Taming the problem of urban climate adaptation

Can design-thinking strengthen collaborative efforts?

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0. Abstract

Adapting to climate change is an increasingly important task for cities, as extreme rainfalls and heat waves challenge urbanized areas. Although many residents, professionals and governments support 'greening' the city, these initiatives bring along fundamental questions. Who is maintaining the 'green' areas? Furthermore, does the government have the legitimacy, knowledge and money to deal with this challenge by itself? Climate adaptation is often called a wicked issue, and needs according to a wide array of scholars a collaborative governance process to come up with a solution. This paper explores what design science can add to the principles of collaborative governance, and describes the fundamentals of design-thinking. It is a stream of literature and a craftsmanship which produces - due to its goal-orientation, iterative and creative processes, and deep understanding about what works in a certain situation – a solution for a particular problem or user. (Re-)evaluation, field experiments and iterations help to improve the quality of the prototype solution. This is typically done a few times before the final prototype solution is generated.

1. Introduction

Due to the increasing consequences of climate change - like extreme rainfall and heat waves – cities have to think about adaptation measures. In addition to collective measures taken by public authorities, cities also look for possibilities to mobilize citizens to contribute to robustness to climate change. Citizens can take private measures (like greening roofs or gardens) but they can also collaborate with public and private actors in order to implement and maintain green lanes, squares and parking places. The latter refers to so-called blue green infrastructures. These infrastructures can contribute significantly to the prevention of water nuisance and contribute to urban cooling.

It is often stated that to accomplish solutions for this kind of complex and wicked problems the willingness of a wide array of stakeholders to collaborate is crucial. Climate adaptation is often framed

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as a wicked issue in which there are controversies both about the facts as well as the values, which requires processes of frame reflection, social learning and joint deliberation (Termeer et al. 2013). Hereby, the paradigm of collaborative governance is considered as a useful framework to organize such processes (Ansell & Gash, 2008; Emerson et al. 2011). However, in the influential work of Rittel & Webber, the idea of wicked issues is not approached from a consensus-building perspective, but from a design science perspective. The design perspective involves a strong focus on creating a solution to a problem (Dorst, 2011; Norman & Verganti, 2014) and is therefore purposeful and need-oriented. Within the design sciences, the argument is often heard that wicked issues are typically design problems and thus suitable for a design approach in which we do not have all necessary information to optimize choices and have to build our understanding upon fast iterations between provisional problem definitions and possible solutions

In this paper, our argument is that processes of collaborative governance and design are similar to a large extent, but they can complement and strengthen each other especially in wicked issues, like climate change. In those, a more creative and result-oriented approach is required in order to create real solutions to these problems. Therefore, in this paper we confront the paradigms of collaborative governance with the main principles of design science. We explore what design science can add to the main principles of collaborative governance processes when it comes to the question how to deal with a wicked issue like climate adaptation.

The structure of the paper is as follows. First, we elaborate on the challenge of urban climate adaptation and greening the city. We delve more into the question why this challenge can be characterized as a wicked issue and why such an issue requires a collaborative approach. Subsequently, we outline the main principles of collaborative governance and explore the opportunities and pitfalls of these principles for these kind of wicked problems. Then we explore how a design-oriented process can be used to deal with such issues. After comparing both paradigms we present a more integrated approach for collaborative design which forms the conceptual basis for conducting research to wicked problems.

2. The wicked issue of climate adaptation and the quest for collaboration

Climate adaptation is often labelled as a wicked issue. Despite growing scientific evidence, there is disagreement about the causes of climate change and its impacts. Moreover, there is also no consensus about how one should oppose issues related to climate change (Eckersley, 2016; Pollitt, 2016; Termeer, Dewulf, & Breeman, 2013). Some authors even call this issue ‘super-wicked’ (Levin, Cashore, Bernstein, & Auld, 2007). There are at least four characteristics that make climate adaptation an ill-structured problem (Verkerk, Teisman, & Van Buuren, 2015). First of all, the problem has many

different appearances, depending on the scale and the domain. Some consequences are positive (for tourism and recreation), other consequences are disastrous (sea level rise). However, these consequences differ across different geographical areas. This makes the problem a highly fragmented and it impacts different (policy) domains and levels (Bache, Bartle, Flinders, & Marsden, 2015). Secondly, there is much uncertainty about the (severity of the) different impacts of climate change. Unknown are the direction and velocity of these impacts. Therefore, prioritizing actions for mitigation and adaptation is extremely difficult. This related to the controversial character of climate change: there is not only climate-scepticism, there are even people (at powerful positions) who deny climate change. And despite a growing consensus, there is political unwillingness to confront possible consequences now. Finally, the impacts of climate change are complex and thus erratic and nonlinear. Some impacts strengthen each other (like melting ice and sea-level rise). Other impacts cause entirely new, additional problems (like climate refugees).

Collaborative or network governance is often considered as a necessary, although not always sufficient, mean to deal with wicked issues, especially to deal with the controversies, surrounding such issues (Head, 2008; Keast, Mandell, Brown, & Woolcock, 2004; Koppenjan & Klijn, 2004). Collaborative governance is considered a potential way of realizing frame reflection and consensus among actors with divergent views and agendas. In the next section we outline the essentials of collaborative governance.

3. The essentials of collaborative governance

Collaborative governance is seen in this paper - because it is framed from the perspective of cities - as:

"A governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets" (Ansell & Gash, 2007)

The literature about collaborative governance is broad, and based upon different literature streams, focusing on system and context characteristics, specific institutions and instruments influencing the system, and on leadership and individuals who make up the collaboration. These literature streams point us towards the main dimensions of collaborative governance. Throughout the paper we will discuss collaborative governance, referring to process in which public and private organizations, and citizens jointly organize themselves to cope with urban climate adaptation. After

their literature review Ansell and Gash (2007) show that every collaborative governance situation has five building blocks: pre-existing conditions, institutional framework, the inner system, facilitative leadership and outcomes.

The pre-existing conditions are contextual factors or a given - like collaboration history, resources of particular actors, incentives to collaborate - and the outcomes are part the output of the collaboration, in our cases an approach to tackle climate adaptation in cities. Furthermore, the definition of Ansell and Cash (2007) stresses that these building blocks, if they want to facilitate a collaborative outcome, are to be consensus-oriented and deliberative. Meaning, that the process to achieve a collaborative effort should be cyclical or iterative, which means that actors have to go back and forward between different steps in the process (Ansell & Gash, 2007, pp. 557–558). Most authors describe a few steps in which collaborative efforts and actions get their form, for instance, very broadly: preparation, development, and decision making (Edelenbos, 2005, p. 118)

The institutional framework sets the: *"basic protocols and ground rules for collaboration, which are critical for the procedural legitimacy of the collaborative process"* (Ansell & Gash, 2007, p. 555) Ostrom (2005) shows in her research that individuals often devise ingenious and eminently sensible ways to manage common pool resources. However, designing an institutional framework for collaborative processes is not simple. As traditional regulation, and differentiating tasks and products to different stakeholders does not help to create shared ownership and hierarchy does not work in mutual dependent webs of actors (Ansell & Gash, 2007; O'Toole Jr., 2003), many scholars suggest deliberation and networks as a solution, in which one can reach consensus about *satisficing* solutions (Healey, 1998; Roberts, 2000; Weber et al., 2014). Furthermore, the goal and the solution are viewed by multiple stakeholders – who have different interests and values - from a different angle. This sometimes creates a situation in which every possible solution or approach is inherently biased and value-laden (Rittel & Webber, 1973). Different groups, or even individuals value different things. A solution that satisfies one, might be objectionable or create a problem to another.

The inner system is the collaborative process. Collaborative governance processes have to result into broadly supported solutions, that contribute to the climate robustness of cities and enable other forms of public value creation, and which are seen by the involved stakeholders as their joint responsibility to implement and maintain. The related functionalities have to do with:

- Facilitating a process of joint organization or exploration in which actors are invited to bring in their ambitions and look for possibilities to connect them to the ambition of urban adaptation (Rittel & Webber, 1973);

- Mobilizing expertise and resources to maximize the contribution of the solution to climate adaptation (Head & Alford, 2013, p. 21);
- Organizing broad ownership and willingness to contribute to the goals and objectives (McQuaid, 2010; Voorberg, Bekkers, & Tummers, 2014);

Ansell and Gash and many others focus on leadership as one of the main elements of collaborative governance. Similar to others they basically say that leadership is essential for inventing and upholding the ground rules, but besides that for building trust, and to broker and facilitate dialogue. The latter is done by a facilitative leader, by exploring possible gains and connecting resources, which stakeholders could bring to the table. Leadership is not necessarily a hierarchical term, as Ansell and Gash stipulate, leaders can both facilitate, mediate as well as intervene, in order of increasing pressure. Moreover, leadership roles (for instance formal/informal) may also lay with multiple leaders, rather than with one. This might be even something to consider when building collaborative governance arrangements, as tensions could exist when fulfilling the formal coordinating role, and a more informal or brokering role (Ansell & Gash, 2007).

4. The essentials of design-science and it's potential for wicked problems

Since the classical work of Rittel & Webber (1971), it is often stated that classical scientific approaches are suitable for tame or well-structured problems, while design is useful when it comes to ill-structured or wicked issues. In this section we describe the main principles of the design sciences and reflect upon the question why design is a suitable approach for dealing with wicked issues.

Design is a generic concept what is used in all kinds of literature and all kinds of disciplines. Looking at the most cited articles in design sciences we are able to detect a number of characteristics which may be an addition to the collaborative governance paradigm. Design is often considered as a *goal-oriented* concept. Or, to put it differently, the legitimacy of a design (of a product, service or process) lies in the extent in which it helps to achieve a certain goal (Bayazit, 2004; Cross, 2001; Margolin & Margolin, 2002). The goal of design is to satisfy the needs of a customer or service user (Norman & Verganti, 2014) and to create added value for this customer/users or a collective of customers/users (Oosterlaken, 2009; Tromp, Hekkert, & Verbeek, 2011). The important question becomes then, what is needed to come to a design which serves the interest of users or consumers? Answering this question is not a panacea, since design science covers design of concrete products, such as cars and mobile phones, but may also refer to governance processes or public services. However, looking at the design literature, it reveals a number of generic aspects which can be helpful for collaborative governance as well. For starters, various authors have presented a social perspective on design. This

social aspect can have various turnouts. For instance, design can refer to making sense of things by processes of deliberation and reasoning (Kolko, 2010a; Norman & Verganti, 2014). Others have stressed that design is a learning process*,* in which knowledge is constructed and people move back and forth from the analytical phase of design (Fagerberg & Godinho, 2005). In addition, Bjorklund (2013) approaches design in a similar vain. She showed that designing consists of social constructions of what accounts as a problem. Her point of departure is that what accounts as solution is based on what the perceived problem is. As such, finding a useful solution to a problem is depending on how the problem is framed and how many people can be convinced about this frame (see also Moreno et al., 2014; Ozkan & Dogan, 2013). In order to facilitate this social perspective on design, we can identify a number of conditions.

In the first place, the root for effective design is the taking into account of diversity by and of intertwining stakeholders (e.g. Margolin & Margolin, 2002; Oosterlaken, 2009; Secomandi & Snelders, 2011). In that regard, Oosterlaken argues that a capability approach (the opportunities every individual has) is necessary to draw attention to human diversity. Not only in terms of what we value, but also in terms of personal and social/environmental characteristics.

In the second place, in order to take that diversity into account it is essential that service users or customers are involved in the development of the product or service. Siu (2003) argues that designers always should recognize that users have the right to actualize and modify designs to make them more suitable. That is why many authors have emphasized the circular character of design processes, with multiple deliberation moments (Kolko, 2010b; Norman & Verganti, 2014; Xenakis & Arnellos, 2013), thereby creating feedback loops and reflection (Fallman, 2008; Scott, Bakker, & Quist, 2012).

In the third place, these processes of deliberation will ultimately lead to common goals and aligned incentives for stakeholders (Blizzard & Klotz, 2012). In particular the contribution of Blizzard and Klotz is interesting, since they argue that in order to effectively address a wicked climate issue (in their case carbon emissions), the involvement of multiple stakeholders in co-design is needed. As such, they approach the social perspective of design not from a normative angle, but from an instrumental angle.

As to the question how design in a collaborative way should be organized, most authors distinguish more or less the same phases or steps. In the first step, the needs of users are analysed by bringing various stakeholders together and collectively deliberate the goals direction of the design (Dorst & Cross, 2001; Fallman, 2008; Farrell & Hooker, 2013). Once, these are specified, the second step is to draft a *possible* solution, which is labelled as *prototype.* This prototype is characterized by a *abductive* line of reasoning (Kolko, 2010b; Margolin, 2007), implying that it may possibly work in a given context, but testing need to show whether that is indeed the case. Important to note is that the prototype is the collective result of prioritizing, judging and forging connections of involved actors

(Margonlin, 2007). Therefore it is a collective product, made in co-design with relevant stakeholders. The third step is then to test and refine the prototype. In the design literature this phase is often considered as an interrelated phase, since this testing is based on short iterations of tests and evaluations (Cascini, Fantoni, & Montagna, 2013; Dorst & Cross, 2001; Ranscombe, Hicks, Mullineux, & Singh, 2012; Scott et al., 2012). Especially in this phase the user orientation of design thinking is displayed. Adaptations on the prototype should be based on the extent in which the needs of users are satisfied (Margolin & Margolin, 2002), or users have the feeling that added value has been created (Oosterlaken, 2009; Tromp et al., 2011). In the last step, a prototype is accepted as definitive product or service, if the problem and the solution are believed to be effectively matched (Dorst, 2001). Morelli (2002) argues in that regard, that this matching is not only based on a techno productive dimension, but also to a social and cultural dimension. Therefore, elements like user-friendliness and aesthetics should not be disregarded as unimportant (Ranscombe et al., 2012). Moreover, a responsible design from an ethical point of view allows service users to conclude whether a design has effectively bridged the gap between problem and solution (Chapman, 2009; Siu, 2003).

The attractiveness of a design approach for 'wicked problems' in the public sector becomes more clear now. As Rittel and Webber (1973) argued, the days of solving major urban and social problems through an 'engineering' approach have ended. Modern society is pluralistic and social groups have important differences in attitudes that undermine the possibility of clear and agreed solutions (cf. Head, 2008). Design approaches are often seen as a suitable way of dealing with wicked issues. There are two important reasons for this. In the first place, design approaches leave room for abduction and start the exploration of possible solutions with educated guesses based upon making plausible inferences of what we know. By doing so they provide us with a starting point for understanding a complex and uncertain situation. Second, a design approach enables us to gradually refine both our problem definition and possible solution by a stepwise process of contextualizing the developed prototype. In the words of Dorst (2006):

"*Creative design seems more to be a matter of developing and refining together both the formulation of a problem and ideas for a solution, with constant iteration of analysis, synthesis, and evaluation processes between the two notional design "spaces"—problem space and solution space. In creative design, the designer is seeking to generate a matching problem-solution pair, through a coevolution of the problem and the solution. Creative design involves a period of exploration in which problem and solution spaces are evolving, and are unstable until (temporarily) fixed by an emergent bridge, which identifies a problem-solution pairing*".

5. The two paradigms compared

Both the idea of collaborative governance and design sciences are promising ways to encounter wicked problems. However, they depart from very diverging premises and use highly different strategies. Thus, the question is whether they can be combined in order to realize a more effective approach of dealing with a wicked issue like climate adaptation. However, until now a systematic reflection upon the question whether both paradigms can strengthen each other is lacking. In this section we compare both perspectives.

In Table 1 the two concepts and their main differences are schematically shown.

TABLE 1: collaborative governance and design science compared

	Collaborative governance	**Design science**
Legitimacy gained by	Whether the solution is shared and taken in consensus **= Consensus oriented**	the extent in which the design helps to achieve a certain goal **= Goal-oriented**
Participants	All relevant stakeholders, AND Independent process manager	All relevant stakeholders, AND design experts
Logic	**Incremental**, stepwise **process** of building consensus about the problem and subsequently the solution	**Iterative process** of making educated guesses about what the problem and the solution might be.
Process	**Deliberative**: - Joint exploration, and framing the collaboration and process - Mobilizing resources and expertise - Organize ownership, shared responsibility	**Creative**: - Framing the challenge - Exploring all imaginable solutions - Developing, testing and refining prototypes
Quality indicators process	Principled engagement Shared motivation Capacity for joint action (Emerson, Nabatchi, & Balogh, 2012)	Deep understanding Creativity Intuition
Outcome	Consensus about goals and means	Tested prototype

6. The best of both worlds? Towards an integrative framework for collaborative design

We argue that there are at least three ways to enrich the framework of collaborative governance with insights from design science.

1. *Make the consensus-oriented dialogue also solution-oriented and therefore focus on the product;*

As collaborative governance often starts with stakeholders with vested interests, these processes may be very political and - because of that – sometimes end in a deadlock (6, Leat, Setzler, & Stoker, 2002; Agranoff, 2006; Jessop, 2009). Framing, and starting from another angle has been advocated as a way to overcome this (Peters, 2004). Starting with a very practical and small scale-problem and an emphasis on a solution, like in design science, can depoliticize the collaboration (Lach, Rayner, & Ingram, 2005). Besides, design science is user-oriented. As a consequence, a solution is not the sum of what organizations or actors can bring to the table, but about serving the needs of a product or service user.

Often collaboration processes start with the usual suspects, like all the stakeholders, and in some cases the users. Design science proponents propose a more far-reaching actor constellation and start with a range of creative actors, entrepreneurs etc. not directly having a stake at play, who can bring about new views, frames and solutions.

2. *To create room for creativity and imagination in processes of collaboration;*

Many solutions are chosen because something has worked in the past, or because it is the 'way we do things'. Habits develop because activities have been effective in the past, and led to the attainment of certain outcomes. These habits tend to become standard. Sometimes, in even such a way that a collaboration or an actor fails to recognize that activities and procedures which have been successful earlier, need not necessarily be so in *any* situation and under *all* conditions (Merton, 1936). Design science puts forward creativity, combined with critical thinking. For instance, by combining and colliding qualitative and quantitative knowledge to create new understandings of the problem, that can subsequently lead to better designs to solve the problem. Furthermore, brainstorming and other open methods are used to break down habits and automatic responses.

Next to the creative process of inventing a design, the whole process of discovering, 'tweaking' and prototyping design solutions has to continue over time. This evolution asks for being constantly aware of the tests and newly discovered facts. This process by itself can lead to new and better guidelines to replace or supplement traditional ways of problem solving.

3. *To organize collaboration processes as a process of (rapid) prototyping based upon developing, testing and refining possible designs.*

Leaving room for all alternative solutions and tests, 'objectifies' the solutions and again: depoliticizes the problem. Research methods are advocated in design-thinking, as they can replace perceptions about problems and possible solutions with facts. If possible solution scenarios are tested, one can work in collaboration on better solutions that incrementally improve the starting position. Furthermore, systematically redefining conditions and characteristics of the design can lead to new information about elements in the organizational process and management of collaborations (like the ICT architecture, communication flow, and interaction with stakeholders, etc). This improves not only the design process itself, but might also have an influence on the operations of the involved organizations.

4. Outlook: taming the problem of urban adaptation by collaborative design

In this paper, we started out by showing how wicked issues like climate change are often considered a problem which needs to be combatted by forming collaborative alliances. Therefore, the notion of collaborative governance seems to be an appropriate approach for such issues. However, we argue that in order to effectively confront such issues, a more goal-oriented and creative paradigm is needed. That is why in this paper our aim was to enhance our understanding of collaborative governance by insights from design science. Doing so has resulted in the formulation of three enhancements of the collaborative governance paradigm, which can be considered as stepping stones towards an integrative framework. Arriving at this point, the next step would be to conclude and test this framework. In this paper we collided both paradigms, which showed where both paradigms can add to each other.

Applying this framework is possibly challenging, since wicked issues are regularly hard to grasp within a case. However, especially when it comes to make the urban environment more adaptive towards climate change, the wickedness of these problems are reflected on a micro-scale. Often these kind of adaptation require thorough changes within the urban landscape, thereby changing public infrastructure, housing and most likely service provision. Then, within the scope of climate change, setting constructive dialogues and alternative relationships will not be enough to alter such an issue and new both goal -and need oriented (Blizzard & Klotz, 2012) approaches are needed, which may benefit from design science. Therefore, these kind of cases may be suitable cases to test whether collaborative governance can be enriched by design sciences. Hopefully, empirical results will generate possible upscaling possibilities towards other wicked issues.

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