequences. Considering the structural difficulty of aligning the actual results with the initial policy objectives, which as we have seen clearly emerges in literature, in recent years the focus has moved towards issues related to monitoring and evaluation. In quite a few documents meant to provide guidance for policy makers (HM Treasury, 2011, 2018), effective monitoring and evaluation of policy are presented as key activities/phases that are necessary to ensure that the desired outcomes are being achieved at minimum cost, and that unintended consequences are identified and managed. In this view, monitoring and evaluation of policy should test both that the implemented policy is working as expected, and that it remains appropriate in light of wider changes.

This approach is typical of the top-down school, according to which achieving results is primarily a matter of controlling and redirecting the implementation phase, to make sure that it is conducted in accordance with the goals initially set. In reality, as we have seen, the degree of implementability of policies is largely dependent on the connection between the initial and the later stages of the process, and on the capacity to consider from the very beginning a number of factors (technical, economic, organisational, cultural, etc.) that can hamper or foster implementation. Moreover, modifying a policy while it is being run is far from being an easy task if the policy is not conceived as flexible, which calls for a profound transformation not only of the policy itself, but also and primarily of the whole policy making environment and process. Developing and implementing a policy usually takes a long time, and its outcomes and impacts can be appreciated in an even longer time: sometimes it may take years to have impacts to be assessed. Moreover, policies are not all of the same species and policy studies have proposed different approaches to individualise typologies (Lowi, 1972; Wilson, 1995): while the results of some policies can be reasonably predicted, in most of the cases, there is a structural problem in tracing causal connections and in anticipating results.

In many cases, governmental agencies report that progress has been made in strengthening the framework for the monitoring and evaluation of policies and the adoption of Impact Assessment (IA) frameworks and tools, although they highlight that, given the length of the policy making cycle, it may take time to see results. In the case of the UK, for new regulations starting from 2007, the IA template requires policymakers to indicate a date by which the regulation will be reviewed. The default position is a post-implementation review three to five years after commencement. (House of Lords, Committee on the Merits of Statutory Instruments, 2010)

1.5 Muddling through

'The Science of Muddling Through', a 1959 paper by Charles E. Lindblom, has deeply influenced the thinking about public policy decision-making. Lindblom's idea is that effective decision-making in complex situations is bound to what he calls "incrementalism": a method of change by which many small policy changes are enacted over time in order to create a larger policy change. This perspective is in contrast with the rational policy model, which postulates that an accurate planning of actions and resources

can achieve a relevant transformation in one single push rather than through a process of continuous improvement.

Lindblom's position can be interpreted as a middle way between the rational actor model and bounded rationality, as he did not see as adequate both policy rationality driven by long term goals and the satisficing approach. Differently from a more 'strategic' approach, incrementalism is based on the idea of dealing with the immediate problems as they arrive and avoiding trying to create an overall strategic plan. In Lindblom's view, this means 'muddling through' the issues at hand based on importance. In this, the perspective is quite similar to the 'resource-based view' of firm's management (Barney, 1991), and the one that may be found in studies on improvisation and bricolage in project and company management and in entrepreneurship. (Klein, Biesenthal, & Dehlin, 2015)

Even though the incrementalist perspective is for some aspects in clear contrast with the top-down and the bottom-up approaches to policy making, it had in fact a quite strong influence on both. On one hand, it is at the core of an attitude that may be found in the top-down school, according to which a significant degree of transformation as well as a complex system of actors involved should be avoided to give shape to successful policies. On the other hand, it is at the core of the bargaining attitude that may be found in the bottom-up school, according to which a constant negotiation among different levels of governance is needed to render policies implementable.

It is interesting to notice that similar debates, in which an incrementalist perspective has been discussed against a breakthrough or radical one, took place across time in different fields: e.g. the longstanding discussion about radical vs. incremental transformation in innovation studies (Norman & Verganti, 2014); the analogous discussion in change management (Todd, 1999); and the diverging perspectives proposed by the strategic positioning school (Porter, 1980) and the resource-based view school (Wernerfelt, 1984; Barney, 1991) in firm's strategic management.

Meeting studies on complex social and biological systems, the incrementalist perspective evolved into the theory of punctuated equilibrium (Gersick, 1991; Baumgartner & Jones, 1993), which analyses common patterns in the evolution of different policy topics, providing an explanation of how the attitude towards policy and organisational change varies across time. Following Lindblom, the theory assumes the idea that policies and organisations generally change only incrementally due to several restraints: 'stickiness' of institutional cultures, vested interests, and the bounded rationality of individuals in decision-making positions are most often at play simultaneously to impede radical change.

Policy change will thus be punctuated by continuous small adjustments over long periods of relative stability. What is new in the theory is the idea that these periods of stability are sometimes followed by abrupt changes at a given time due to large shifts in society or government. Policy is thus characterized by long periods of stability, punctuated by large though less frequent radical changes. Although the theory can be applied to a variety of situations across different sectors, Gersick (1991) highlights that there are at least two cautions to take: i) punctuated equilibrium is not the only way in which systems change; and ii) models cannot be freely moved from one domain of research and practice to another. Punctuated equilibrium poses a few relevant questions for those who are interested in managing change: "*Do these data reflect a system in equilibrium or in transition? Do they depend on characteristics inherent in the system's parts, or in the deep structure that organizes them? How far can these conclusions be expected to hold, should the system undergo radical change?*" (Gersick, 1991, p. 34) At the same time, the theory does not aim to put decision makers at ease with managing transformation. Gersick highlights that traditional deterministic paradigms won't be of help, as they are neither able to predict for how long the inertia of a system can bring it ahead with small changes, nor able to cope with the unpredictability of radical changes that rewrite the rules of the game.

1.6 Policies as objects of design

According to Howlett (2011, 2014), a stream of policy studies is focused on policy design. In his view, not all policies are or can be designed: in some circumstances, policy decisions are highly contingent and 'irrational', and driven by purely situational logics and opportunism; in others careful deliberation and assessment stand at the core of what constitutes a design.

The overall objective of policy design is to have a number of policy actors work together in an organised fashion, with the aim of improving the policy making process to realise better outcomes. In the 'policy design' perspective, this may be achieved "*through the accurate anticipation of the consequences of government actions and the articulation of specific courses of action to be followed.*" (Howlett & Lejano, 2013, p. 358)

From Ross (1916) onwards, anticipation is a quite strongly questioned issue, with reference to the actual capacity of policy actors to predict results, particularly when policy challenges are complex and the situations in which they are framed see the interaction of a relevant number of factors and actors. Nevertheless, the idea of having actors cooperate in a more

structured manner as a way of improving results is surely close to the perspective of the design sciences, which has applied it to a variety of different situations and sectors.
Another point of contact with design sciences is the very meaning of 'design', and the situated nature of design activities.
In Howlett's view: *"Conceived of as both a process and outcome, policy design is very much situated in the 'contextual' orientation, which is characteristic of modern policy science.*" (Howlett, 2014, p. 190) Howlett's perspective is fairly close to the one that may be found in the debate that design sciences had about the same meaning of 'design', which may be quite vast and sometimes vague, and range from process to object and from verb to noun (Heskett, 2002).
What seems to be missing in the policy design school is a discourse that opens up the policy making process, from a process closed in a domain of experts to a process more open to the participation of external subjects, more apt to include non-experts and more human-centered. Howlett studies and his reconstruction of the 'designerly' approach to policy making are indeed almost entirely built within the field of political sciences, with reference to other fields such as organisational studies and - by contrast - governance studies, but with quite limited mentions to the evolution of design sciences.
At the same time, design sciences expanded their domain of research and practice including new objects of design: from tangibles to intangibles and from simple elements to complex systems (Norman & Stappers, 2015). Richard Buchanan tried to systematise this expansion in his framework of the four orders of design (Buchanan, 2001), which today has probably become insufficient due to a further expansion bound to the diffusion of the concept of Design Thinking (Brown & Kātz, 2009) and its application to new domains of research and practice. Along this process, policies have also become objects of interest for design (Bason, 2014; Kimbell & Macdonald, 2015; Kimbell, 2016; Kimbell & Bailey, 2017), while policy makers and civil servants have become interested in understanding how design knowledge and processes may help develop better policies and tackle some of the unsolved issues in the policy making process.
The disposition towards participation, which perfectly matches the rising need to engage diverse actors and stakeholders in the policy making process, is likely one of the most relevant traits of interest of design for policy makers.
If we look at how policies and policy making have evolved, we can easily see that in recent years the question of participation and openness have become more central (Lemke & Harris-Wai, 2015; Fitzgerald et al., 2016; Figueiredo Nascimento, Cucillato, Schade, &

Martinho Guimaraes Pires Pereira, 2016). In the field of public services and policies, we move from a debate closed within the domain of the public administration, which used to frame the question of policy making as a technical issue to be managed internally, to a new condition in which the role of non-public actors, be they come from the for-profit or the non-profit field, is growing and calling for a new attitude towards complexity.

Even if the necessity to deal with complexity is well rooted both in Prigogine's thinking and in Cybernetics, the idea of embracing complexity is fairly recent, and connected with the systemic nature of many of the wicked problems (Rittel & Webber, 1973) that PAs and other organisations typically deal with. Having multiple actors interact, experimenting with innovative ways of putting traditionally closed organisations in contact with external subjects, and shifting portions of power from the centre to the periphery and from inside to outside are all complex matters, which happen to be interrelated among them and connected with the same degree of complexity of the issues to be handled.

In this perspective, the attitude towards policy design - like the attitude for any other complex object of design - may easily swing between the difficult attempt to embrace complexity and cope with it, and the temptation of going back to the draconian simplification suggested by the top-down school. Not by chance, simplification is most often found in the construction of the political background for policy making and in the initial stages of the policy making process, while as soon as we move towards implementation, the complexity of the factors that are on the ground and that must be managed to concretely implement the policy emerge leading to the structural mismatch between initial intentions and declarations and possible or real achievements. Design science and designerly approaches to policies, which will be introduced in the following chapters, emerge as particularly interesting right now because they seem apt to handling wicked and undefined problems (Buchanan, 1992), because they introduce an experimental and flexible approach that uses iteration and prototyping as ways of verifying, selecting and honing possible solutions (Unger & Eppinger, 2011; Ulrich & Eppinger, 2012), because they propose a human centred perspective while considering other factors, because they go beyond a pure utilitarian and problem-solving attitude, and because they suggest a new practice-based approach to co-creation.

With reference to this last point, and as we have already mentioned in the beginning of this chapter, policies are being observed in the perspective of increasing the degree of participation of stakeholders which were traditionally considered as references more than actors of the process. "Co-" is emerging as a paradigm not only in new product and service

development, but also in the design of more open and flexible programs across different fields of policy making. This opens to new perspectives in policy making, but at the same time poses quite a few challenges that are rooted both in some of the structural issues that we described and in contingencies that depend on contextual factors.

A review of how co-creation has been interpreted and experimented both in the broad domain of policy making and in the more specific field of STI policies, able to investigate both the positive experiences and the difficulties encountered so far, is then needed as a starting point for a reflection on how design could provide a useful contribution.

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2 Co-creation for policy making: state of the art, criticalities and perspectives

2.1 Introduction

Traditional policy making is based on a model in which "knowledge" is considered in terms of a stock of meaningful information to be transferred from experts and academics to a specific community, or a local context. Under this perspective, policy making is essentially a matter of translating knowledge in a unidirectional way from one site or community, to another. Generally speaking, this model assumes that experts are the unique legitimate actor able to produce and transfer relevant knowledge, by defining appropriate "pipelines" for top down communication to the concerned target community. In this way, this model does not consider lay people as potential active agents, which can actively produce, interpret and share information.

In this respect, one of the main challenges concerning policy making in our contemporary societies regards the accountability gap between what citizens and concerned groups of people need or demand, and what the governments actually do in practice with the aim to face this demand (Dalton, 2008; Rosanvallon, 2008). Since the early 90s, the issue of citizen empowerment in western societies through their engagement in policy making has become significantly relevant, because of the so-called democratic deficit, and the growing disaffection and distrust toward public politics and the form of representative democracy (Moss & Coleman, 2014; Bartoletti & Faccioli, 2016). Indeed, nowadays, governments and policymakers are recognizing how complex issues, such as climate change, the regulation of emerging technologies, the crisis of the traditional welfare state, urban planning and territorial development, as well as the delivery of public services, require a more holistic and participated approach in order to improve the quality and the effectiveness of the processes behind public policy making. Moreover, it is important to underline that citizens are more and more actively exposed to new media (access to open data, online petitions, online alternative and counter-information), which disclose novel opportunities to coordinate the voice of the people and collective initiatives. In this way, citizens seem to be more informed and much more aware of certain relevant public issue, thus becoming more attentive in monitoring both the government's "policy performance" and their capacity in providing tangible, positive outcomes for the sake of society (Bennett, 2008; Bennett & Segerberg, 2012).

According to policy making scholars (see Birkland, 2016), citizens require to be informed and supported to articulate their collective action and their voice. At the same time, policy makers and governments may develop a peculiar sensibility and actionable strategy to shape a constructive dialogue, thus to properly act on the basis of the feedbacks and information collectively elaborated by citizens. This position derives from the assumption that the 'one-size-fits-all' paradigm in policy making no longer works, since local, historical, cultural and socioeconomic variables play a crucial role in defining specific needs, expectations, as well as the quality of interactions between citizens, stakeholders and public administrations (Jun & Bryer, 2017; Hong & Cho, 2018). More in detail, over the last decade a growing body of research has begun to reconsider the policy making process within the "co-creation" frame. The notion of co-creation has its origin in the field of management and product design, as a strategy that brings different actors together (firms, group of customers) in order to jointly produce a mutually relevant outcome (see O'Hern & Rindfleisch, 2010). On the basis of this perspective, both scholars and policy makers have emphasized how engaging with stakeholders and citizens in co-creation for policy making can allow the definition of more consistent, sustainable and appropriate policies, in relation to the specific situated context in which a policy measure is expected to be implemented (Voorberg et al., 2015; McGann et al., 2018). In this sense, it is becoming more and more relevant in the practices of policy making to involve and locate concerned groups of people at the centre of the policymaker's activities, in order to allow citizens to assume a legitimate pro-active public role, in terms of collaborators and creators, and not as mere passive policy targets (Benington, 2010). In this respect, it is crucial to develop an in-depth understanding of the key conditions and pre-requisites required to have a sustainable and effective co-creation process for policy making. With this aim in mind, we develop a comprehensive analysis of the debate over the introduction of co-creation methodologies, by scrutinizing different major sectors mainly affected by this approach in designing and implementing policies and related outcomes. In this sense, we aim to search in literature for 'process conditions' that have been designed or discussed to shape valuable attitudes, behaviours and experience in co-creation practices supporting policymakers. In more details, we consider process condition and activity principles as key elements, which can facilitate or hinder the contribution of the co-creation approach in policy making. In so doing, we aim at opening the 'black box' of co-creation, by focusing on how and under which conditions co-creation can be usefully enabled in policy making landscapes.

2.2 Co-creation landscapes in policy making

Traditional and mainstream approaches in policy making seem to be inadequate not only in responding to the main challenges which affect the regional, national and transnational policy agenda, but also in considering the multifaceted needs of concerned groups of people and local communities. During the late 2000s, some global institutions started to reflect on the conditions and potential tools oriented at sustaining the definition of policies that engage the general public. One of the most relevant documents has been produced by the OECD[3] under the aegis of the "OECD Ministerial Meeting on Strengthening Trust in Government" (held in 2005 in Rotterdam), with the aim of outlining "a way for governments to improve their policy performance by working with citizens, civil society organisations (CSOs), businesses and other stakeholders to deliver concrete improvements in policy outcomes and the quality of public services" (OECD 2009, p. 13). In a similar vein, in September 2011, eight founding governments (Brazil, Indonesia, Mexico, Norway, the Philippines, South Africa, the United Kingdom and the United States) launched *The Open Government Partnership* (OG[4]), a multilateral initiative oriented to develop concrete commitments from governments to promote transparency, empower citizens, fight corruption, and harness new technologies to strengthen co-creation in policy making. These two emblematic initiatives can be labelled as "citizen-centric" policy making processes (instead of administration-centric and hierarchical), and are based on the assumption that the involvement of citizens, especially those located in marginal or vulnerable areas, can render the policy making more transparent, accountable and responsive to the situated expectations, thus increasing public satisfaction and reducing the public spending. In this respect, it is worth noting that citizen expectations should not be seen as a monolithic entity, but rather composed by ambivalent and heterogeneous needs. Therefore, centralised hierarchical processes of involvement can be unable to meet the multiple, public voices and needs. For this reason, an effective co-creation process in policy making requires being iterative and able to capture the feedbacks arising from the citizens after the implementation of the specific policy measure. In this sense, differently from traditional policy making which is characterised by consultation with stakeholders late in

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[3] OECD 2009. Studies on Public Engagement Focus on Citizens public Engagement for better policy and service http://www20.iadb.org/intal/catalogo/pe/2009/03785.pdf

[4] https://www.opengovpartnership.org

the process, usually when problem definition has occurred, co-creation highlights the significance of early engagement with citizen and stakeholders. In this respect, according to Creţu (2016), author of the report "Co-creating Public Policies or Ways to Bring Citizens into the Process" for the European Public Sector Information Platform (funded by the European Commission under the eContentplus programme), it is crucial to be aware of whole spectrum of roles that citizens can perform in co-creation for policy making. Creţu, drawing on the classification of roles for citizens in public sector co-creation elaborated by the IBM Center for Business, outline the following profiles:

- Citizen as explorer: This profile implies skills in defining emerging problems of which government agencies and policy making are partially unaware. Citizens, starting from their everyday life experiences, are best located in articulating and signalling relevant problems which affect the local or regional community;
- Citizen as ideator: This profile concerns the ability of citizens to render local knowledge and information about their specific needs actionable in order to improve existing services, or elaborate innovative solutions to civic problems;
- Citizen as designer: This profile can be boosted by a range of IT-based tools that support knowledge sharing, visualization and virtual prototyping in order to design and develop implementable outcomes and solutions to defined civic problems;
- Citizen as diffuser: This profile implies abilities in stimulating the community at different levels to adopt a suitable solution developed via a co-creation approach by the government.

These roles imply more than asking citizens just to participate, following deliberative procedures, to the production of policy measures, since co-creation can change knowledge and assumptions about who is responsible for the definition of public service delivery and in allocating public goods and resources.
In a similar vein, Voorberg et al. (2015) provide a classification of the manifold forms of co-creation, by distinguishing three typologies which differ in their degrees of citizen involvement: i) citizens as co-implementers, which implies performing some implementation tasks, traditionally carried out by local or national government; ii) citizens as co-designers, in which the involvement lies within the public organizations. Concerned groups of people can define the content and how the service delivery is being designed; iii)

citizens as initiators, which take the responsibility to formulate and propose specific initiatives, regulatory measures or implementable services. In this last case, the public authorities or the government are actors that may act on the basis of the citizen's inputs. Furthermore, Voorberg and colleagues (2015) have outlined relevant factors that may influence the conditions under which citizens can actively participate in co-creation programs. More in detail, they have identified factors that act both on the organizational and citizen side. Firstly, on the organizational side, the *compatibility of public organizations to citizen participation* represents a critical dimension related to the presence or the absence of a culture of openness and transparency within public institutions, as well as the level of development of infrastructures and training facilities to communicate both with citizens and heterogeneous stakeholders (see Bovaird & Loeffler, 2012; Andrews & Brewer, 2013). Second, the *attitude of public officials and politicians toward public accountability* may strongly affect the modalities through which co-creation take place, by demarcating the legitimate profile of actors to be involved in co-creation initiatives promoted by public organizations (Roberts et al. 2013). In close connection with this last dimension, the authors also mention the *risk-averse administrative culture* as an important factor, which can influence administrators and politicians in involving citizens as reliable and active partners (Baars, 2011). Finally, Voorberg and colleagues (ibid) argued that some scholars underline the relevance of shaping a clear and accountable system of incentives for boosting participation in co-creation programs (Fuglsang, 2008).
Regarding the citizen side, *personal characteristics*, intrinsic values, and biographic dimensions (education and family background) of citizens have been considered as determinant factors in influencing the willingness and modalities of taking part in co-creation programmes (Wise et al., 2012). Furthermore, the *sense of ownership* and the *perceived ability* to participate in the public sphere can play a pivotal role in how citizens can co-define and influence policy programmes and public services. In addition, social capital and the extension of social networks are elements in interplay in the shaping of the modalities of citizen involvement in co-creation (Schafft & Brown, 2000). A last important influential factor seems to be the degree of trust people have in co-creation, as a suitable framework to address and solve emerging needs.
As we mention above in relation to organizational factors, the presence of a clear structure of incentives may be important in stimulating citizen involvement in co-creation initiatives for policy making, and for the co-production of public services (Alford, 2002). Recently, Western governments are resorting more and more to financial incentives, as a strategy of

conferring value, in a transparent and accountable way, to citizen engagement. In this respect, a recent experimental study carried out by Voorberg and colleagues (2018) has showed that both substantial and small financial rewards are irrelevant in increasing the citizen's willingness to take part in co-creation initiatives. Since financial incentives does not seem to be a cost-efficient instrument in boosting co-creation, the concerned study suggests that governments and initiators of co-creation initiatives should strengthen social motivations (e.g. solidarity, charity) instead of sustaining engagement by means of financial rewards.

2.3 Co-creation for policy making in practices

As we have outlined in the previous sections, scholars have highlighted how co-creation represents a promising approach to shape and strengthen generative relationship among citizens, public organizations and stakeholders in order to orient policy making processes. Under this perspective, in co-creation initiatives, citizens are not considered as mere targets of specific policy measures, but rather as relevant agents who bear values, abilities and resources which can be enabled in designing or changing policy frameworks or public services. Despite the fact that policymaking is a recent object of co-creation, scholars have started to question what it is exactly, and how it is performed in practice. In the next section we discuss the cumulative body of research on co-creation for orienting policy measures in relation to the main sectors affected by this novel approach. In particular, we focus our attention on the following domains: i) public service and welfare innovation; and ii) urban planning and territorial development.

2.3.1 Co-creation for policy making in public service and welfare innovation

Nowadays, in a context of systemic crisis, public policies, as well as the practice of policy making in itself, need to be continuously redefined and readjusted in order to face unexpected problems, or deal with emergency situations which can affect our turbulent societies. In this context, policy makers and governments consider co-creation with citizens and stakeholders a valuable perspective to define and implement innovative public services able to meet the needs of citizens in relation to the major societal challenges, such as ageing, work instability, public health, and so on. Recently, the European Commission has put particular emphasis on co-creation, arguing how the complexity of today’s public issues

and societal demands require to be taken on by the public sector in cooperation with diverse stakeholders and concerned groups of lay people (Alford, 2009). Thus, especially at the local and regional scale, governments seek to co-create and innovate public welfare services and solve social problems, by actively involving citizens,

According to Torfing and colleagues (2016) "the public sector is currently being transformed from a legal authority and a service provider to an arena of co-creation" (p. 2). Under this perspective, co-creation is configuring as an emerging public administration paradigm, implying a new style of thinking regarding policy making and public service delivery (OECD 2011). Thus, Torfing et al., by framing the public sector as an open ended setting for co-creation, have argued that citizens are not mere co-producers of their own public or welfare services. Rather, under the aegis of co-creation, concerned groups of people can be involved in generating value for other citizens, by means of collective voluntary work carried out with public organizations in order to improve and innovate existing services through iterative processes of adjustments. In this sense, the transformation of the public sector as loci for co-creation implies that affected actors, public organizations, stakeholders and other professionals cooperate across institutional boundaries, thus enabling a constructive translation of competences, knowledge, and ideas with the aim to boost public and welfare services in terms of regulatory frameworks, policies and implementable plans (Bovaird & Loeffler, 2012). Consequently, thanks to the early engagement of people in co-creation, what is at stake is not only the co-production of a public service or a policy in itself, but rather the modalities through which a problem is defined as such in relation to a shared ways of solving it.

Torfing and colleagues' study mentioned above seems to be adequate in providing a well understanding of the main emerging trends opened up by co-creation in Western societies. However, for the purposes of this document, it worth noting that only a few empirical investigations have provided evidence for a such vigorous active engagement of citizens in policy making processes. In this regard, Pestoff (2006) presents the main findings of a comparative study on parents' participation in public service provision for childcare. The study is based on the TSFEPS project "Changing Family Structures and Social Policy: Childcare Services as Sources of Social Cohesion", a comparative European investigation carried out between 2002 and 2005 in eight European nations (Belgium, Bulgaria, England, France, Germany, Italy, Spain and Sweden). Generally speaking, the author shows how parents are much more involved in a form of auxiliary or ancillary activity of co-production by making donations or spending time on voluntary work. Thus, citizens seem to be

restricted to the role of co-implementers. However, in some countries like France, Germany, and Sweden (characterized by well-known, long-standing tradition of top-down public engagement and active citizenship), parents are also engaged in more complex activities of co-creation, by taking active part as co-designers in user boards that oversee the management of the day care facility. Furthermore, Pestoff mentions that in these countries, parents may even act as co-initiators, co-creating new alternative self-owned childcare facilities, which can be managed by means of a board composed by both public and private actors and financially supported by the local municipalities.

Vamstad (cited in Pestoff, 2012) has carried out a similar study in 2007 about the governance of the Swedish welfare state, by focusing on the parents' participation and service quality in preschool facilities. The study highlights how co-operatives managed by parents can enhance greater participation in economic and political terms, thus achieving better quality preschool services than those provided by the local government or by private actors. The concerned study clearly demonstrates that the co-operative model may be a suitable organizational form for sustaining co-creation. Thus, the author argued that public or private for-profit services enable weak forms of participation, strongly limiting the possibility of parents to influence the management of the services. Even though many countries in Europe are developing their own way to boost co-creation for policy making in public service and welfare innovation, generally speaking, the last two studies mentioned above allow us to underline not only that citizen participation in co-creation initiative may involve different dimensions related to economic, organizational and social factors; but also that the different providers of welfare services can have a critical influence in determining the agency of citizens in co-creation (see Meijer 2011).

Another example of the changing forms of co-creation in public service provision is presented in Jetté and Vaillancourt's study (2011) about elderly care in Quebec. In their study, authors have showed how simple form of co-production can be the driver of more complex form of co-creation. More in details, Jetté and Vaillancourt outline how the so-called "domestic help social economy enterprises" (DHSEEs), that primarily provide housekeeping services for individuals with physical or cognitive disabilities, can become crucial partners in the policy making processes that gradually came to innovate and co-create service delivery for elderly people at large.

An interesting and novel perspective over co-creation is provide by Pestoff, Brandse and Verschuere (2012), which locate the citizen participation in the innovation of the public sector and of the welfare system within the frame of the so-called "information society".

According to Pestoff et al., co-creation seems to greatly benefit by the adoption of ICT technologies and on-line based platforms, as a way to shape new and more effective forms of peer production and coordination among public agencies and citizens within policy making, governance innovation and public services production (Meijer 2012). Under this perspective, Pestoff and colleagues define co-creation as a form of "peer production" that allow for the definition and implementation of public services by means of self-organized communities composed by concerned citizens, rather than by paid professionals and experts. In continuity with this strand of research, Kokkinakos et al. (2012) provide an overview on how Web 2.0 social media can allow the building of *ad hoc* collaboration platforms for managing co-creation programs between groups of citizens, and between citizens and public administrations, thus encouraging sharing knowledge about citizens' opinions on public service delivery. According to Kokkinakos and colleagues, online-based platforms can bring policymakers closer to the public's needs in order to co-create cost-effective public services. In a similar vein, Accordino (2013) presents an in-depth understating of the "Futurium platform" used by *Digital Futures* (project launched in July 2011 by the European Commission's Directorate for Communications Networks, Content and Technology). Even though the platform was primarily developed with the aim of hosting and managing visions and policy insights generated within Digital Futures project, it is rapidly evolved in a platform for co-creation, with the aim to experiment new policy making models, called "Policy Making 3.0.", rooted in stakeholders and citizens participation in problem framing, definition and assessment of policy measures. Overall, co-creation in the public sector is characterized by the mutual engagement of State and non-State actors, which can greatly benefit from the adoption of ICT for the management of the flow of information, thus favouring citizens to act not only as recipients of information, but also as producers of meaningful knowledge.

2.3.2 Co-creation for policy making in urban planning and territorial development

Policy making in urban planning and territorial development has been intensely characterized by public participatory programs, as an attempt to involve citizens and various stakeholders with the primary aim of shaping a more responsive culture of urban management and local sustainable development. Thus, public debates, consensus conferences, citizen forums and deliberation initiatives, it is argued, may enact responsible urban planning (see Al-Kodmany, 1999; Needham, 2008; Davis & Andrew, 2017). In a

seminal contribution, Ben-Ari (1990), for example, analyses the cultural assumptions in which the involvement of citizens in garbage disposal services in a Japanese city is rooted. In this study, urban residents can be considered as a mere co-implementer of new policy in waste management, since they are required by a public organization to act in accomplishing some punctual prescribed tasks, such as separating types of garbage, thus supplanting the work of paid officials. According to the author, this kind of involvement intends to both supplant the work of paid workers with the service-directed activities performed by urban residents and search for more efficient and quality municipal services. However, in more general terms, the main reasons behind the growing public involvement in policy making matters related to urban management or local territorial development principally derive from the recognition of the human right to democracy and procedural justice (see Rowe & Frewer, 2000), or from a pragmatic assumption that the implementation of undesired local regulation may provoke protests and reduce trust in public authorities.

In more recent times, due to the complexity of emerging issues related to industrial transitions, urbanization and population growth, governments are soliciting the implementation of new participatory initiatives which embrace an early engagement of citizens (Rydin & Pennington, 2000). In this sense, nowadays, cities are considered fundamental units for co-creation policy making that may have significant beneficial consequences on quality of life, including those that shape individual urban behaviour, such as garbage collection, water treatment and infrastructure development (Dork & Monteyne, 2011; Nevens et al., 2013; Leendertse et al. 2016; Graversgaard, 2017). In this respect, some authors consider the multiple experiences of open-innovation ecosystems, such as living labs, as virtuous examples of co-creation policy making occurring in cities or urban agglomerations (Nevens, et al. 2013). This kind of co-creation experiences may involve urban governance co-creation by means of experimentation and assessment of innovative scenarios and concepts, and the consequent implementation of technological products in real life use cases. Coherently with a co-creation sensitivity, use cases engage citizen communities, concerned groups of people and stakeholders not as observed actors, but as active agents in the process of problem definition and in the creation of possible solutions. Analytically speaking, urban co-creation for policy pursues the aim of redistributing, at the local scale, the agency to intervene in defining the modalities and instruments to manage public issues, by bridging the gap between experts and lay people.

In this sense, co-creation should enable the translation of experiential knowledge of inhabiting urban environments into actionable policy measures.

Under this perspective, Leenderts and colleagues (2016) analyse urban policy co-creation between public planning authorities and stakeholders on shaping the transport infrastructure in the Netherlands. This kind of infrastructure not only provides access to specific urban areas, but also determines the spatial quality. In particular, the authors present the case study of the Blankenburgverbinding, a new infrastructure to the west of Rotterdam, crossing a highly populated area including relevant ecological zones. The process of co-creation described in the study required stakeholder engagement by means of the so-called *Strategic Stakeholder Involvement* (SSI), which combines traditional stakeholder management, oriented at minimizing risks caused by parties with divergent interests, with the principles of "issue management" and "project management". More in detail, design tables and workshops were the modalities through which stakeholders were actively engaged in the planning and design process with the purpose to collect relevant information about the area and to keep the participants informed about the process. In analysing the performance of the concerned co-creation process, authors argued that, since the project evolves over time, it is required to be transparent by keeping the stakeholders continually informed about the planning and the on-going process, including unexpected changes. In this sense, transparency principles in co-creation imply sharing with stakeholders not only what has been done, but also what public authorities are doing and in which ways. In terms of lessons learned, the authors underline how the action of co-creation implies the performance of complex roles in the decision-making process, and consequently the crucial aspect of carefully selecting participants. In general, participants tend to act under the pressure of their idiosyncratic interests, thus a regular process of participation assessment may be useful to guarantee a balanced decision-making process that embraces the heterogeneity of positions.

Assuming a more analytical sensitivity, Wipf, Ohl, and Groeneveld (2009) described how citizens invited by local authorities could actively participate in the design and maintenance of outdoor recreation. The authors explore the generation and operationalization of policy regarding the case of outdoor activities, by paying particular attention to the ways in which participants co-develop a tool for the management of conflicts over the use of natural spaces for the purpose of sport. The initiative was launched in 2004 in the Alsace region (France) under the supervision of an advisory body, with the aim to co-create a "departmental plan" for the management of outdoor sports. This

initiative is rooted in the need to reduce the environmental impact of outdoor activities, such as the nuisances inflicted on fauna and flora, by the creation of participative systems (meetings for public debate, consultative commissions). According to the authors, the main risk of this initiative regarded the possibility that conflicts would emerge around a regulatory measure devoted to ban certain outdoor activities. In order to manage such a conflict, the public authorities adhered to a set of universal principles to safeguard the environment, which was conceived as a common good. Among the most relevant effects related to this approach, the authors mention: i) the shaping of tolerant behaviour and the reinforcement of internal cohesion; ii) the development of a positive attitude toward common interest; and iii) the strengthening of the idea that participative procedural justice can enable citizens to propose acceptable arbitration. In this way, the authors emphasize how the co-creation initiative was crucial towards allowing citizens to reinforce a general culture of justice over the natural spaces.

Other authors have paid attention to water management. Even though this field has been traditionally hegemonized by experts and public authorities, nowadays public actors, stakeholders, NGOs and citizens are more and more mutually engaged in the co-creation of water management initiatives. In this respect, co-creation is a relevant approach since water management bears great relevance on regional and local governance, as well as on an ensemble of economic activities such as fisheries, industries and intensive farming. According to Torfing and colleagues (2016) one of the main problems in water governance concerns the lack of funding for the building and maintenance of the infrastructures. In this regard, co-creation has been helpful in many cases, such as in Kansas where a team of 42 volunteers worked with state government to construct and manage a 12-mile pipeline for helping farmers located in a remote area to get water. Here, co-creation proved to be a cost-effective strategy, since volunteers completed the pipeline faster than expected in the initial plan, and with a significant reduction of costs (ibid). A recent study by Edelenbos, Buuren, and Schie (2011) provides a detailed description of two Dutch water management projects supporting the co-creation of policy actionable knowledge through the participation of bureaucrats, experts and stakeholders. Authors emphasise how in both cases the selection of experts and stakeholders is a political and biased process that affect the whole process of knowledge co-production. Thus, the interaction among the bureaucrats, experts and stakeholders may be strongly problematic and, consequently, the different political values distort the process of co-production of relevant knowledge for water management. Firstly, the paper shows how both bureaucrats and experts are not

willing to recognize the stakeholder knowledge as relevant for problem definition and for the elaboration of suitable solutions. At the same time, stakeholders are recalcitrant in acknowledging the political and strategic relevance of expert knowledge, since they are much more concerned with pragmatic issues considered appropriate for them, and undervalue input of bureaucrats and experts. Overall, the work of Edelenbos, Buuren, and Schie (2011), by assuming an analytical posture, underlines relevant barriers to co-creation, related to the conflict in knowledge sharing between public and private actors.

The relevance of co-creation in developing and implementing cost-effective policies has been recently investigated by Graversgaard and colleagues (2017). Authors present a multi-case study on the establishment 23 regional water councils in Danish in order to co-create and provide knowledge to Danish authorities for the development of the so-called "River Basin Management Plans (RBMP)". The water councils were in charge of advising public authorities on the implementation of regulatory measures to improve the management of the Danish network of streams. The findings of the research suggest that the constitution of water councils and the adoption of a co-creation logic of action in water planning has significant advantages, such as the translation of lay local knowledge into actionable efficient solutions at lower costs. According to the authors, the early engagement of stakeholders in co-creation water management allows for the development of regulatory measures that are highly sustainable both in economic and environmental terms.

2.4 A comparative understanding of co-creation for policy making

On the basis of the literature review, co-creation-driven policy making circumscribes a frame oriented to regulate relevant public issues by adopting a "horizontal" and early engagement of citizens and stakeholders throughout the process: from problem definition, through data collection, to the definition, implementation and assessment of the policy. In general terms, co-creation is a dialectical process of bringing different perspectives (governments, citizens, stakeholders, NGOs) to bear on a problem.

The advocates of this approach argue that specific neglected problems and needs, which may affect local communities or vulnerable groups of people, could become more salient and the object of public policies, rendering them more sensitive to the local context, and thus more effective (Cacari-Stone, 2014; Firmstone & Coleman, 2015). In this sense, co-creation is a matter of aligning different contexts, cultures, beliefs and knowledge (for example lay and expert knowledge) within a frame of collaboration and partnership, which enact policy making as a non-linear, open-ended and iterative process. In performing such an alignment, co-creation enables a learning process, within which actors can learn new competences and acquire relevant knowledge by interacting with particular groups of interest in order to face peculiar social challenges. Under this lens, a co-creation framework can allow individuals, public institutions and other collective organizations to consider alternative sources of knowledge, information and experiences, which go beyond the traditional and established institutional settings for policy decision-making.

Analytically speaking, co-creation, by enabling "informational engagement", allows for citizen 'lay knowledge' to be considered as a complementary experiential source of critical insights to be rendered actionable in (re)designing public services and public policy measures (Firmstone & Coleman 2015).

By focussing on the case studies detailed in the previous sections, co-creation can sustain an enlargement of the opportunities for civic collaboration, including citizens, stakeholders, and public issues not involved before (Firmstone & Coleman, 2015). Nevertheless, it seems that consistent and appropriate procedures have still not been defined, particularly regarding how the views and lay expertise of citizens can be effectively taken into account and used both for policy generation and assessment. By assuming a comparative perspective in analysing experiences rooted in co-creation for policy making, there seems to be slight variations in the different contexts, regarding the strategies and tools employed to launch civic collaboration, and to manage public debate

and open discussion. In this respect, one the main criticalities concerns the selection procedures for persons and groups to be involved in co-creation. In the most relevant case studies, co-creation is confined to small groups of informed and well educated people, thus neglecting citizens with a lack of cultural and social capital, and reproducing social and economic inequalities among citizens (Norris, 2002; Rosanvallon, 2011; Coleman & Firmstone, 2014). In this respect, there is the need to carefully analyse how citizens are selected or self-selected, and how the intensity of collaboration (in terms of disaffection in respect to the engagement procedures) evolves during the co-creation process. Addressing these issues, it may allow for a better understanding of both the relevance of co-creation in sustaining the trust in the public administration, and the ability of specific stakeholders and citizens groups to be effective representatives in the definition of policy measures.
Given this state of affairs, it is however important to recognize that co-creation can be a relevant perspective in public policy generation and assessment, as it takes into account different partners' visions and improves reciprocity in managing social challenges.
According to our case study review, an effective co-creation initiative requires framing civic collaboration in a systemic perspective, paying particular attention to general scenarios in which the local variables are embedded. This aspect emphasises how co-creation is not a linear mechanism of increasing civic collaboration in policy making; but rather an ambivalent, territorially situated process, which can be articulated in a differential way because of the manifold dynamics between macro variables (i.e. national and transnational governance processes), meso-organizational arrangements (i.e. network of public organizations, consortium of NGOs and strategic stakeholder alliances), and local needs and variables. In this sense, initiators of co-creation experiences are required to manage a multi-scale and multi-directional dialogue through information collection and dissemination at the local, regional and national level. This dimension implies the shaping of a "community of knowing", which could be able to generate policy measures tailored to the specificity of the concerned local context and, at the same time, consistent with the wider social, economic and political dynamics that act at the macro and meso level.

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3 Co-Creation in STI policy making: state of the art, criticalities and perspectives

3.1 Introduction and Review of the literature

Co-creation in science, technology and innovation policy has been experimented with for more than 20 years, particularly in the aftermath of a series of public science controversies UK. In this section, we give a brief map of the genealogy of co-creation in STI policy making and review the key lessons learned from the academic literature evaluating practice.

Arguably, policy co-creation dates back to the participatory democracy of ancient Greece, whereby the process in which citizens publicly discuss and debate laws was seen as a way of reaching better decisions than by experts acting alone (Carpini et al., 2004). However, many of the modern ideas around public participation and experiments in democracy draw upon the ideas of John Dewey in the early 20th Century. He argued that as the world became industrialised, the issues faced by politics was becoming increasingly complex. As a result, ordinary citizens were unable to perform the governing role that traditional democratic theory gave them, and so Dewey made the case for participatory democracy – rather than increased roles for experts (Dewey, 1927). In his views, citizens didn't need to be involved in controversies because they were matters of public concern, but because citizen involvement offered the best way of resolving those controversies. 'The public' in his terms is made up of citizens whose common interest is focused on alleviating these negative externalities.

Nevertheless, during the late 20th Century, public concerns around scientific and environmental developments such as nuclear power and industrial pollution came to be seen by many scientists and policymakers as 'problems' that need to be solved and which arose as a result of public ignorance. They argued that problematic views, irrational fears and sensationalist media coverage could therefore be brought around through more information and education – an idea that came to be known as 'the deficit model'.

However, as the way in which people form views around risks and new technologies become more understood, and as the relationship between lay and expert understandings were explored further, little evidence emerged to support this deficit model. In the simplest terms, research in fields like Science and Technology Studies (STS) found that the relationship between knowledge of science and support for it was much more complicated than that suggested in the deficit model. People's attitudes to risk and technologies varied from technology to technology and between different social groups. In some instances –

particularly around controversial technologies – people's attitudes tended to become more polarised when they knew more about that technology (Evans & Durant, 1995).

Brian Wynne (1998) investigated the nature of expertise in conflicting situations and highlighted the existence of 'lay expertise', Looking at the handling of advice on the nuclear fallout from the Chernobyl disaster in the 1980s, he described how Cumbrian sheep farmers' predictions of the soil's response to the fallout proved to be more accurate than the 'expert' models. While the farmers were considered non-experts in contrast to the scientists brought in by policymakers, they nevertheless had an understanding of how the soil metabolized radiation, and how sheep interacted with the grass and soil. Their knowledge however was based upon day-to-day interactions with the living world rather than statistical models and laboratory experiments. Wynne argued that this case demonstrated how the designation of 'expert' was a function of *how* particular actors understood the world, rather than *what* they understood. When conflicts arise, he argued that it is often not simply a matter of ignorance or misunderstanding on the part of non-experts, but a question of placing importance on different issues, questions or perspectives.

Importantly, alongside this, we understand that science is a very human activity, shaped by the social and material worlds we live in as much as the natural world being studied. Scholars in the sociology of science have argued that the neutrality and objectivity credited to scientific approaches often obscures significant judgements and value based choices that shape the outputs of science, technology and innovation. In other words, the values and visions of those doing the science and developing the technologies are deeply embedded in the science we do and technologies and innovations we develop.

This appreciation of the constructed nature of science and innovation, and the values and decisions that are enacted through them, has led to calls for more participatory approaches to science policy and scientific governance, particularly in the face of public controversies, such as those around Bovine Spongiform Encephalopathy (BSE), nuclear waste or climate change (Callon, Lascoumes, & Barthe, 2001; Giddens, 1998; Jasanoff, 2003; Wynne, 1993). New techniques to involve citizens in policy decisions in fields ranging from environmental management and urban planning, to patient involvement in medical decision-making and international development (Barnes et al., 2007).

Bringing together many of these ideas around democracy, uncertainty and the social nature of science and technology, a practice called Participatory Technology Assessment (PTA) arose in Europe during the 1980s and 1990s (Griessler et al., 2011). PTA is a process (or series of processes), which aimed to broaden the knowledge base of decision-making by

taking an interdisciplinary approach to identifying the possible positive and negative implications of a technology in order to make political decision-making more informed and rational. Joss and Durant argue that such participatory processes were rooted in a 'dialogue model' of the public understanding of science, in which the key activity is two-way or multi-way communication between scientists and non-scientists, with the aim of creating greater mutual understanding, which may or may not lead to greater accord between scientists and non-scientists (Joss & Durant, 1995).

A number of European countries took up this approach during the 1980s and 1990s, most notably the Danish Board of Technology, which developed and ran a series of 'Consensus Conferences'. The Netherlands also took up the idea, organising a consensus conference on genetic modification of animals in 1993. In 1994 London's Science Museum organised the UK's first consensus conference on plant biotechnology (see Dale, 1995; Joss & Durant, 1995a, 1995b for descriptions of the event) and the UK Government took up the idea more widely in 2004, setting up the ScienceWise programme to involve citizens in policymaking around science and innovation.

More recently, we have also seen the emergence of 'Citizen Science', which sets out to allow members of the public to participate in science at various levels. Originating in a book of the same name, Alan Irwin's original conception of Citizen Science was as a way to create more active 'scientific citizenship' by bring the public and science closer together through dialogue and decision-making around environmental risks (Irwin, 1995). The term was however adopted to refer to projects that involve citizens in the 'doing' of science – gathering or analysing large amounts of data, for example. More recently however the concept of Extreme Citizen Science (ExCiteS) has emerged, which moves closer to Irwin's original ideal (Haklay, 2013). In Extreme Citizen Science (ExCiteS) scientists and non-scientists work together to decide the scientific problems to work on and how to collect and validate data. Participants can potentially be involved in analysis, publication and use of data if they wish (Haklay, 2013).

3.2 Lessons learned from public participation/co-creation in science and technology policy to date

In this section we summarise the key lessons from the literature evaluating public participation and co-creation activities to date.

- **Public need to be involved in defining and framing problem to be solved/question to be answered.** Evidence of impact on policy, and lessons of what worked, is still very limited. This appears to be because there has been little research into policy impact (Rowe and Frewer, 2005; Emery et al 2014) and because research that has been done has found little evidence of impact (Hansen & Allansdottir, 2011; Kurath & Gisler, 2009; Loeber et al., 2011). Typically, the reasons given for the lack of impact focus on the lack of reflexivity of the policymaking institutions – that the problems policy sets out to solve and the role of science, technology and innovation in that solution are pre-determined and not open for discussion. This leads to potential misunderstandings, frustrations and failings, as public participants feel that they are simply being asked to market test the acceptability of technologies and Institutions appear to see public participation as an opportunity to gain trust for a predetermined approach, rather than to rethink their policies and practices (Chilvers, 2012; Macnaghten & Chilvers, 2014; Stirling, 2007; Thorpe & Gregory, 2010; Wynne, 2006). Instead, scholars argue that it is vital that the problems to be solved and the kind of solutions sought are framed by public participants at the start, such that the problems and solutions are co-created. The 'ScienceWise guiding principles for participation in science and technology policy'(2018)[5] echo this, recommending that participation commences as early as possible in the policy/decision process. They also suggest that "where appropriate we will work with participants to agree framings that focus on broad questions and a range of alternatives to encourage more in-depth discussion. For example, we might start by asking, "How do we provide for our energy needs in the future?" rather than by asking "should we build new nuclear power stations?" " (Sciencewise, 2018).

- **Work needs to be done to establish the credibility and value of public perspectives and inputs.** There have also been indications that policymakers do not consider social knowledge as equal to 'expert' technical knowledge (Kurath, 2009) such that the role of the public is limited to discussion questions of values and ethical issues, rather than exposing 'expertise' to scrutiny (Kurath & Gisler, 2009;

[5]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/673990/sciencewise-guiding-principles.pdf

Wynne, 2006). For instance, research looking at the policy impact of public debates around GM in New Zealand found that the value focus of public discussions led to public views being deemed 'alternative science' and therefore not credible, in preference for technical expertise. Questions around representativeness and scale of participation also arise in policy discussions of public involvement in decision making. In participatory technology development exercises, the focus of practice has tended to be on diversity and dissent, rather than questions of reciprocity, accountability and reason (Lovbrand et al., 2010). The basis of representativeness (who is present at the dialogues and who do they speak for) is also often unclear (Sturgis, 2014), raising (for policymakers) important questions of legitimacy and accountability. At the same time, the guidelines produced by ScienceWise, the UK Government's expert resource centre on public participation in policymaking, recommends that dialogue takes place within "a culture of openness, transparency and participation with sufficient account taken of hard to reach groups where necessary". They also recommend that techniques and processes are employed which are sufficiently credible to policy makers to enable them to take the dialogue into account in decision making.

- **The outputs of participation and cocreation need to 'fit' within the machinery of policymaking.** There is a paradox within the move towards co-creation: On one hand, for co-creation to offer genuine alternatives to politics as usual, it needs to be distinctively different from other modes of policy advice. On the other hand, if they are too 'alternative' they risk being ignored (Biegelbauer & Hansen, 2011) or unable to be processed by the policymaking machinery (Smallman, 2018). The relationship to policy – in particular weak links to policymaking – are seen as further significant inhibitors of impact (Abels, 2007; Emery et al. 2014; Kurath, 2009). Participatory procedures, especially those dominated by lay people, have also been criticised for producing very unspecific and broad results that are hard to integrate into policy-making (Abels, 2007; Kurath, 2009). Van Eeten (2001) argues that it is the problematic nature of reaching conclusions in public dialogue activities that makes the substance of what is being said difficult for policymakers to incorporate. Discussions generate varied views, which are difficult to focus into clear outcomes or conclusions that would be policy relevant and a basis for collective decision making. Following on from this, and the point above, ScienceWise (2018)

recommend that it is important to ensure that policy makers and experts involved in the participatory exercise are competent in the techniques and requirements of participation as well as in their own areas of specialisation. They argue that it may be necessary to put in place measures to provide support or to build the capacity of the public, experts and policy makers to enable effective participation.

- **Need to involve policymakers in the whole co-creation process.** Participatory techniques have however been found to bring significant benefits to participants. For example, participants in UK GM Nation debate reported that they had found the experience enjoyable and constructive (Rowe, 2005). ScienceWise also reported that where policymakers had been actively involved in the participatory process, they were more positive about public participation and appeared to take more account of the outcomes, allowing greater policy impact (Warburton, 2011). They went on to recommend that participatory processes assure feed into public policy through commitment and buy-in from policy actors (Sciencewise, 2018).

- **Measuring impact on policy is complex and requires a long timeline.** Policymaking is a complex and not necessary linear or cyclical process, which draws on many sources and drivers. Timelines can be long and so it is very difficult attribute cause and effect (Culyer & Lomas, 2006).

- **Context matters.** A standard approach to co-creation in policy is likely to be difficult as they way in which public participation exercises are embraced by policymakers (and citizens) appears to be context specific. In particular, numerous studies have found how important the democratic context is. Participation and co-creation considered to be better suited to more open and less 'paternalistic' political systems (Beigelbauer and Hansen, 2011). For example, the Swiss political culture, which emphasises consensus and has a strong measures for direct democracy is arguably better suited to incorporate the results of participation than a country such as Austria, which has a more 'corporatist' approach to democracy, relying more heavily upon expert sources (Loeber et al., 2011). For example, while 'Living Labs' is a familiar concept in most Scandinavian [and continental European countries?] it is an un-adopted idea in the UK. This presents particular challenges for scaling and transferring participatory models. The Sciencewise Guidelines highlight the importance of institutional context, arguing that "the means by which dialogue can

impact upon policy and decision-making will be specific to each organisation involved in the dialogue process and each issue under consideration." (Sciencewise, 2018). This means that it is important that the extent to which participation can influence policy is acknowledged up front and that organisations consider their own institutional arrangements and working practices to ensure effective application of dialogue processes.

3.3 References

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4 Design for policy making

4.1 Introduction

Design for Policy This chapter presents design for policy as a promising approach to overcome some of the challenges that the current policy-making process faces. Design draws on several aspects of co-creation but also provides methodology and tools that can contribute to shaping co-creative policy processes from idea to implementation. The chapter is going to be very case driven. After an initial, brief setting of the conceptual framework, the chapter provides an overview of a number of design for policy cases with a focus on describing their essential challenges, actors, phases and results. This will be succeeded by a comparative analysis of the cases, deriving their main features, both looking at the promises and challenges of design for policy.

4.2 The Conceptual Framework

The conceptual framework is largely going to be based on the anthology ”Design for Policy” (2014) edited by Christian Bason (PhD and CEO of the Danish Design Centre). The anthology is the first publication to chart the emergence of collaborative design approaches to innovation in public policy with contributions from a range of the world’s leading academics, design practitioners and public managers.

According to Bason, policy-making in the 21st century has become increasingly difficult due to the constant change and uncertainty caused by the rise of a global networked economy driven by new technology, new patterns of global trade, finance and mobility, new media, new lifestyle and health patterns.

Developments that the practices and tools of policy-makers have not kept sufficiently abreast of (2014: 2). This forces policy-makers to become more proactive and dynamic in understanding these currents and to provide the governmental framework that will give value to all levels of society: the public, private and civic sector. The methodology and strategies from design provide a tangible approach for governments to explore new models of governance. Bason leans on Simon’s (1996) broad definition of design as the human endeavor of converting actual into preferred situations (Bason, 2014: 3). This definition sees design as the process of creating “new integrations of signs, things, actions and environments that address the concrete needs and values of human beings in diverse circumstances” (Buchanan, 1990: 20). Thus, design is not just an addition to the repertoire

of policy tools. Design offers a whole new way for policy-making to be done. To understand how design can unfold as a strategy for policy-making, it is useful to examine three promises of design as highlighted by Bason.

4.2.1 Understanding the architecture of the problem

Firstly, design offers a new approach to the task of understanding problems, as design provides an array of highly concrete research tools, ranging from ethnographic, qualitative, user-centered research, to probing and experimentation via rapid prototyping, to visualising vast quantities of data in new and powerful ways (Bason, 2014: 4). These research tools can help policy-makers root causes of problems and their underlying interdependencies - the 'architecture of problems' (Boyer et al., 2011; Mulgan, 2014).

4.2.2 Co-creating solutions

Secondly, the collaborative aspects of design suggest that policy options could be increasingly co-designed through an interplay between policy-makers at different levels of the governance system, interest and lobby groups, external experts and, not least, end-users such as citizens or business representatives themselves (Bason, 2014: 5). To exemplify, the use of graphic illustrations, tangibles, visuals and scenarios can stimulate cross-cutting dialogue, mutual understanding and collective ownership of ideas and solutions.

4.2.3 Tangible approaches to future solutions

Thirdly, design offers the devices (concepts, identities, interfaces, graphics, products, service templates and system maps) that can help give form and shape to policy in practice. As Bason writes, "the ability to create deliberate user experiences and to make services and products desirable and attractive, impacting human behaviour and outcomes, is at the heart of design practice" (ibid.). To sum up, these three promises combined offer key approaches to support policy-makers in understanding the core issues providing a solid base for decision-making. It offers help to policy-makers to involve the right stakeholders in the process to ensure that solutions are based on real needs. And by introducing visual devices and physical prototypes for future policy practices, new solutions become tangible,

accessible and attractive for a diverse group of stakeholders. Importantly, design processes are never linear.

The iterative cycle of understanding-ideating-prototyping- verifying is central to design and crucial to support processes that are unpredictable and complex in their nature. Bunt & Christiansen point to how design-led approaches to policymaking take a dynamic and integrated relationship between policy and practice as a premise in planning and development processes (2014: 42). Design closes the gap between development of the model and its implementation. It is in the testing and iteration that the plan comes to life. It only makes sense when seen in relation to context, practical outlook and consequences. This also implies that design as a discipline is comfortable with complexity and uncertainty, accustomed to being open-ended.

According to Bunt & Christiansen, a core strength of the design approach is that it starts from understanding the aforementioned 'architecture of the problem' to open a new space of possibility in touch with the practical realities of the people influenced by the policy (ibid.). Central to this report, co-creation is a consistent ingredient in design. According to Bason, design is shifting from the idea of unique designer to the concept of 'co': to co-llaboration, co-creation and co-design as a central feature, emphasizing the explicit involvement of users, partners, suppliers and other stakeholders in the design process, in essence discarding the notion of the heroic single designer (2014: 4). Variations such as participatory design and service design, which focuses on (re)designing service processes from an end-user perspective, are in rapid growth (ibid.). To sum up, what is central to design is the systemic yet creative involvement of stakeholders in co-creating solutions. And that design provides the research tools to understand the problem as well as the devices to give shape to policy in practice.

4.3 Design for Policy Cases

With this brief theoretical introduction to design for policy, this section now zooms in on design for policy in practice by presenting a number of design for policy cases. Each will be tagged with one or more of the following sectors: urban planning, social innovation, public services and new welfare configurations and, lastly, territorial development. There are a few reservations and issues connected to the chosen cases. As will be further described in the next section analysing the cases, almost all the cases are examples of successful design for policy, as unsuccessful cases are rarely published. It is also likely that some of the

challenges and critical aspects of the collected cases are underexposed. This of course limits the understanding of central learning and challenges regarding design for policy. Another point worth noting in regard to the collection of cases is that the cases had to be in English or Danish and of a certain textual length to be accessible to the authors. Also, geographical variation has not been a criterion when selecting the cases (many of the cases are from the UK and Denmark).

#1 Designing services for housing (US)

Sector: Urban Planning and Social Innovation

Actors: DESIS Lab, Public Policy Lab and the New York City Department of Housing Preservation and Development

In 2012, the DESIS Lab entered a partnership with the Public Policy Lab (a non-profit dedicated to improving public services through design) and the New York City Department of Housing Preservation and Development. Together they developed the project Designing Services for Housing focusing on the issue of affordable housing in the city. The affordable housing landscape consists of a diverse network of government actors, regulatory bodies, private developers of affordable housing, property managers, community-based organizations, tenant associations and individuals. It is an inherently collaborative field, requiring interaction between a number of different parties, making it an ideal space to explore the possibilities of enhanced forms of collaborative practice between public and private actors. Design was applied as a process to connect the stakeholders in collaborative-solution focused dialogue and as a means to test future solutions through pilot projects. After a number of co-creation sessions and dialogue with managers, front-line staff, community-based organizations, affordable housing developers and potential and current users of the services, four proposals for enhancing the marketing, lottery and lease-up processes for affordable housing were selected. The selected proposals were transformed into pilot projects to test the efficacy of the proposals. Most of the proposals involving co-production and bottom-up social innovation were not, however, immediately or entirely embraced by the New York City Department - they were considered outside their scope and therefore not developed as pilot proposals but left as recommendations for future exploration.

#2 Prototyping for the private rented sector (UK)

Sector: Public Services and New Welfare Configurations

Actors: Policy Lab, Department for Communities and Local Government (DCLG) and design agency

In 2017, Policy Lab worked together with the Department for Communities and Local Government (DCLG) to explore ways to improve experiences of people in the Private Rented Sector (PRS). First, a co-creation workshop was held with landlords and tenants. The workshop was designed as a sprint, a fast-paced design process, where personas were developed to help the participants to always have the users in mind. After the workshop, the main challenge was identified as "How can we improve the experiences and security of tenants and landlords in the Private Rented Sector?".

The stakeholders came up with a range of possible interventions, sketched their ideas, shared and rapidly iterated. With the help of a design agency, the Policy Lab took those early ideas and developed a set of low-fidelity (really simple) prototypes. Afterwards, policy-makers from DCLG joined the agency to explore first-hand how landlords, tenants and letting agents interacted with the prototypes. Policy Lab then identified barriers, insights and opportunities for each of the prototypes. The tangible prototypes made it much easier to see which ideas would fail, which needed more work and which could benefit all parties. A final blueprinting session was then held with the stakeholders who identified two services to map in detail to see how the interventions could be brought to life.

#3 Building a new school (France)

Sector: Public Services and New Welfare Configurations

Actors: La 27e Région and the Regional Government of Champagne Ardenne

La 27e Région is a non-profit foundation working to facilitate public sector innovation through design at local and regional level. In 2009, a multidisciplinary team from the foundation spent several weeks in a school which was to be totally rebuilt (mainly funded by the Regional Government of Champagne Ardenne). There was a strong focus on securing a balanced dialogue between the local community (pupils, teachers and parents) and the architect. In the course of one day, the local community had the possibility to react, re-interrogate and criticize the project by drawing ideas and writing questions on large blueprints laid out on the classroom tables. The next day, the architect came to the school and saw the blueprints. It was clear to the architect and the regional government that they

had to take the practices of people much more into account in the organisation of interiors, such as classrooms and lobbies.

#4 Prototyping national insurance letters (UK)

Sector: Public Services and New Welfare Configurations

Actors: HM Revenue & Customs and Policy Lab

In 2015, HM Revenue & Customs and Policy Lab in the UK wanted to come up with new ways of communicating with young people about National Insurance. The challenge was that people do not get a physical card anymore but just a letter containing their number. Lots of these letters are thrown away or lost, not least by people under the age of 24. Thus, the aim was to improve the way young people become aware of, receive and use their National Insurance numbers. A co-design workshop with six young people pointed to the need of a better letter - according to them, the letter didn't look important enough. Another workshop was run where a larger number of young people re-designed the letters and worked with a group of policy-makers, youth engagement specialists and frontline staff to improve these prototypes. The resulting versions of the letter were then presented to and discussed with another group of young people to find out which would be most effective.

#5 Open policy making in action: Empowering divorcing couples and separating families to create sustainable solutions (UK)

Sector: Public Services and New Welfare Configurations

Actors: Ministry of Justice and Policy Lab

In 2014, the Ministry of Justice in the UK and Policy Lab worked together to understand the experiences of people going through separation and divorce and use these insights to explore how family mediation services could be redesigned to better meet people's needs. Phase one was about generating insights and included a collaborative workshop with mediators, policy-makers, judges and other stakeholders. Through six detailed personas and user journeys (a user journey is a description of the experience a person has when utilizing/interacting with something), they explored the experiences of people getting separated or divorced and then articulated visions for helping people reach agreement about family disputes. They then selected three visions and sketched roadmaps to work towards prototyping these. Phase two of the project then focused on making sense of these insights, prioritizing which ideas to take forward via prototyping to explore and test aspects of the future visions in more depth.

#6 Prototyping an online crime reporting service (UK)

Sector: Public Services and New Welfare Configurations

Actors: Home Office and Policy Lab

In 2015, the Home Office and Policy Lab started working on a new online crime reporting service with a strong focus on developing it in a user-centered way and iterating and improving it again and again with users.

First, a co-design workshop was held where senior police, academics, civil servants and victims' representatives used simple craft materials, Lego and video to quickly build and share ideas on new ways to report crime. The Home Office and Policy Lab then combined these ideas into prototypes and went back to the users to test them. They refined the prototypes and produced a few more iterations until Surrey and Sussex Police were ready to build a prototype. This will be again tested with users and their feedback used to improve it again before it is offered as a national service.

#7 Using design fiction to prototype new politics (UK)

Sector: Public Services and New Welfare Configurations

Actors: ProtoPolicy, the All-Party Parliamentary Design and Innovation Group, Lancaster University, Falmouth University and PDR

In 2015, ProtoPolicy, the All-Party Parliamentary Design and Innovation Group, Lancaster University, Falmouth University and PDR (a design consultancy) got together in a pilot project to explore how design fictions (products or service concepts, images and films that help us imagine future scenarios) could help politicians and civil servants to engage with citizens, imagine the future implications of policy initiatives and negotiate political questions. Their driver was the notification that people are often excluded from the policy making process. Public consultation is a common approach, but as it often involves the public having to read through lengthy reports, the process is inaccessible to many segments of society. In the project, the team examined the aspects of the proposed Assisted Dying Bill. By engaging with community groups and older people in a number of workshops, the team created two design fictions which were afterwards presented to civil servants and politicians at an event. The project showed how design methods can be used to facilitate an inclusive and constructive dialogue between politicians, community groups and citizens on controversial political and legislative issues. A number of challenges were also identified. One was that facilitating a constructive dialogue between stakeholders using the design

fictions to collect meaningful data and draw robust conclusions is central. Others were the issues of timescales, cost and pressures of public opinion and party lines.

#8 Blockchain4EU: Blockchain for industrial transformation (EU)

Sector: Public Services and New Welfare Configurations

Actors: EU Policy Lab/JRC (Joint Research Centre)

The EU research project Blockchain for Industrial Transformations (from 2017 by the EU Policy Lab) is a forward-looking exploration of existing, emerging and potential applications based on Blockchain and other DLTs (Distributed Ledger Technology). The project combines Science and Technology Studies with a transdisciplinary policy lab toolbox filled with insights from foresight and horizon scanning, behavioral insights, or participatory, critical and speculative design. An innovative experimental approach was taken that allowed first to select and refine the sectors, topics and dimensions to be explored, and second to generate ideas on how Blockchain and other DLTs could exist in the near future and ultimately test new narratives and plausible scenarios around it. This entailed a mix of desk and qualitative research with a series of interviews, surveys, and ethnographic explorations, together with co-creation workshops.

The workshops resulted in the collaborative envisioning, design and creation of five prototypes aimed at physically showcasing how Blockchain could be applied in five sectors. The project resulted in some key insights for industrial transformation and a number of science for policy strategic recommendations. Beyond their presentation in the #Blockchain4EU final event, the prototypes will be used for research purposes in the scope of future activities developed by the Joint Research Centre and will be used by other EU actors to trigger and stimulate debates in several other instances considering Blockchain and other DLTs.

#9 The future of migration in Europe (EU)

Sector: Public Services and New Welfare Configurations

Actors: EU Policy Lab/JRC (Joint Research Centre)

The large inflows of migrants to Europe in 2015 and 2016 have triggered the EU to think long-term about the matter and look beyond the current crisis to be better prepared for the next 15 years. As a result, a project initiated in 2016 and led by the EU Policy Lab is aiming to improve understandings of what drives migration, identify possible future implications of today's policy decisions and suggest areas for future policy initiatives. The project will

result in a set of global scenarios for the future of migration in Europe in 2030 and a new version of the Scenario Exploration System board game (produced by JRC) on migration. This approach will make it possible to engage with external stakeholders affected by EU migration and asylum policies, as a key principle of the project is a systemic approach - drawing on the expertise of an interdisciplinary group of experts, diverse stakeholders and policy-makers from different parts of the European Commission to ensure a holistic understanding of migration, its multiple causes and diverse outcomes.

#10 The future of the EU collaborative economy (EU)

Sector: Public Services and New Welfare Configurations

Actors: EU Policy Lab/JRC (Joint Research Centre)

The rapid growth of the collaborative economy has fueled a discussion about its potential benefits and challenges. As a result, the Joint Research Centre (JRC) in 2015 initiated a project on the future of the EU sharing economy towards 2030 to contribute to the development of the European agenda for this. Led by the EU Policy Lab, the project had a qualitative and participatory approach, using scenario-building to illustrate divergent directions the EU could pursue.

First, a workshop was held with experts, policy-makers and stakeholders with a broad range of backgrounds. A design approach was taken, asking participants to develop a concrete sharing economy platform and to identify the roles, motivations and challenges from the point of view of users, providers and platforms, and the implications for the public interest. The insights were then used by the Lab in an in-house iterative process to develop four scenarios for the European sharing economy in 2030. The scenarios were further enriched and analyzed in a second workshop where the scenarios were used as contexts in which participants had to take up roles to better reflect on future opportunities and challenges created by the collaborative economy. After this, the scenarios were modified and the analysis of the scenarios resulted in the identification of several issues that need attention.

#11 Health 2050 – four scenarios for human-driven health and freedom of choice (Finland)

Sector: Public Welfare and New Welfare Configurations and Social Innovation

Actors: The Finnish National Institute for Health and Welfare and Demos Helsinki

In 2014, the Finnish National Institute for Health and Welfare and Demos Helsinki (an independent think tank) got together to explore how hidden resources in people and communities can be better utilized to tackle the toughest challenges of health and healthcare such as lifestyle diseases and health inequalities. The outcome of the project were four future scenarios that illustrate how overall perceived health in society can be doubled in 2050 without increasing the total health costs. The scenarios were co-created with more than 140 professionals engaged in six different workshops. In the workshops, the backcasting method was used to brainstorm on various desirable futures and then to work backwards to identify policies and programs that would connect the future to the present. Nine human-driven insights arose from the four scenarios that will produce better health in the future.

#12 Opportunity for All Youth (Canada)

Sector: Public Welfare and New Welfare Configurations and Social Innovation

Actors: Employers/companies and MaRS Solutions Lab

Approximately 1 million Canadian youths are not in school, not employed and are not finding opportunities to succeed. The Opportunity For All Youth, launched in 2018, is an employer-led initiative supported by MaRS Solutions Lab and partly funded by the Government of Canada's Skills Link Program. It aims to fundamentally improve opportunities for youth by setting a collective goal of providing meaningful employment and job training to 100,000 Canadian youths. Such a goal requires a collective effort at a national scale, of committed employers working closely with job training service providers, governments and foundations. The approach is learning together, scaling what works, piloting new approaches, sharing this with other employers and growing the movement. The project will measure its impact based on data evidence provided to it by the coalition employers, the community employment agencies and the youth hired.

#13 Practice check (Denmark)

Sector: Public Welfare and New Welfare Configurations

Actors: The Danish Agency for Labour Market and Recruitment and MindLab

Political initiatives do not always proceed as expected from idea to roll-out. Therefore, the former Danish policy lab, MindLab, has developed a process model called Practice Check which makes it possible in just a few days to get closer to how political initiatives work in practice. The model was developed and tested in a concrete case involving the Danish

Agency for Labour Market and Recruitment on the basis of the notification that there can be a great distance from the parliament's visions of getting more citizens employed, to the job center workers who have to make it happen in practice. New initiatives often land in a hilly landscape of existing legislation, administration and professional assessments. What the model can do is to identify whether employees have understood the intentions of an initiative or whether the initiative creates the intended value among the citizens. With such a mapping, it can be clarified how the approach should be adjusted. One of the Practice Checks at the Danish Agency for Labour Market and Recruitment was about the flex job scheme, where the municipalities conveyed reports of rules that were difficult to work with. The team conducted qualitative interviews in six municipalities with case managers, team leaders and job center managers to identify exactly where the problems were and then prototype new ways to implement the scheme.

#14 Design in the development of local government policy and advice (UK)

Sector: Public Welfare and New Welfare Configurations

Actors: Cornwall Council and different design firms

Cornwall Council in the UK developed a design-led approach to policy-making from 2009 to 2013, initially through a Design Council partnership program called Designs of the Time (with the support of different design firms) and then led by the council's Chief Executive's department. The goal was to deliver more for less, improving the quality of services by re-forming and redesigning the way services were conceived and delivered. Giving that Cornwall has 50,000 public sector workers and 500,000 citizens, the ambition was to rebalance the economy towards the social sector and citizen sector. Design was used specifically to enable citizens to make a greater contribution to the development of new policies. More specifically, a living lab approach were taken where 10 projects used design approaches to enable local people to prototype and develop innovative new services.

#15 Camillagaarden (Denmark)

Sector: Public Welfare and New Welfare Configurations and Social Innovation

Actors: Camillagaarden, Local Government Denmark and 1508

Some years ago, Camillagaarden, a workplace for adult mentally handicapped, had come to a point where it risked losing its funding due to too few users. Therefore, in a joint project with Local Government Denmark and the design firm 1508, the manager and staff at Camillagaarden were trained to apply design approaches such as cultural probes, photo

diaries, prototypes, service analogies, testing and ideation methods to explore new ways of involving and engaging citizens. The design methods allowed citizens to visually articulate their hopes, dreams and aspirations about what a good experience at Camillagaarden was about, and how it could be made better. According to the managers, the citizens are now actively involved as true innovators. User satisfaction has skyrocketed and the number of users has gone up nearly 300 percent, creating a waiting list.

#16 Co-designing better outcomes for vulnerable families (Australia)

Sector: Public Welfare and New Welfare Configurations and Social Innovation

Actors: The Australian Capital Government and ThinkPlace

The Australian Capital Government (ACT) sought to take a new approach to improving outcomes for families with complex needs accessing multiple services in Canberra. Teaming up with the design firm ThinkPlace, the government embarked on a two-phase co-design project, following the design approach of first divergence and then convergence. Phase one, Listening to Families, involved face-to-face, in depth interviews with nine families, through which they sought to better understand their journeys through the services system. This phase generated three ideas to improve the experiences of families. In phase two, Improving Services with Families, prototypes were developed and tested on the basis of the ideas, for example of the lead worker service model and the family information profile. Subsequent phases scaled the prototypes and addressed and used insights to make systemic policy, legislative and structural change. The project is an example of how design approaches succeed in linking policy intent with on-the-ground professional practices and how they may affect positive change in the lives of families.

#17 The Branchekode.dk project (Denmark)

Sector: Public Welfare and New Welfare Configurations

Actors: The Danish Business Authority and MindLab

Branchekode.dk is where business owners in Denmark have to register their companies. However, the website was rather complex. For example, the users had to use the appropriate industry code for their business, choosing from a pool of more than 700 codes used by the government to classify businesses for statistics, tax and administrative purposes. Therefore, the Danish Business Authority teamed up with MindLab to close the last mile separating well-considered regulations from effective use by citizens. The goals were as follows: 1) the purpose of the electronic self-service must be communicated clearly;

2) the system must handle the complexity of the self-service solution, not the user; 3) the self-service solution must be based on the user's reality; and 4) the authorities involved must cooperate in the digital solutions. Eventually, the design proposed by MindLab stood out as a demonstration project of sorts for what could be accomplished in the public sector with design-driven methods of prototyping, co-creation and the integration of deep insights collected from users - a process which was human-centered, participatory and inclusive of citizens, business savvy and outcome-oriented.

#18 Away with red tape (Denmark)

Sector: Public Welfare and New Welfare Configurations

Actors: The Danish Tax and Customs Administration and MindLab

In Denmark, young people between 18 and 30 years are the demographic group least likely to be capable to do their taxes online. This insight pushed the Danish Tax and Customs Administration to partner with MindLab to gain a better understanding of the experience of citizens and their encounters with public sector bureaucracy. The initiatives that have emerged stem from a design-driven process, which is characterized by systemic idea development and prioritization, the development of concepts and the description of specific prototypes in direct dialogue with citizens. These processes were all driven from an informational base coming from conducting interviews to be able to sketch out the service journey and experience in concrete and illustrative ways. An important part of this was the use of audio clips and radio montages of frustrated young citizens trying to do their taxes online. In total, the project set out a course of addressing problems in a more human-centered way, creating taxation procedures more in tune with the lives of citizens.

#19 Recover: Edmonton's urban wellness plan (Canada)

Sector: Urban Planning

Actors: City of Edmonton in Canada and MaRS Solutions Lab (and a lot of other actors such as InWithForward, REACH Edmonton, Leger, the University of Alberta, Civitas Consulting, and Critical Point Communications)

Recover (launched in 2017) is a collaborative initiative between the City of Edmonton in Canada and MaRS Solutions Lab focused on this challenge: How might we improve quality of life and inclusion for everyone in the urban core (having a high concentration of people experiencing homelessness, mental health and addiction challenges), and eventually for residents citywide? They explain their approach as a social innovation approach. Working

together with actors such as InWithForward, REACH Edmonton, Leger, the University of Alberta, Civitas Consulting and Critical Point Communications, the project organized 75 people into three committees in a series of participatory workshops. The workshops were supported by over 70 ethnographic observations and interviews with people living rough as well as residents, businesses and community-serving organizations. In the workshops, participants envisioned preferred futures for Edmonton; mapped 270 government policies and strategies influencing urban wellness; surfaced and engaged with tensions and polarities within the community; and generated over 200 solution ideas. 13 prototypes have been developed which are now being tested in the community. Project teams are conducting small-scale experiments in the field to help refine ideas into solutions that work to improve urban wellness. The Recover plan was presented to Council in August 2018.

#20 Digital Villages (Germany)

Sector: Territorial Development

Actors: The Ministry of International Affairs and Sports Rhineland-Palatinate and Fraunhofer Institute for Experimental Software Engineering

In Germany, the Ministry of International Affairs and Sports Rhineland-Palatinate has teamed up with Fraunhofer Institute for Experimental Software Engineering (IESE) in a project called Digital Villages (started in 2015 and running until 2019). The purpose of the project is to identify digital solutions for people living in sparsely populated areas by testing a holistic approach to the digitization of rural services in several pilot villages. Through the creation of a common digital platform, they are developing new solutions for the supply of local goods, communication, mobility and e-government. The project describes the approach as a 'living lab approach'. In phase one, concepts and concrete solutions were discussed with the residents and other stakeholders. Then, prototypes were developed which were further elaborated with stakeholders until the concrete solutions had been digitalized (mostly in the shape of mobile apps or digital web services).

#21 Prototyping human-centered policies for children (Nicaragua and UNICEF)

Sector: Territorial Development

Actors: Nicaraguan Government and UNICEF

Together with UNICEF, five teams from different sectors and levels of the Nicaraguan government gathered in 2015 to tackle: i) violence and abuse against children, ii) education and child labor, iii) recreation, iv) infant and prenatal health and v) birth registration. An

iterative try-fail-learn-repeat approach was taken. In a co-creation workshop, they identified replicable and cost-effective strategies to be tested in five vulnerable municipalities. Each group was assigned a small "risk investment" which they were free to use for prototyping. After 1,5 months of planning and a series of feedback clinics, the government teams and UNICEF travelled back to the communities to put their prototypes to test. The solutions ranged from SMS-based system to improve the real-time information gathering of communal health workers that support pregnant women, to participatory design of recreational spaces that "embrace the chaos" in highly vulnerable communities.

4.4 Evidences and main findings

After this case overview, the following sections will look deeper into the cases, comparing them and deducting features and characteristics generally present in many of them. With the conceptual framework in mind, the section will zoom in on the design-driven research tools in the cases, the collaborative aspects and the devices that help give form and shape to policy in practice. In closing, some of the criticalities and challenges that design for policy faces will be discussed.

4.4.1 Research tools

One of the promises of design are the concrete design tools that design provides to help the stakeholders involved understand the architecture of the problem. Through the cases, the following paragraph will examine the tools and methodology from design that accommodate this process.

- **Understanding the users**
  The cases above provide several concrete examples of how design tools and methodology give approaches to better problem-understanding, allowing stakeholders to empathize with and understand user demands, challenges and needs.
  Drawing on ethnography and anthropology, design introduces approaches to gain unique problem insight. This is combined with tactile, visual and physical tools from design that helps give imagery and touch to these insights, thereby making them more accessible to a diverse stakeholder group. This is exemplified by the case from Australia about improving outcomes for vulnerable families (case #16), where

considerable effort is put into understanding the users. The project's first phase was titled 'Listening to Families'. In this phase, face-to-face, in depth interviews were held with nine families to better understand their journeys through the service system. Here, in depth interviews are used as an approach to provide qualitative information about the end-user, offering a deeper understanding of the broader and more emotional journey for vulnerable families. In phase 2, 'Services with Families', prototypes were developed and tested on the basis of the idea before prototyping and scaling solutions. Hence, sympathetic insight into the end-user gives the stakeholders involved a more user-centric point of departure for the coming process of understanding how to improve the journey through the public system for vulnerable families. Design offers several approaches to enhance a more user-centric point of departure. In the case of Camillagaarden (case #15), a workplace for adult mentally handicapped, different design methods, such as photo diaries and cultural probes, allowed citizens to visually articulate their hopes, dreams and aspirations about what a good experience at Camillagaarden entailed and how it could be improved. Here, the user becomes a participant and co-producer of the insights generated about them and their context. Not only do they participate in articulating their story as is the case with interviews, they also co-create the visual and tangible output that describe their situation through visual devices. Personas are also a recurrent methodological tool (highlighted in cases #2 and #5) that can enhance the sympathetic insight of the target user. Personas describe archetypical target users and, importantly, unfold their needs, demands, behavior and lifestyle. This gives the stakeholders involved the opportunity to access the problem with a more holistic and empathetic approach - not only looking at how the targets users interact with a given specific service or offering, but understanding how new political solutions can fit into and broadly accommodate the lifestyle and unarticulated desires of the intended end-user. Some of the strongest cases highlight how design tools provide such crucial initial insights that it shapes the whole direction of the coming collaborative process. An example is the case with the Danish Tax and Customs Administration and MindLab about young people being the least capable of doing their taxes online (case #18). Audio clips and radio montages (stemming from interviews) of frustrated young citizens trying to do their taxes online formed an important basis for sketching out the users' service journeys, and the launched initiatives were based on these new insights. Another example is

the one from France about the rebuilding of a school (case #3) where the local community were given the opportunity to draw ideas and write questions on large blueprints laid out on classroom tables which the architect then came to the school to see. The project was then adjusted according to the ideas. As noted above, besides providing research tools and user-centric insights, another central element to design is the collaborative aspect. By taking a close closer look at the cases, this section explores how policy options can be increasingly co-designed through an interplay between a very diverse group of stakeholders.

4.4.2 Involving users, citizens and other stakeholders

Several cases illustrate how the design process tends to zoom in closely on a selected user group - often the end-user. With its focus on the user as the ultimate reference point, design has the capacity to realign stakeholders towards a common purpose. This is for instance evident in the case from Australia (case #16) about improving outcomes for vulnerable families. Here, there is a strong focus on involving the end-user, in this case the families, in the process. And in the case from France about rebuilding a school (case #3), the local community were invited to re-interrogate and criticize the project.

The collected cases have a strong focus on involving the right stakeholders in the process of policy making. Who the right stakeholders are, of course, depend on the specific context of the case. In a majority of the cases where design for policy unfolds, there is quite a consistent involvement of a broad and diverse range of stakeholders - involving the political and governance level as well as civic society. This broad stakeholder engagement allows for the involved policy actors to empathize with and understand the broad ecosystem as well as issues that transcend political branches and sectors. This is for instance evident in the case Opportunity for All from Canada (case #12) which has the aim of providing employment and job training to 100,000 youths. Here, the approach is a collective effort with employers working closely with job training service providers, governments and foundations. Also the case about Recover aimed at improving the quality of life and inclusion for everyone in the urban core of Edmonton in Canada (case #19) involves a large number of stakeholders such as - besides the City of Edmonton and MaRS Solutions Lab - InWithForward, REACH Edmonton, Leger, the University of Alberta, Civitas Consulting, and Critical Point Communications as well as residents, businesses and community-serving organizations.

The diverse stakeholder groups are often involved initially in the process through co-design workshops where insights and ideas regarding the specific challenge are generated. For example, in the case from the US on the issue of affordable housing in New York City (case #1), co-creation sessions were held with managers, front-line staff, community-based organizations, affordable housing developers and potential and current users of the services. And in the case from the UK about new ways of communicating with young people about National Insurance (case #4), a co-design workshop was held with young people and another one with a larger group of young people, youth engagement specialists and frontline staff.

In some of the cases, the stakeholders also co-produce material that will shape the coming process, for instance through prototyping. For example, in the case just mentioned about National Insurance (case #4), the stakeholders in the workshop re-designed and prototyped the National Insurance letter that people receive. In other cases, the prototypes are produced afterwards by the government, labs or design firms (see next section) where they interpret input from the co-design workshops. An example of this is the case from the UK about improving the experience of people in the Private Rented Sector (case #2). Here, a co-creation workshop was held where the stakeholders came up with a range of possible interventions (answering to the challenge of "How can we improve the experiences and security of tenants and landlords in the Private Rented Sector?"), sketched their ideas, shared and rapidly iterated. The Policy Lab then took these early ideas from the workshop and developed the prototypes.

Whether the stakeholders are little or much involved in the production of the prototypes, they are often involved again later in the process of testing the prototypes and the subsequent iterative phases. These iterated interactions with stakeholders are essential to the co-creative process, ensuring that policy stakeholders continuously allow user insight to influence the process - not just in the early development phases, but also towards implementation, where ideas are narrowed down to solutions and implementation plans. An example of the iterative involvement of users is the just mentioned case from the UK about the Private Rented Sector (case #2). After developing the initial prototypes, Policy Lab let landlords, tenants and letting agents interact with the prototypes which made it possible for Policy Lab to identify barriers, insights and opportunities for each prototype, making it much easier to see which ideas would fail, which needed more work, and which could benefit all parties. Then, a final blueprinting session was held with the stakeholders who identified two services to map in detail to see how the interventions could be brought to

life. Also the case about an online crime reporting service from the UK (case #6) includes the process of iterating and improving it again and again with users. Thus, the Home Office and the Policy Lab refined the prototypes developed by participants in a co-design workshop and went back to the users to test them. A few more iterations were produced until Surrey and Sussex Police were ready to build a prototype. This prototype will again be tested with users and their feedback will be used to improve it again before it is offered as a national service.

The iterative involvement of users through feedback loops of insight, input and prototype tests helps support the initial hypothesis that *design approaches can help bridge the gap between ideation and implementation, and achieve higher levels of citizen engagement*.

- **Innovation labs.** In many of the cases, the governmental unit collaborates with a design or innovation lab. As Bason & Schneider writes, efforts to promote radical innovations in the public sector are increasingly followed by the creation of different types of 'authorizing environments' that foster these experiments (2014: 34). Thus, such labs are on the rise. Some of them are positioned *within* the government, others outside the government working *with* the government. The labs can be placed on a continuum going from government-led labs in one end (strong government support and participation and often owned and funded by governments) to government enabled labs in the other end (little support and high degree of independence, may engage governments purely as clients or endorsers of their activities). Some of the labs operate on national level, others at regional or local level. DESIS Lab (US), Public Policy Lab (US), Policy Lab (UK), MindLab (Denmark), La 27e Région (France) and the EU Policy Lab are some of the labs appearing in the cases. La 27e Région is the only lab operating specifically at local or regional level. Other labs such as Demos Helsinki and MaRS Solutions Lab have partnered with government.
- **Design firms.** Another actor appearing in many of the cases are design firms. It is typical constellation that a government unit, an innovation lab, and one or more design firms work together in a concrete case.

4.4.3 Devices to help give form and shape to policy in practice

Lastly, we will explore how the cases apply devices to help give form and shape to policy in practice. Prototypes are a common concept from the design field, offering physical and tangible interpretations of ideas or solutions. Introducing physical and visual objects in a co-design process allows for a varied group of stakeholders to react to and relate to the process from the initial ideation phases to the final implementation phases.

Prototyping can be done in many different ways. In quite a few of the cases, prototyping is used where *mock-ups* are built of for example craft materials or Lego. Mock-ups are simple, quick and cheap manifestations of an idea and are often made early in the process to give the involved stakeholders something tangible to relate to and base their decisions on. Anyone can make mock-ups without having specific design experience. Therefore, low threshold prototyping such as mock-ups is inclusive to a diverse group of stakeholders, demanding no prior knowledge or experience. This is rarely the case in more traditional policy processes, for instance in public meetings or hearings where convincing contributions from the public require political or argumental flair.

An example of the use of mock-ups is the case from the UK about prototyping an online reporting service (case #6). Here, in a co-design workshop, senior police, academics, civil servants and victim's representatives used simple craft materials, Lego and video to quickly build and share new ways to report crime. Mock-ups can also be digital. An example is the case from Germany about Digital Villages (case #20). Here, the purpose is to identify digital solutions for people living in sparsely populated areas. Prototypes were developed with stakeholders and were subsequently digitized - mostly in the shape of mobile apps or digital web services. In the case from Nicaragua (case #21), prototypes were used in developing SMS-based systems to improve real-time information gathering of communal health workers that support pregnant woman.

Prototyping can also be done by simply *sketching* solutions. Such an approach was taken in the case from the UK (case #2) where the Policy Lab worked together with the Department for Communities and Local Government to explore ways to improve the experiences of people in the Private Rented Sector. Here, the participants in a co-creation workshop sketched their different ideas of improving security of tenants and landlords. Sketching was also used in the case from France where La 27e Région was to rebuild a school, and where pupils and teachers drew ideas and wrote questions on large blueprints.

The use of prototypes is also seen applied in the later project phases in some cases, after the initial ideation. Here, prototyping is applied as pilot testing of a solution or scenario in a context that is closer to the implementation of the solution. In these cases, the prototypes are more thoroughly processed and more "finished" in their character. The idea is to test the solution in a realistic context to get relevant feedback from users and to be able to adjust and adapt the prototypes to be relevant for implementation.

Such pilot testing is used in the case mentioned above about prototyping an online reporting service (case #6). After the co-design workshop, the Home Office and Policy Lab

combined the ideas into prototypes. After a few iterations with users, Surrey and Sussex Police were ready to build prototypes to be tested in real life. The plan was to iterate these prototypes with users again and then, eventually, offered the crime reporting service as a online service. In the case about co-designing better outcomes for vulnerable families (case #16), subsequent phases after the initial testing of prototypes scaled these and used insights to make systemic policy, legislative and structural change.

In several of the cases, *scenario building* is applied. Scenarios are visualizations or physical manifestations of plausible future scenarios. The EU Policy Lab often uses scenario building, and all three EU cases presented in the last section involves scenarios. In the #Blockchain4EU project (case #8), scenario building is used to physically showcase how Blockchain can be applied in five specific sectors. In another EU case, scenarios illustrate four different futures of migration (case #9). And in a third EU project, scenarios were used to show four alternative futures of the EU collaborative economy (case #10). The advantage of scenario building is that it helps make the future more concrete and easier to relate to. The scenario method also allows for participants to backcast these scenarios to explore what challenges they pose in the presence or the near future. In the last-mentioned case, for example, the scenarios were used as contexts in which the participants had to take up roles to better reflect on future opportunities and challenges by the collaborative economy. Also the Demos Helsinki case (case #11) uses scenario building, specifically to illustrate four different ways that overall perceived health in society can be doubled in 2050 without increasing the total health costs.

4.5 Challenges and criticalities

As touched upon earlier, a majority of the available cases are success stories of design for policy. The section above has analysed and compared some of the characteristics of the success cases. Several of these cases are also vague in describing how the new insights and solutions were actually implemented and transformed into political practice. It is evident that the practice of design for policy faces a number of challenges and it is important to add that design in policy is still not a common practice.

The only truly critical case collected is the case about affordable housing in New York City (case #1). The ecosystem of affordable housing consists of a large number of different stakeholders, making it relevant to explore the possibilities of enhanced forms of collaborative practice. In a number of co-creation sessions, different proposals were

developed, but when it came to turning the proposals into actual pilot proposals, most of the proposals involving co-production and bottom-up social innovation were declined by the New York City Department involved. The case is described in the anthology "Design for Policy" (2014) where it sheds light on some of the concrete challenges in the interdisciplinary collaboration amongst design practitioners, design educators, civil servants and policy-makers.

The first challenge is that of designers acknowledging the political inherit to design - that design is a political act because it is a set of practices and procedures which directly challenge the established order (Brown et al., 2014: 158-59). For example, in the concrete case, some proposals in which co-production was directed at reorienting relationships between stakeholders did not fall directly within the agency's current mandate or practices and were therefore turned down.

The second challenge focuses on overcoming epistemological barriers (ibid.: 160-61). Designers and policy-makers have quite different epistemological frameworks. While policy-makers tend to take an 'economist' approach to problem-solving, valuing new ideas by weighing them against quantitative metrics for an initiative's likelihood of success, designers tend to rely on rapid experiments, ad hoc iterations and speculative narratives. The case of affordable housing, like previous research, pointed to the fact that designers often lack the 'epistemological authority' to convey the validity of their ideas to agency partners. The last challenge is on managing risk aversion (ibid.: 161-63). Designers are not necessarily aware of the constraints that government agencies face in exploring, entertaining and implementing new ideas as the agencies are publicly accountable for their actions and for their use of taxpayers' money - something which can prevent designers from taking the risks necessary to be truly innovative. In the concrete case, the more people that proposals and interventions were potentially exposed to, the greater the limitations that were imposed upon them. Bason elaborates on the inherent clash between the logics of administrative organization and the sensibilities of design practitioners: "Behind this apparent chasm between the design community on the one hand, and policy makers on the other, lies perhaps not just unrealistic claims from designers, but a difference in the values – implicit or espoused – that characterize the two" (2014: 5). Inspired by Banerjee (2009), Brown (2009) and Martin (2009), Bason creates the table below, laying out the differences between the two actors.

World of government	World of design
Analysis	Synthesis
Rational	Emotional
Logical	Intuitive
Deductive	Intuitive
Solutions	Paradigms, platforms
'Thinking it through'	Rapid prototyping (think through doing)
Single disciplines (e.g. law, economics)	Multiple disciplines, T-shape
Elegance	Impact, value, diffusion

Table 1: Design in the balance

These arguments support the initial hypothesis that *the introduction of co-creation methods and tools calls for new competences and for organizational transformation.* While design processes without doubt provide value to co-creative processes in policy processes, there is a clear demand for new skills and insights to be developed for both policy and design stakeholders.

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5 Framing co-creation in RRI and beyond

5.1 Introduction

In literature, co-creation is defined as the participation of end-users in the process of innovation (von Hippel, 1987). Co-creation as an innovation paradigm has been initially developed in the private sector as a consequence of two main trends. First, end-users may become co-creators, whose experiences with products or services can be of added value for a company by defining product requirements and testing the quality of their interaction with them. Secondly, the private sector can ask end users to take part in different activities of the production chain, from product ideation to their production and delivery. In this perspective, end-users are defined as possible co-designers/co-producers of innovation. This second perspective nurtures the idea that end-users are an interesting source of product and service innovation (Vargo &Lusch, 2004; von Hippel, 2007) helping companies to achieve competitive advantage by collaborating with their customers (Grissemann and Stokburger-Sauer 2012). But what do we know about co-creation with citizens as end users in the public sector? The trend of involving citizens in co-creating public services is more recent than the private sector (Deserti and Rizzo, 2014b). It basically relies on the idea of improving the efficiency and effectiveness of public services by asking people what they need and assessing with them the quality of the interaction with service touch points (Clatworthy, 2013).

Recent literature on public service delivery considers citizens as valuable partners (Szkuta, Pizzicannella, and Osimo 2014; OECD 2011) and describes different partnership typologies (Bradwell and Marr 2008; Nambisan and Nambisan 2013). Typologies describe how the relations between government and citizens can become sustainable (Ryan, 2012); how, when and where citizens are involved in the innovation process (Osborne and Strokosch 2013; Ostrom, 1996); the different roles citizens can play in the co-creation process (Lelieveldt et al., 2009) as co-designers, co-implementers, and co-initiators (Voorberg, Bekkers, & Tummers, 2015).

Starting from the early 2000s, the notion of co-creation has become more complex by including in the process different stakeholder typologies with different interests and needs to be aligned. Correspondingly, the idea of ecosystem has developed as a fruitful context where co-creation can occur. Users/Citizen-driven innovation develops in co-creation ecosystems (European Commission, 2016) as described by the quadruple helix model (Carayannis, Barth, & Campbell 2012). In these contexts, co-creation starts from the

situated needs, competencies and experiences of each actor, and strives to set up new modes of interaction that will flow in new assembly and network configurations. If well conducted, the process may lead not only to the generation of new solutions, but also to the reconfiguration of the same socio-technical system where it takes place. In other words, change occurs not just at the level of the outputs or single solutions, but across the entire ecosystem within which co-creation occurs. This overall system - which could be described as the complex combination of ideas, institutions, regulations and policies - constitutes at the same time the environment where user/citizen-driven innovation can unfold, and the result of its diffusion. In this scenario, citizen-driven innovation has emerged as a new paradigm for cities: a bottom-up process - social in its means and in its ends - in which social innovators, creative communities, citizens, vulnerable groups and civil servants co-produce unprecedented solutions at the interplay of state, private sector and civil society (Terstriep et al., 2015), tackling complex societal challenges (e.g. inclusion, employment, migration, climate change, etc.). In particular, urban Social Innovation (SI) - as results from different EU projects (SIMPACT, SIC, SI-DRIVE, Transit, BENISI, Transition) have pointed out - has shown how citizens play a pivotal role in the search for new ideas and ways to solve major urban social challenges. Citizens are coming together to demand better solutions and find creative ways to work together and produce them.

In the domain of RRI, the notion of co-creation with citizens overlaps with the broad concept of participation, which could also refer to passive involvement. Among the number of definitions of RRI available in literature, none of them directly refers to co-creation as both a means or an end.

Definition	Author/s	Year
"Responsible innovation is a collective commitment of care for the future through responsive stewardship of science and innovation in the present"	(Owen et al. 2013)	2013, p. 30
"Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and	(von Schomberg. 2013)	2013, p. 60

technological advances in our society)"		
"Responsible Innovation is an activity or process which may give rise to previously unknown designs pertaining either to the physical world (e.g. designs of buildings and infrastructure), the conceptual world (e.g. conceptual frameworks, mathematics, logic, theory, software), the institutional world (social and legal institutions, procedures and organization) or combinations of these, which – when implemented – expand the set of relevant feasible options regarding solving a set of moral problems".	(van den Hoven 2013)	2013, p. 67
"RRI is a higher-level responsibility or meta-responsibility that aims to shape, maintain, develop, coordinate and align existing and novel research and innovation-related processes, actors and responsibilities with a view to ensuring desirable and acceptable research outcomes".	(Stahl 2013)	2013, p. 712
"RRI is characterized by a shift from assessing the desirability of the outcome of innovation processes, such as evaluating harmful product outcomes in court under liability law, to assessing the qualities of the innovation process".	(Spruit, Hoople, and Rolfe 2016)	2016, p. 872
"Responsible innovation means taking care of the future through collective stewardship of science and innovation in the present".	(Stilgoe, Owen, and Macnaghten 2013)	2013, p. 1570
"Responsible Research and Innovation (RRI) refers to the comprehensive approach of proceeding in research and innovation in ways that allow all stakeholders that are involved in the processes of research and innovation at an early stage (A) to obtain relevant knowledge on the consequences of the outcomes of their actions and on the range of options open to them and (B) to effectively evaluate both outcomes and options in terms of societal	(Expert Group on the State of Art in Europe on Responsible Research and Innovation 2013)	2013, p. 3

needs and moral values and (C) to use these considerations (under A and B) as functional requirements for design and development of new research, products and services. The RRI approach has to be a key part of the research and innovation process and should be established as a collective, inclusive and system-wide approach".		
"Responsible Research and Innovation means that societal actors work together during the whole research and innovation process in order to better align both the process and its outcomes, with the values, needs and expectations of European society. RRI is an ambitious challenge for the creation of a Research and Innovation policy driven by the needs of society and engaging all societal actors via inclusive participatory approaches".	(European Commission 2014)	2014, p. 2
"Responsible Research and Innovation is a dynamic, iterative process by which all stakeholders involved in the R&I practice become mutually responsive to each other and share responsibility regarding the RRI outcomes and process requirements".	(Kupper et al. 2014)	2014, p. 4

Table 2: RRI main definitions. (Source: Deliverable D2.2*, Societal engagement under the terms of RRI*, PROSO project, H2020, 2016)

Despite the absence of a concept of co-creation in RRI definitions some of them include a complex notion of collaboration with an emphasis on stakeholders' engagement as a precondition for RRI implementation:

"Responsible Research and Innovation (RRI) refers to the ***comprehensive approach of proceeding in research and innovation*** *in ways that allow* ***all stakeholders*** *that are involved in the processes of research and innovation at an early stage (A) to* ***obtain relevant knowledge on the consequences*** *of the outcomes of their actions and on the range of options open to them and (B) to* ***effectively evaluate both outcomes and options*** *in terms of societal needs and moral values and (C) to use these considerations (under A and B) as*

functional requirements for design and development of new research*, products and services. The RRI approach has to be a key part of the research and innovation process and should be established as a* ***collective, inclusive and system-wide approach"*** *(Expert Group on the State of Art in Europe on Responsible Research and Innovation, 2013).*

Projects funded under the H2020 framework have tried to operationalise this definition. The project PE2020 categorizes actors in four groups: public, private, social and fourth sector this last one representing the interest of actors active in social cooperation (Rask et al. 2016).

The project Engage2020 identified six types of participants whose involvement in R&I should be strengthened: CSOs, citizens, affected populations, consumers, employees, users (Kuhn et al., 2014). The ACCOMPLISH project is suggesting that one of the preferred ways to integrate SSH in innovation processes is to support the diffusion of the co-creation approach. In RRI, this would imply moving beyond the passive and linear valorisation approaches in RRI (from academia to society) to the quadruple helix model of actor interaction as the most suitable one to support a new wave of research and innovation development based on the notion of sharing responsibility between academia, industry, citizens, NGOs and government.

Recently very few contributions in RRI literature have introduced the perspective of co-creation, borrowed from the literature previously mentioned, with the aim to evolve the concept of RRI from a model of two-way communication towards a process of research and innovation development. These contributions have introduced co-creation to overcome some of the current limits and weakness in RRI to:

- fill the gap on how to introduce RRI into real solutions/implementations;
- deal with wicked problems like societal challenges that require non-linear model of innovation (iterative design);
- introduce a mechanism for getting equal partnership between diverse stakeholders (including citizens).

Nathan (2018) discusses the shortcomings of linear innovation process models, especially technological innovation, and introduces design thinking (and co-design) as an improved, circular responsible innovation process model, especially for non-linear wicked problems, in order to embed ethical decision-making at the organizational level by taking into consideration both internal and external stakeholders and networks.

Gudowsky and Peissl (2016) report the experience conducted within CIMULACT with co-design workshops led by expert designers who involved citizens in the prototyping of different research agendas to support the idea selection process and include citizen knowledge in a European research programme. The authors underlined the role of co-design tools as a fundamental, common language among the different participants that were co-designing together prototypes of agendas to be further discussed and re-designed. Within the frame of the FoTRRIS H2020 project, the partners carried out a "co-created RRI experiment". Bajmócy and Pataki (2018) synthesizing the results of one of this experiment underlined the role of co-creation as a trans-disciplinary knowledge creation mechanism and as a mechanism for getting equal partnership of diverse stakeholders (including citizens) in concretely addressing societal challenges. Co-creation also brought a different distribution of power over the process that very likely resulted in changes regarding the aims, the process of design, the time frame, and the indicators of success.
However, until now the notion of co-creation and that of RRI have developed as two separated areas of knowledge with rare intersections and cross fertilisation between the two. Even if EU research policy has conceived co-creation as a new and promising paradigm of innovation to be funded, it has been kept separate from RRI as an ethical perspective from which to face science and innovation development.
What is worth noticing here is how, at the moment, Social Innovation represents, with its focus on societal problems and its co-creation approach to solution implementation, a de facto experimentation of the use of co-creation for RRI implementation.

5.2 Participation and RRI toolboxes

Toolboxes in RRI have been designed on the basis of some fundamental model of how participation and communication should occur between citizens and different levels of government and decision making authorities to guarantee a high level of access and democratisation of political decision making.
Following Sherry Arnstein, public participation includes a variety of devices which differentiate on a Ladder of Citizen Participation (Arnstein, 1969): from manipulation and therapy, through informing and consultation, to partnership, delegated power and citizen control. Arnstein differentiates eight hierarchical levels according to the political power assigned to citizens: manipulation, therapy, informing (all three are summarized under non-participation), informing, consultation, placation (the three are summarized under

tokenism), partnership, delegated power and citizen control (summarized under citizen power). The 'ladder of citizen participation' is well suited for categorizing participation in policy-making and planning processes, but less so for the involvement of citizens in research, where epistemic aspects play an important role.

Rowe and Frewer (Rowe and Frewer, 2005) present a typology of public engagement mechanisms that is based on the nature and direction of information flow between sponsors and participants. The authors distinguish public communication (with a uni-directional information flow from sponsor to participants) from public consultation (with a uni-directional information flow from participants to sponsors) and public participation (with a two-way information flow). In a similar way, yet confined to the field of scientific knowledge production, Jellema and Mulder (2016) distinguish, from the perspective of the researcher, discussing (science café), consulting (designing research by stakeholders' involvement), involving (citizen science), and collaborating with and supporting the public (science shop).

In principle, upstream citizen participation in science and technology implies mechanisms and processes to enable two-way exchanges between different publics and different powerholders about technology governance when its development is still in an early stage, with the aspiration of making sure that the goals of the techno-scientific enterprise are aligned with societal values.

The project Engage2020 (Jellema and Mulder, 2016) a priori excluded participation formats that focus on one-way communication. It defined six levels of engagement: dialogue (improving the "two-way" communication between scientists, policy makers and citizens to ensure a regular exchange of views); consulting (obtaining public feedback for decision-makers on analyses, alternatives and/or decisions); involving (working directly with the public throughout the engagement process to ensure that public concerns and aspirations are consistently understood and considered in decision-making processes); collaborating (partnering with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution); empowering (the involved participants acquire certain skills/knowledge in the process of engagement), and direct decision (final decision-making is in the hands of the public).

In a comparable approach yet with a broader scope, the PE2020 project (Ravn, Mejlgaard, and Rask 2014) distinguished five categories of public engagement, namely public communication (informing and educating citizens, one-way communication from sponsors to citizens); public activism (informing decision-makers, creating awareness, one-way

communication from citizens to sponsors, 'uninvited'); public consultation (informing decision-makers on public opinions, 'invited' by sponsors, one-way communication from citizens to sponsors); public deliberation (group deliberation on policy issues, outcome may impact decision-making, two-way communication), and public participation (assign partly or full decision-making power to citizens, two-way communication).

Based on Arnstein's 'ladder of participation', the project RRITools (Kupper et al., 2014) established four levels of engagement: consultation (stakeholders provide information but have little power to influence decisions); advice (stakeholders provide advice on decisions as members of an advisory or decision-making committee; influence in the decision-making process is not guaranteed); collaboration/partnership between research professionals, policy-makers and stakeholders (stakeholder inputs are included in decision-making processes) and control (shift in decision-making power from researchers and policy-makers to stakeholders).

However, in practice many engagement processes still "fall short in terms of true citizen participation, as an evaluation of 70 international engagement initiatives on nanotechnology found. When evaluated against the 'Ladder of Citizen Participation' most fell in the lower categories of manipulation or tokenism" (Sutcliffe, 2011).

Similarly, in the PROSO expert workshop (Bauer, Bogner, & Fuchs 2016) opinions were collected that even though some innovative forms of engagement were introduced, activities with a focus on one-way communication prevailed in the project. Hence, RRI is at risk of being replaced or at least dominated by approaches aiming at educating the public. Proso project (Bauer, Bogner, & Fuchs 2016) "has pointed out that "according to several EU projects dealing with the engagement issue the research and innovation process can be divided into four phases: policy formation, programme development, project definition, as well as research and innovation" (p. 30).

Furthermore, as some critics have noted, the idea of upstream public engagement itself is problematic since it supposes a linear conception of the innovation process, and its influence turns to be limited when the goal is the co-construction of innovations. There is a risk that one rationale (i.e. the scientific one) is considered the one best way of how to deliberate on the respective subject.

A large repertoire of tools and procedures then exists, ranging from public outreach to dialogue events, based on two main assumptions directly derived from the literature mentioned above:

- Tools must support the formation of a two way dialogue with citizens and stakeholders, i.e. they are communication tools; and
- They must support a communication flow aimed at informing the main phases of the research and innovation processes modelled as a top down approach.

In recent years a range of projects, notably Engage2020, PE2020 and RRITools, as well as STS scholars have explored whether the well-proven repertoire of participatory methods suits the requirements for societal engagement under RRI.
The project PROSO (Bauer, Bogner, & Fuchs 2016) in reviewing and critically assessing participatory tools and procedures individualised the focus of the toolboxes on the following areas:

- Engagement in agenda-setting and policy formation (addressing the European level) that includes consultation activities and dialogue procedures, including stakeholder fora, citizen juries or focus groups (Boussaguet and Dehousse, 2009);
- Participation in advisory boards, committees, and consultative bodies dealing with shaping research agendas, funding decisions or evaluation of research activities (Gudowsky et al., 2012);
- Participation in technology assessment, foresight exercises, and other impact assessment procedures (Bogner and Torgersen, 2014);
- Citizens' engagement in scientific knowledge production by being involved in data collection and/or actual research mostly referred to as citizen science (Irwin, 1995);
- CSO involvement in research and funding of CSO activities related to research and innovation such as the publicly funded civil society platform for a turnaround in research policy in Germany (see e.g. the CONSIDER project Böschen and Pfersdorf, 2014);
- Increased and innovative public outreach activities, including science events, science museums, interactive science centres and mobile exhibition spaces (Gisler, 2011);
- Grassroot approaches, including hackathons, crowdsourcing, 'fab labs' or maker spaces, where the end user plays a role as a funder, designer, judge and/or commissioner (Andersson et al., 2015, 25).

5.2.1 Typologies of toolboxes

A) Toolboxes to collect reliable data from citizen engagement

Interviews, surveys, questionnaires and others that allow researchers to collect reliable quantitative and qualitative data.
Engagement **has to be conducted on a scientific basis and evidences collected must justify in terms of reliability** in their inclusion in the research and innovation development process.

B) Toolboxes to inform participants

Photographs, diagrams, graphs/charts, videos, documents, or Web links to additional articles or pages which will enable citizens to be well-informed and properly equipped to participate meaningfully in the discussion.
Engagement **cannot be expected to provide sensible feedback if people are ill-informed about the issue at hand.**

C) Toolboxes for participatory research

Assessment tools, tests, science shops, management tools, guidelines for designing and conducting events (exhibitions, workshops, panels, educational events for teenagers); tools for international cooperation, or the Gender-Diversity-Index.
Engagement must support the direct participation of citizens in decision-making processes as a way to bridge **the perceived democratic or performance gap between institutions and citizens**.

D) Toolboxes for training to RRI

Materials produced with the aim to integrate RRI in various levels of higher education, from undergraduate to doctorate degrees[6]. Audio-visual training materials and tutorials and resources for academic staff (EnRRICH, COMPASS); training courses for science teachers on RRI (PARRISE) or on vertical themes like nanotechnologies[7]; resources to train early career researchers in a RRI perspective (PERMORM). Resources for teenagers[8].

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[6] www.heirri.eu

[7] http://nanopinion.archiv.zsi.at/en/about-nano/multimedia-repository.html

[8] http://www.expecteverything.eu/hypatia/toolkit/

Engagement can be reached by **transforming also the culture and mindset of researchers and teachers.**

E) Toolboxes for the introduction RRI in universities and research organisations

Tools for planning and implementing PE initiatives; for Embedding PE in current strategies and practices, for sustaining the establishment of PE policies on science and innovation at local and national level (https://toolkit.pe2020.eu/). Engagement must be introduced in the culture of **every research institution**.

5.3 Co-creation and design toolboxes

Co-creation tools to involve end users and stockholders often refers to the long experience and literature developed in the domain of design.

The design discipline conducts its activities under the umbrella of action research: Koskinen et al. (2012) write about design research in which "construction [...] takes center place and becomes the key means in constructing knowledge" (p. 5). Zimmerman et alii (2010) describes Research through Design as the "process of iteratively designing artifacts as a creative way of investigating what a potential future might be" (p. 312).

A worth contribution by Sanders and Stappers (Sanders and Stappers 2008) has made the effort to systematise the approach to design research into one unifying, visual framework. Their map (see figure 5) support to allocate co-design tools during all points along the design development process.

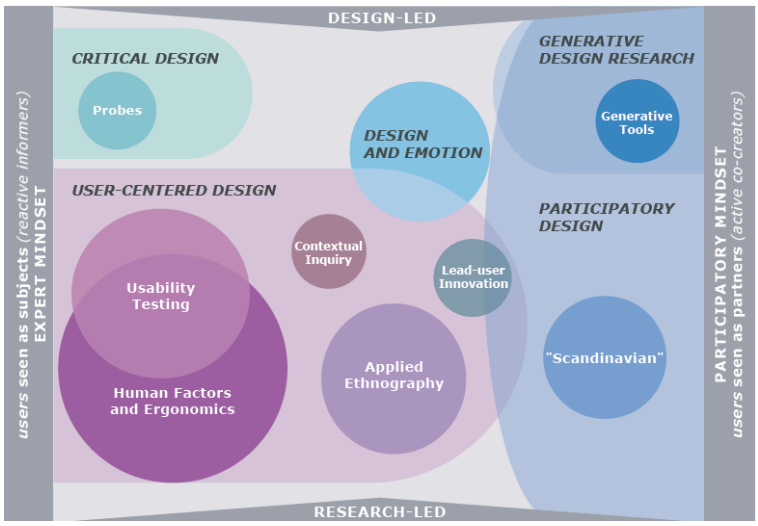

Figure 5: The landscape of co-design (Sanders and Stappers 2008)

The map represents diverse approaches to co-design intersecting a research-led perspective vs. a design-led one, and an expert mindset vs. a participatory one. The research-led perspective has the longest history and has been introduced by applied psychologists, anthropologists, sociologists and engineers. It aspires to being closer to science and less to art/creativity. The design-led perspective has come into play more recently. It does not aspire to conform to scientific ways of assessing value or relevance but to practically co-design innovation.

The west side of the map describes design researchers and practitioners involved with designing "for" people. The east side of the map describes design researchers and practitioners operating on this side typically design "with" people. They see people as the true experts in domains of experience such as living, learning, working, etc. Design researchers having a participatory mindset see people as co-creators in the design process.

The largest and most developed area on the map is the user-centred design zone. Thousands of people in this zone do design research to help make new product and services better meet the needs of end users.

They collect, analyse and interpret data in order to develop specifications or principles to guide or inform the design development of product and services. They also apply their tools and methods in the evaluation of concepts and prototypes by involving end users.

In this area are potentially located all the approaches under the hat of value-sensitive design mainly applied to the evaluation of the effectiveness and ethical acceptability of ICT-based solutions.

The participatory design zone spreads across both research-led and design-led perspectives on the eastern side of the map. Participatory design attempts to involve those who will become the "users" throughout the design development process to the extent that this is possible. The participatory approach reflects the idea that those who will be affected by design have to be included in the design process.

The generative design research territory has been growing recently in the top right corner. It is design-led and fuelled by a participatory mindset. Generative design research has been used and been found useful across all the design domains, although its rate of adoption varies greatly across the domains. Generative design research focuses on the creation of tools that non-designers can use to express their dreams (or fears) for the future. These expressions inform and inspire designers to make things that people really need (and at many levels of need). Generative design aims to empower everyday people to envision solutions.

The different tools and toolboxes developed by design over the course of its development (as described in the map above) to engage with users and stakeholders can be positioned along a continuum that describes the role and responsibilities of end users and stakeholders in the process of innovation.
From initial involvement in the process of collecting user requirements to testing solutions to actively involving them in co-designing in contexts
In this development, design elaborated basic concepts into more complex ones:

- from end users as a source of information to citizens and stakeholders as experts of the challenge;
- from users as testers in usability labs to citizens and stakeholders engaged together in specific contexts; and
- from prototypes as tools for testing to prototypes as tools for co-design.

These developments have been reflected in an intense activity of design tools, overwhelming the real needs for new tools and producing a "toolification" effect that needs to be carefully addressed.

5.3.1 Typologies of toolboxes

A) Toolboxes to collect reliable data on developed solutions

Interviews, surveys, questionnaire, users testing and others to involve end users to give feedback on the developed solutions. Products, services and processes **must not prevent people to interact with them.**

B) Toolboxes to support designers develop participatory design

Templates, probes, stories, pictures, diaries produced by users to express their needs and help to inform the innovation process: what people need and desire. Design **must produce solutions people need**.

C) Toolboxes to support everybody to collaborate in the design process

Problem solving definition, idea cards, idea generation, customer journeys, storyboard of interactions, role playing used all together by a group of stakeholders (including citizens) who have interest in solving a specific challenge. The challenge is quite often societal and

tools allow the alignment of stakeholders' diverse interests. Solutions must be developed in a **complex design process where designers and non-designers have a role as experts in their fields.**

5.4 Comparing RRI and co-design toolboxes

With respect to their practical viability, both co-creation and RRI have massively recurred to the use of tools to support end users and stakeholder engagement and have massively produced toolboxes for collecting tools and instructions for future uses. Also for this area of activity, co-creation and RRI have referred to different traditions and literatures.
Co-creation has primarily focused on the design culture (Deserti and Rizzo 2014) where there is a long tradition of designing with users and designing tools to support users in taking part of the innovation process (Sanders and Stappers 2014).
RRI has primarily focused on media, political and social sciences (Burns, O'Connor, and Stocklmayer 2003; Durant 1999; Schuurbiers and Fisher 2009) where there is a long tradition of research on two- and multiple-way communication models and tools to support the democratisation of the policy making processes and of the political decision making.
In consequence, the tools and toolkits developed in the two areas present differences and controversies:

- tools and toolkits for co-creation are developed to support the process of innovation from the ideation to experimentation to the delivery of a product or a service based on a continuous process of iteration (through experimentation) until the solution is aligned with all the needs and interests developed;
- tools and toolkits in RRI are developed to support the integration of stakeholder knowledge, requests and needs in the process of policy development. These are mainly linear upstream processes that rarely include long-term experimentations and a trial an error approach;
- tools in co-creation are specific artefacts that support the process of innovation, to gain specific results that allow the process to further develop and iterate until a final solution is implemented;
- tools in RRI can be specific artefacts or entire methodologies or processes that implement RRI;

- tools in co-creation are designed to be directly manipulated by the stakeholders, are visually based, and allow discussion among participants until a final representation aligns the interest and perspective of all the stakeholders (iteration);
- tools in RRI are mainly used and manipulated by researchers; and finally,
- prototypes, which represents a specific category of tool in co-creation. Prototypes are particular tools co-designed with the participants that represent a possible solution. They are developed to support the phase of experimentation in the process of innovation. RRI tools do not include prototypes for experimentations.

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6 Annex 1: The SISCODE toolbox

6.1 Introduction

Recently, the release of new design and innovation toolkits has become a very popular initiative. However, the Observatory of Public Sector Innovation (OECD) proposes that instead of creating new toolkits, it is important to organise and facilitate access to the existing relevant amount of toolkits and tools with "an accessible way to find out what's possible, navigate what's available, match tools with the context and the available skills and capabilities, and get advice and support when inevitably issues arise" with the goal of providing "some common language about what tools are, what they do, and a means of sequencing and navigating between all of the (large and growing) options available" (Hanson, 2018). Moreover, it is essential to guide people to understand and analyse their contexts to better define what sort of tools to use.

Therefore, the SISCODE Toolbox aims to facilitate the design and implementation of Co-Creation Journeys in the SISCODE laboratories in WP3, by leveraging existing tools and toolkits, instead of designing new ones. With a focus on the better understanding and the prioritization of the particularities of each context, the selection of the existing tools and toolkits will support the development of the design process from the problem analysis to the ideation of a solution, to the development of a prototype and its experimentation in the real context. The SISCODE Toolbox, therefore, works more on a meta- dimension, trying to add metadata and tools that will support people in making sense of existing data, tools and toolkits. The development of the SISCODE Toolbox is based on two principles:

- **The notion of construction as a learning process.** The advantages of researching, or learning, through construction, is a principle also discussed in education. Constructionism is an instructional method promoted by Seymour Papert (1983) that sets the learner (in Papert's discussion: a child) in a dialogue with its environment and the construction. Papert goes as far as calling this, very appropriately, "learning by design" (Papert, 1983, cited by Lebrun, 2002, p. 28). This perspective on learning is also applicable to RtD; in which researchers learn about the object of their inquiry through the constant evolution of the artifact, i.e., it "allows for creating a dialogue with the material" (Toeters et al., 2013, p. 116). This dialogue and constant realignment, however, generate issues in ensuring validity in its results.
- **The role of prototypes as boundary objects to support the learning process.** The term 'prototype', along with the verb 'prototyping', have become popular in design

> research, and especially so in interaction design. Originally, the term indicated a precursor of a mass-produced product, which shares its material qualities, but will undergo testing and development during implementation. In design research, the term 'prototype' is also used for all kinds of product-like physical constructions. Prototypes are a narrower category than artefacts. They are 'like products' in the sense that someone can interact with them and experience them, whereas sketches and blueprints are less direct representations about - rather than realizations of - intended situations and interactions (Stappers & Giaccardi).

Research through Design (RtD) is a research approach that employs methods and processes from design practice as a legitimate method of inquiry. Moreover, it is a process of iteratively designing artifacts as a creative way of investigating what a potential future might be. RtD forces researchers to focus on research about the future, instead of about the present or the past. (Zimmerman, Stolterman & Forlizzi, 2010). Moreover, it stresses design artefacts as outcomes that can transform the world from its current state to a preferred state. The artefacts produced in this type of research become design exemplars, providing an appropriate conduit to easily transfer findings to other researchers and practitioners. (Zimmerman, Forlizzi & Evenson, 2007). In the field of co-design in particular, prototypes are co-constructed with all the stakeholders that are part of the innovation process. The role of prototypes has then changed in the last 10 years and if in the past designers used to be educated to *making* activity as a way to give shape to the future, today we can see designers and non-designers working together, using *making* as a way to make sense of the future.

With the experimental activities conducted in the 10 Co-creation Labs with citizens, local actors, stakeholders and policy makers, WP3 of the SISCODE project will aim at increasing knowledge on co-creation through action research. Moreover, it will test the effectiveness of design methodologies to better combine co-construction (ideation) and co-production (implementation) of solutions and policies for the integration of society in science and innovation. SISCODE's Co-Creation Labs will then design and implement co-creation journeys that will engage local partners and stakeholders in a co-creation process from the stage of co-design to that of co-production of prototypes, and back to co-design with an iterative process.

One of the main challenges of SISCODE's Co-Creation Labs is the development of co-creation journeys capable of adapting the SISCODE design-based learning framework to

diverse innovation processes that are in place in different local contexts and co-creation laboratories. Therefore, the SISCODE Toolbox should enable Co-Creation Labs to design and modify their processes autonomously, adapting the general SISCODE design-based learning framework to their local context. The necessity of adaptation and customisation requires a design approach that is not only an explanation of how to adopt a selection of tools. Instead, the SISCODE Toolbox proposes a conscious design of the design processes in which such design tools are adopted.

The concept of designing the design process is called Meta-Design approach, which is a broad concept utilised in different contexts with different meanings, and with roots in several disciplines, from design to technology, society, and biology. One of the most relevant analyses of the Meta-Design concept was done by Giaccardi (2003), who traces its roots, meanings, and implications for creative industries in particular. Giaccardi considers Meta-Design an emerging design culture more than an established design approach; originating at the intersection of ICT and Design. According to Giaccardi, Meta-Design changes the perspectives of designers from objects to processes, and from contents to structures. Giaccardi identifies three different declinations of Meta-Design, crossing etymological issues with an extensive review of literature: "*meta-"* as:

- *behind* (or *designing design*): "Design of design processes" / "Design of generative principles of forms" / "Design of design tools";
- *with* (or *designing together*): "Design of media and environments that allow users to act as designers" / "Design of the organization of flows";
- *between/among* (or *designing the "in-between"):* "Design of the spaces of participation" / "Design of relational settings and affective bodies".

The importance of Meta-Design can be found in its comprehension of all the elements that affect design processes and how they can be adapted to organise the most proper participation of stakeholders. For example, the Meta-Design approach has been quite often implemented in the creation of digital environments that enable and organise the participation of users in the design process (Fischer, 2002; Giaccardi, 2003). Some Meta-Design approaches have also been especially focused on digital tools and platforms not just for amplifying the participation of users in the design process, but also for enabling the participation of users in the definition of design processes and in their adaptation to local needs (Menichinelli, Forthcoming, 2018; Menichinelli & Valsecchi, 2016). Furthermore,

these approaches have worked at the definition of a model of design processes, an ontology (Green, Southee, & Boult, 2014) that describes all the elements and variables of design processes that can be then translated into software in order to develop digital platforms supporting their editing. Here the ontology describes a design process as a set of activities modelled using Activity Theory as the unit of analysis and design (Yamagata-Lynch, 2010). Although such platforms have been designed specifically for the context of the Maker movement and might not be applied to other contexts without a proper adaptation, the ontology itself can be adopted as a starting point for the SISCODE Toolbox and be modified for the goals and dynamics of the project.

A simpler approach to Meta-Design, which is very common in the development and distribution of design tools, is the development of visual templates that can be either printed on paper and filled with a pencil or edited on a computer. These templates are usually referred to as *canvases*, since they represent the boundaries and the environment that enable users to take part in design processes, typically realising a particular outcome that is part of an overall design process. One of the most famous tools, developed as a paper canvas, is the Business Model Canvas (Osterwalder & Pigneur, 2010), which generated a trend of design tools released as canvases to deal with traditional and new objects of design. In this case, the canvas was developed with generative goals (creating new business models) after first defining an ontology for business models (Osterwalder, 2004). An example of such canvases, and their inclusion in toolkits are the DIY Toolkit[9], the SIC learning repository[10] and the Service Design Toolkit[11]. Adopting a paper canvas instead of a digital environment would cut the development time, make the SISCODE Toolbox available to the Co-Creation Labs sooner, and achieve a higher degree of usability and accessibility.

The originality of SISCODE's approach is the extensive use of prototypes: not only possible solutions are prototyped to be tested in real contexts, but also the design process is prototyped by identifying and adapting ideal tools from other co-creation methodologies in a meta activity.

9 http://diytoolkit.org/
10 https://www.silearning.eu/
11 http://www.servicedesigntoolkit.org/

Moreover, in SISCODE's approach, the role of prototypes goes beyond the simple testing of rough concepts; instead, it is a "creative way of investigating what a potential future might be." Although the focus on a preferable future state is essential for the co-creation of solutions and the engagement of different stakeholders, it may also guide towards a more collaborative and critical decision-making process[12]. The use of prototypes and their experimentation in real contexts opens up a discourse on what a preferred state might be as an intentional outcome of the co-design process, which also allows different stakeholders to consider the ethical implications of their proposed solutions.

The flexibility of Meta-Design allows the adoption of different approaches for the different frameworks to be adopted or developed in SISCODE. For example, the project proposes for the Co-Creation Journeys the adoption of an experimentation/learning cycle, based on Kolb's experiential learning framework (Kolb, 1983). This learning cycle also represents the generic structure of a design process and of an organisational learning process, and therefore in SISCODE it is the basis for connecting co-design activities with organisational learning, through the integration of appropriate design tools, the co-creation of solutions, the introduction and integration of new knowledge and the connection with policy making. This approach also reinforces the SISCODE perspective that sees Co-Creation Labs as local networks of actors concurring to the co-design and co-production of contextualised solutions (e.g. a policy, a product, a service, a process) in which the learning process involves the whole network. The learning cycle basically foresees four stages with in an iterative process:

- **Concrete Experience:** the learner encounters a new experience or situation, or re-interpret an existing experience. This phase focuses on analysing the context.
- **Reflective Observation:** the learner reflects on the experience on personal basis, trying to map the gap between experience and understanding. This phase focuses on reframing the problem.

[12] It is important to mention that co-design for policymaking usually concentrates the majority of its efforts on the proposal of solutions, while the decision making process is typically less collaborative as a consequence of the complexity of its dynamics.

- **Abstract Conceptualization:** the learner elaborates new ideas based on the previous reflection or on modifications of the existing abstract ideas. This phase focuses on envisioning alternatives.
- **Active Experimentation:** the learner applies the new ideas to his/her surroundings to see if there are any modifications in the next appearance of the experience. This phase focuses on development and prototyping of solutions to the problem.

In SISCODE, these four phases have been overlapped with four phases of a typical design cycle, achieving a new framework combining experimentation and learning, which will be used to re-connect the activities conducted in the ten SISCODE Co-creation Labs with policy makers at local, regional, national and EU levels.

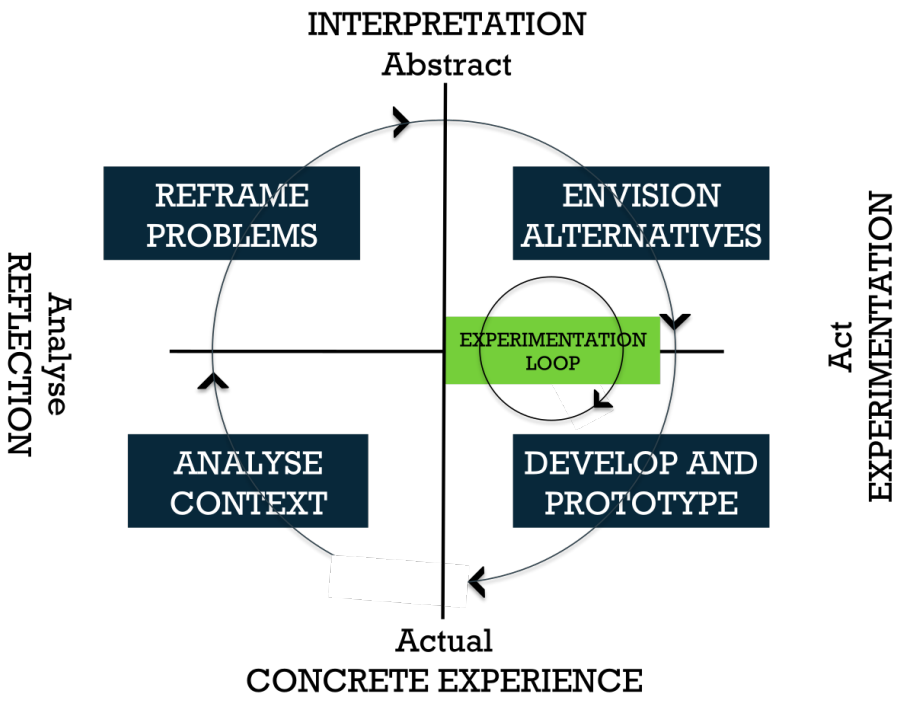


Figure 6: SISCODE design-based learning framework, combining the design cycle with Kolb's experiential learning model

Such cyclical abstract process will need to be transformed into a more concrete and operative process for enabling the design and implementation of the Co-Creation Journeys: here the strategy is to transform – or rather unfold – the cyclical/circular process into a linear one that can be designed to fit into the SISCODE project. A linear and simplistic view of design processes, as found in many step-by-step toolkits and guides, might be flexible

and rich enough for facing Co-creation Journeys with several stakeholders. Circular design processes, or rather the circular visualisation of design processes, has the advantage of representing the iterative nature of such processes or at least of part of them. The difference between linear or circular (cyclic) representation is especially a perspective one: both linear or cyclic organisation of time are possible strategies for visualising time-oriented data with different perspectives for the arrangement of the time domain (Aigner, Miksch, Schumann, & Tominski, 2011); they are thus different perspectives with different meanings in different cultures (Baggini, 2018), but equivalent strategies for organising design processes. A circular representation of a design process can represent iterative processes, but only in an abstract way, without specifying how many iterations will be implemented. Therefore, the identified design cycle can be also represented in a linear way if such iterations are instead defined better, by unwrapping the circular abstract model to a more defined and customisable linear one, especially if it enables more parallel and branching processes and not just one linear process.

The SISCODE Toolbox is thus structured to enable the design of a linear process (but with parallel or branching processes) that is structured in four phases (Figure 6), in which a vast collection of design tools (Kumar, 2013) can be applied, and that use specific design tools to generate outputs. By not receiving a pre-defined set of design tools for the development of each phase, Co-creation Labs will be able to take into consideration the particularities of their context and to include practices already in use.

For the above-mentioned reasons, after a phase of research in which many co-design toolkits have been analysed, the 101 Design Methods book - a quite wide collection of tools with step-by-step instructions - has been selected to form the primary source of tools to be adopted in the Co-creation Labs and possibly complemented with other customised tools. The 101 Design Methods book is a collection of design methods and tools, primarily developed in academic and research-based contexts but with the purpose to support the design practice. The book is self-explanatory also for non-designer, and provides a detailed step-by-step guide on how to use each tool, what are the inputs necessary for its use, and what are its possible outputs and results. Moreover, the tools are organized into 4 different phases - research, analysis, synthesis, and realization, with 7 modes of action (sense intent, know the context, know the people, frame insights, explore concepts, frame solutions, and

realize offerings) - which follow the same structure as the SISCODE design-based learning framework.

6.2 Research Phase

- **Sense Intent**: The understanding of how to start the process considering the context and making sense of it, but also creating a knowledge base to guide the process.
- **Know the Context:** The identification of how the different characteristics of the environment are related to the project. This activity provides a systemic perspective of the environment.
- **Know the People**: The identification of the different stakeholders and the users, the understanding of their interactions with the environment, their needs and interpretations.

6.3 Analysis Phase

- **Frame Insights**: The creation of a structure for what have been learned about the context and stakeholders. Development of analysis and identification of patterns as a way to gain multiple perspectives about the problem.

6.4 Synthesis Phase

- **Explore Concepts:** The conversion of insights into concepts that will be framed, defined, and communicated, as a way to convey value generation opportunities.
- **Frame Solutions:** Clustering and synthesising concepts into coherent value proposition systems.

6.5 Realization

- **Realize Offerings**: to ensure that the solutions are purposefully built around peoples' experiences and can provide real value.

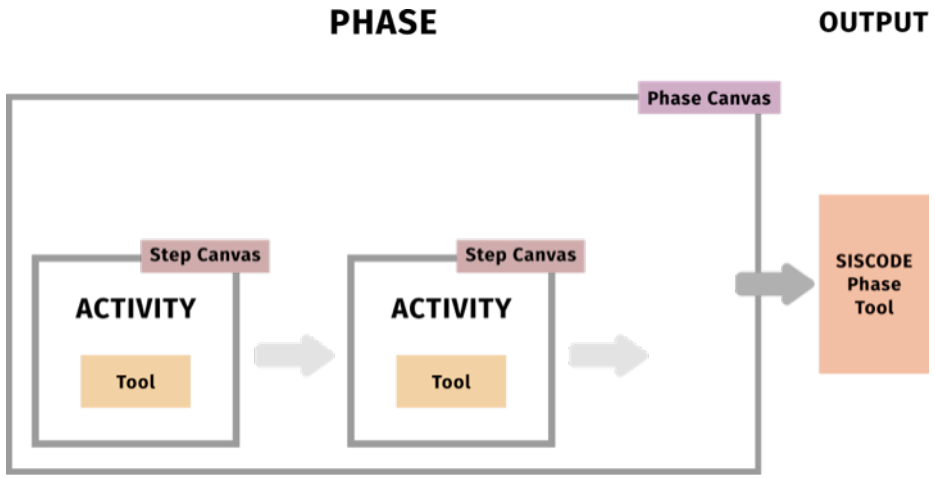
The use of 101 Design Methods by Kumar is a resource suggestion, and it is foreseen that Co-creation Labs may use other tools or toolkits for the accomplishment of each phase. Therefore, the Meta-Design approach is implemented as a way to elaborate a specific ontology (Figure 2) and enables Labs to edit and customise their process with a specific canvas for the phases (Figure 5), and another one for the activities inside the single phases (Figure 6), in which the design tools will be chosen and adopted for each experimentation in different ways. The last Phase - Develop and Prototype - is the one that has a more iterative nature, and a number of two iterations is the minimum requirement. Figure 4 illustrates a model that foresees two iterations, and how after them the results should be discussed with the stakeholders. Table 1 relates and compares Kolb's experiential learning

model, the structure of SISCODE's Co-creation process and the phases proposed by 101 Design Methods, as a way to demonstrate that although they have different nomenclatures they share the same overall macro-phases and are complementary in terms of goals.

Kolb's experiential learning model	SISCODE Process Structure	101 Design Methods Phases	Overall Description
Concrete Experience	Analyze context	Research	Understand the context based on its experience or situation, or re-interpret an existing experience. Identify how the difference circumstances of the environment are related to the project.
Reflective Observation	Reframe Problems	Analysis	Create a structure for what has been learned about the context and stakeholders, but also on a personal basis and experience. Gain multiple perspectives about the problem.
Abstract Conceptualization	Envision Alternatives	Synthesis	Elaborate new ideas based on the previous reflection or the conversion of insights into concepts. Cluster and synthesise concepts into coherent value proposition systems.
Active Experimentation	Develop and Prototype	Realization	Apply the new ideas, ensuring that solutions are purposefully built around peoples' experiences and that they can provide real value.

Table 3: Relationships among the different processes and their phases

Figure 7: Model of a phase in the SISCODE Toolbox



The Phase Canvas (Figure 11) aims to guide the better understanding of each phase, making sense of the necessary inputs and outputs, how to best define the necessary activities for the accomplishment of each phase, and how to manage it. Therefore, the canvas proposes an in-depth discussion on the purpose of the phase, the different stakeholders – the ones involved and the ones affected, and the roles and activities that should be developed by the participants.

- **Subject:** Who is managing the activity?
- **Stakeholders:** Who is directly involved in this activity?
- **Stakeholders:** Who is directly affected by this activity?
- **Roles:** Who is responsible for what / when carrying out this activity?

Although the Phase and Activity Canvas aims to guide the design process, the openness and flexibility of the Meta-Design approach proposed by the SISCODE Toolbox is complex, especially for participants that do not have previous experience on co-design activities. Therefore, one or more specific outputs are pre-defined in order to facilitate the accomplishment of each phase and synthetize the results. Moreover, these outputs will enable the comparison between the different Co-Creation Journeys. Table 4 describes the Synthesis Tools required for each phase, the outputs, and the source.

Phase	Synthesis Tool	Description	Sources
Analyse Context	Problem Definition Canvas	This synthesis tool for the definition of the problem allows participants to identify	https://www.silearning.eu/tools-

		underlying factors that can contextualize the problem or reframe it. As a consequence of the collaboration process, different perspectives and viewpoints are brought to the context of the problem. • Identification of the key social problem or need, and explanation of its importance. • Identification of who is affected by the problem. • Identification of social / cultural factors that shape the problem. • Evidences that the problem is significant. • Reframing the problem.	archive/problem-definition/
Reframe Problems	Idea Card	Organization of the different perspectives and ideas related to the challenge and stakeholders' needs, possible solutions, and possible ways to accomplish them. Moreover, it can also be used for feedback collection.	https://www.silearning.eu/tools-archive/idea-card/
	Personas	Personas are fictional characters who embody the archetype of the different stakeholders. Should be developed after preliminary data collection, like users' observation, in order to better describe their characteristics, behaviors, motivations, needs, and interests.	https://www.silearning.eu/tools-archive/personas/ 101 Design Methods, p. 370

	Stakeholders Map	Identification and understanding of the different stakeholders: • For who the solution is being targeted. • What are roles for the different stakeholders can play. • How the different stakeholders can work together and by what means?	https://www.silearning.eu/tools-archive/stakeholders-map/
Envision Alternatives	Business Model	The social innovation business model canvas proposed helps to identify: • A specific social value proposition. • The Beneficiaries and Financing Supporters, like donors, investors and funders). • The key activities and resources that are needed to support the social innovation. • Social impact measurement and the what indicators to adopt.	https://www.silearning.eu/tools-archive/business-model/
	Customer Journey	A visual interpretation of the user's relationship with the organization, service or product, by the user's perspective.	https://www.silearning.eu/tools-archive/customer-journey/ 101 Design Methods, p. 320 and 326.
Develop & Prototype	Report / Documentation	The documentation of the specific prototypes developed locally.	

Table 4: Description of synthesis tools, phases, and sources

The Activity Canvas (Figure 8) aims to guide the execution of the different activities that will happen during each phase, as well as the goal of each activity and the tools required for its accomplishment.

- **Object:** Who are the participants working on this activity?
- **Rules:** What are the explicit and implicit rules, norms and procedures influencing the activity?
- **Tools:** What tools does the subject use to achieve the outcome required for this activity and how?
- **Outcome:** What is the desired outcome of this activity?

As mentioned before, the tools to be adopted within the SISCODE Toolbox will be based on a pre-selection of tools from the book 101 Design Methods (Kumar, 2013), meant to facilitate their adoption and usage. Table 4 presents the pre-selected tools, their input/outputs, and a suggestion on the phase in which to use them.

Overall, the resulting structure of the SISCODE Toolbox will consist of:

- **Phase and Activity Canvases**: Two canvases, one for documenting a phase, and another one for documenting the activities of each phase.
- **Phase Output:** A specific visualisation format for the documentation and synthesis of the output of each phase.
- **Tools:** A pre-selection of existing tools from the book *101 Design Methods* (Kumar, 2013).
- **Documentation:** A concise and step-by-step guide that explains how to use the SISCODE Toolbox.

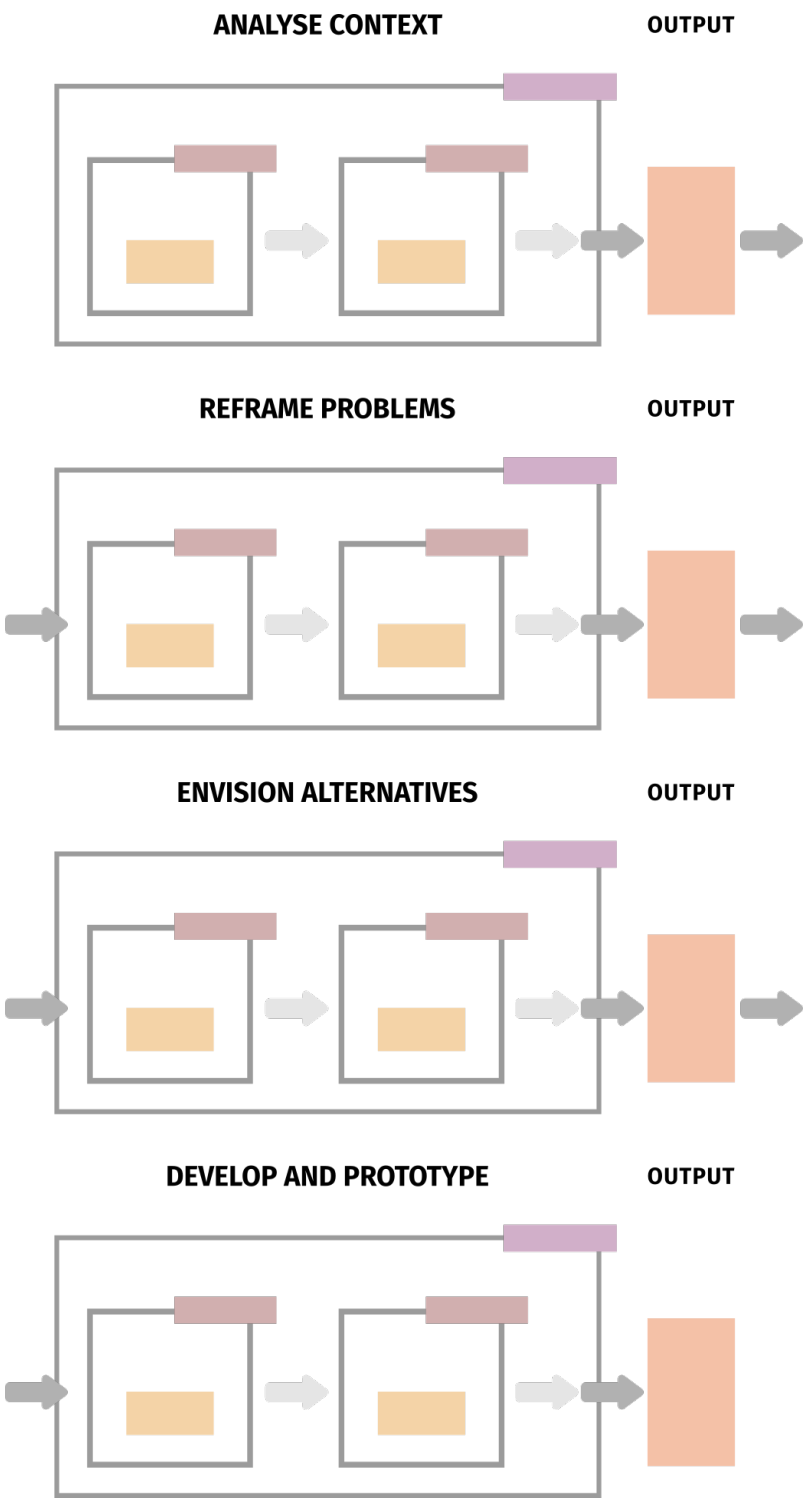


Figure 8: Structure of the whole SISCODE co-design process

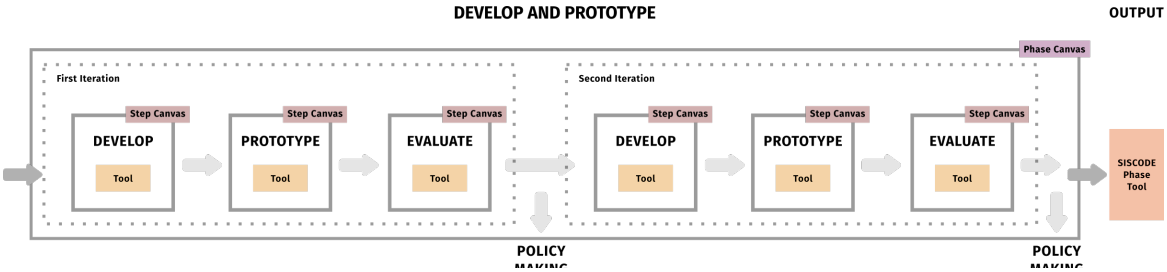
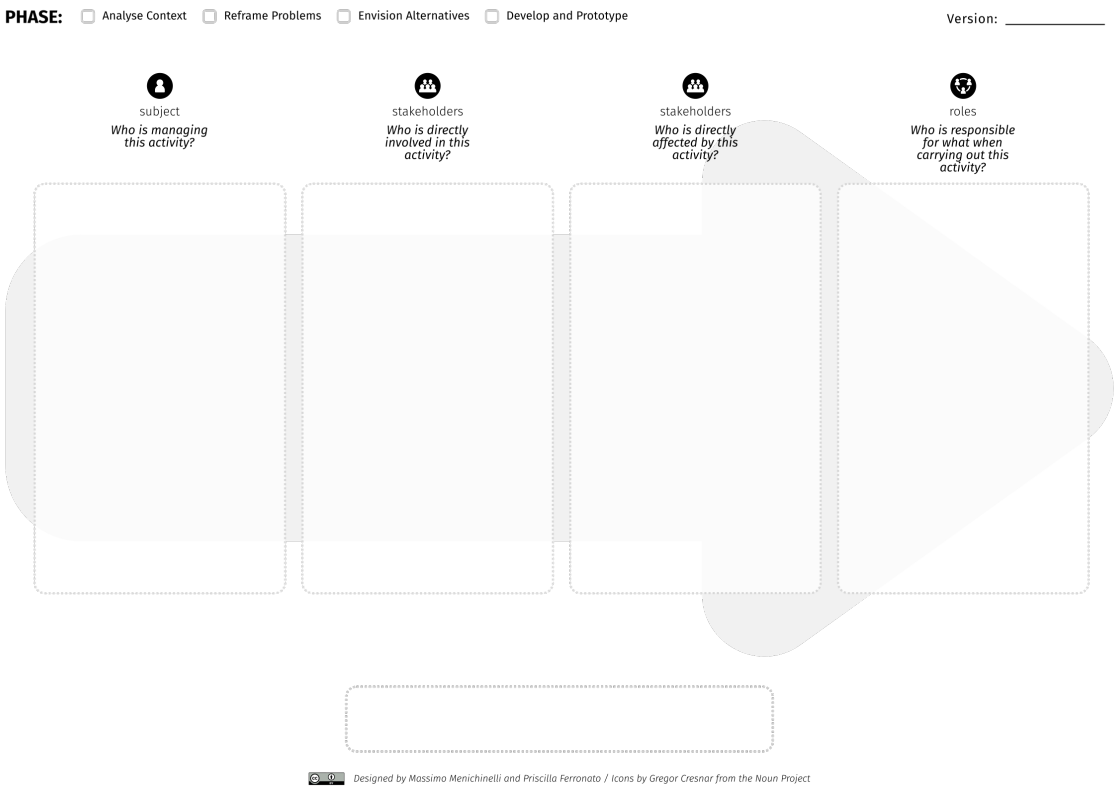


Figure 9: Structure of the Develop and Prototype phase

Figure 10: Canvas for prototyping a phase



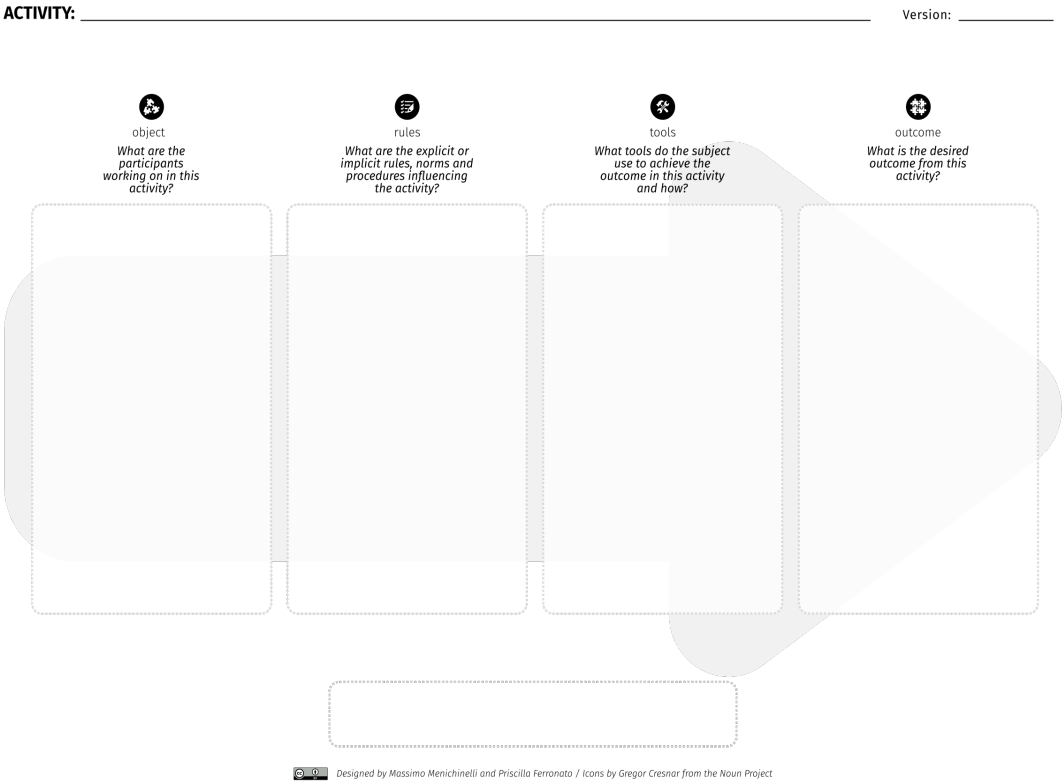


Figure 11: Canvas for prototyping an activity within a phase

Tool	Description	Required Inputs	Outputs	Pages	SISCODE Phase
Five Human Factors	A method for supporting observation in the field, prompting researchers to look for the physical, cognitive, social, cultural, and emotional elements present in any situation to understand how they affect peoples' overall experiences. This research method breaks down a person's experience into its constituent parts to understand each in detail, and then reassembles our findings to understand how they form an overall experience.	Identify the right situation for user observation. Observation or/and engagement through conversation	Organized observations about each of the 5 factors that drive user behaviors (cognitive, physical, cultural, social, and emotional)	p. 177	Analyze context

Ethnographic Interview	A close companion to field visit observational research, Ethnographic Interview is concerned with understanding peoples' activities and experiences from their own perspectives and in their own places.	Project's topic. List of possible questions to initiate the conversation with the participants	Observations about users' experience told from their point of view.	p. 193	Analyze context
User Pictures Interview	Having conversations with people about the photographs they have taken of their activities. The method gathers information, through open-ended questions, about participants by getting them to talk in detail about the photographs they have taken. The narratives emerging from the interviews are sources of rich information and potential insights about the user's experiences and possible unmet needs.	Identify activities relevant to the study that are spontaneous and difficult to observe.	Photos and observations of specific situations that are important to participants.	p. 197	Analyze context
Cultural Artifacts or Cultural Probe	Discovering perceptions of people using artifacts that are culturally relevant to sociocultural groups. The Cultural Artifacts method (re) appropriates a specific element of that culture, either tangible such as a physical object or intangible such as a specific belief the group has, into an artifact relevant to that group and uses that artifact to discover peoples' perceptions traditionally overlooked by other research methods.	Identify a relevant artifact significant to the group of users being studied.	In-depth knowledge of users' activities and thought process. Kits and activities completed by users.	p. 201	Analyze context

Image sort / Card sort	Having people sort symbolic images to find out their thoughts and attitudes about a topic. Image Sorting is a method used to find out peoples' associations and perceptions of particular topics. Engaging in activities in which people sort, discuss, and create stories using prepared images is a powerful way of revealing the emotions, relationships, and values people associate with other people, places, and objects in a situation.	Delimitation of the topic. A comprehensive set of images to help users communicate abstract ideas.	Observations about the users' values and attitudes toward a specific topic.	p. 205	Reframe the Problem & Envision Alternatives
Descriptive value web	A Descriptive Value Web visualizes the existing set of relationships among stakeholders in a given context, showing how value is exchanged and flows through the system. Most frequently it is represented as a network diagram in which stakeholders are presented as nodes connected by links with descriptions of what value is flowing from node to node.	Context and user research data. List of key stakeholders in current context.	A network diagram visualizing relevant stakeholders and existing value exchanges among them.	p.265	Analyze context & Reframe the Problem
Entities position map	The Entities Position Map is a method for analyzing how entities group together in relation to two intersecting attribute scales. Each entity is plotted within the boundaries of the position map. The method helps illuminate not just where entities fall within this defined space, but their relative position to one another.	List of entities to be compared	Map of entities positioned according to two attribute scales revealing insights and opportunities areas.	p. 269	Analyze context & Envision Alternatives

Activity network	This method allows us to take a list of activities gathered during research and see how they are grouped based on their relationships. Structuring activities of stakeholders and showing how they relate to one another.	Comprehensive list of activities happening in the context of study.	A central network map representing how activities are interconnected. Insights about patterns among activities.	p. 296	Reframe the Problem
Compelling experience map	Mapping the entire user experience with five stages -attraction, entry, engagement, exit, and extension.	Data from context and user research	Understanding of strengths and weaknesses of the user experience at different stages of interacting with an offering.	p. 320	Analyze context & Develop and prototype
User journey map	The User Journey Map is a flow map that tracks users' steps through an entire experience. This method breaks down users' journey into component parts to gain insights into problems that may be present or opportunities for innovations.	List of all user activities happening in the context of study.	Visualization of activity clusters over time representing the journey users go through in a particular process/experience Pain-points, insights, and opportunities along the user's journey	p. 326	Analyze context & Develop and prototype
Analysis workshop	Conducting a work session to understand insights, find patterns, and make frameworks for ideation.	Key research findings and insights. List of potential participants.	Identification of key insights and high-level clusters of insights. Understanding of what those indicate about the context.	p. 340	Envision alternatives & Develop and prototype
Personas	Defining user personalities for exploring concepts around them.	Findings from ethnographic research. List of potential users and user attributes	Set of personas based on different user attributes to inform concept exploration.	p.370	Analyze context & Reframe the Problem

Ideation session	Concepts are generated using pre- organized sets of insights, principles, and frameworks that teams have already developed. The method encourages generating as many concepts as possible without making judgments and is done in a short amount of time. The session brings together people with multidisciplinary backgrounds and encourages building on each other's ideas.	Insights, design principles, and/or opportunity frameworks.	Numerous concepts (around the project's research findings).	p. 374	Reframe the Problem & Envision alternatives
Role play ideation	Role-playing is an approach to brainstorming in which each member of the team plays the role of a different stakeholder in the concept area. Stakeholders include end users, designers, engineers, executives, marketers, suppliers, partners, and others. Brainstorming using this method can take individual team members out of their usual mindsets and assumptions.	Innovation opportunities from analysis.	Collection of concepts rooted in empathy and understanding of stakeholder needs.	p. 391	Envision alternatives
"Pupet" scenario	Collaboratively creating current and future scenarios and enacting them with puppets as actors.	Everyday-life findings and insights from ethnographic research.	A collection of future scenarios and related concepts.	p. 401	Envision alternatives
Behavioral prototype	Simulating situations of user activity to understand user behaviors and build early concept. Through observation and conversation, user behaviors to help the team further build on the	Key behaviors and related concepts to be studied.	Refined concepts adjusted for user behaviors.	p. 407	Envision alternatives & Develop and prototype

	concepts. In particular, this method is used to understand the five human factors (physical, cognitive, social, cultural, or emotional) around behaviors and create new value added concepts to support and improve those behaviors				
Concept prototype	Embodying concepts in tangible forms to get feedback from users.	Concepts that can benefit from testing in tangible form.	Refined concepts adjusted around how potential users interact with prototypes.	p. 412	Envision alternatives & Develop and prototype
Concept scenarios	Illustrating concepts as real-life stories featuring users and context.	Concepts generated in the ideation sessions.	A set of scenarios illustrating how concepts will exist in real-life situations.	p. 421	Envision alternatives & Develop and prototype
Foresight scenario	Creating solutions by foreseeing possible alternative future situations.	List of emergent trends critical to projects. Previously generated concepts	Holistic solutions that address multiple future scenarios.	p. 465	Envision alternatives & Develop and prototype
Solution storyboard	Constructing narratives that explain how system solutions work.	Solutions that can benefit from being explained as a story.	Stories that show how the parts of a solution work together.	p. 473	Envision alternatives & Develop and prototype
Platform plan	Planning solutions as platforms using platform principles and attributes.	Collection of planned solutions. Platform principles, attributes, and examples.	A plan showing reconceived solutions as platforms. Discussions among stakeholders about how to implement the platform solutions.	p. 517	Develop and prototype

Pilot deployment test	Placing offerings in the marketplace to learn how they perform and how users experience them.	Selected solutions and their development plans. Access to key stakeholders in the offering launch.	Results based on assessment and analysis of offerings in the pilot market.	p. 529	Develop and prototype

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