

Sustainable design by default.

Towards an action repertoire for transformation.

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Florian Sametinger, Dipl. Des. (FH)

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1. Gutachterin: Prof. Dr. Gesche Joost
2. Gutachter: Prof. em. Dr. Michael Erlhoff

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1. Introduction

1.1. Einleitung

Begibt man sich tief in den Bereich der Nachhaltigkeitsforschung und erörtert die Querverbindungen und Bezüge, die sich für die Praxis des Design eröffnen, so scheint eine eher düstere Lesart von nachhaltigem Design vorzuherrschen, aus deren Perspektive eben dieses nachhaltige Design eine scheiternde Praxis ist, die entweder zu hoch zielt, indem sie globale, inter- und intragenerationale Probleme lösen will, oder zu niedrig, indem sie sich lediglich Materialkreisläufen und-einflüssen neuer Produkte und Services widmet. Dieser Lesart steht allerdings auch eine positivere, konstruktivere entgegen, die die Stärken und Potentiale erkennt, die die Praxis des Design für die Herausforderungen von Nachhaltigkeit bereit hält.

Während der wachstumsorientierte Diskurs der *Nachhaltigen Entwicklung* immer noch weitgehend die Praxis des nachhaltigen Designs dominiert, eröffnen sich neuerdings andere Strömungen ganzheitlicher Ansätze von Nachhaltigkeit, verwurzelt beispielsweise im Postwachstumsdiskurs oder der Perspektive starker Nachhaltigkeit, die sich unter dem Deckmantel von Suffizienz, Resilienz oder Aktivismus im Design wiederentdecken lassen. Diese Bewegungen haben den Anspruch gemein, ihr Wissen mit der Öffentlichkeit teilen zu wollen und damit zu erreichen, dass Bürger aktiv in ihrer Gemeinschaft agieren können.

Die angesprochene düstere Lesart von Nachhaltigkeit im Design, sowie der damit verbundene Aufruf an Designer, ihre Praxis der Un-Nachhaltigkeit in eine zukunftsorientierte zu transformieren, resultiert meist nur in Schulterzucken, da es weitestgehend unklar ist, wie diese höchst theoretischen (utopischen) Anforderungen in der eigenen Praxis umgesetzt werden könnten. Die vorliegende Arbeit spricht sich vehement für eine alternative, positivere Narration von nachhaltigem Design aus, die sich über Schuldzuweisungen hinwegsetzt und sich darauf besinnt, was die designerische Praxis im Kontext von Nachhaltigkeit zu leisten vermag.

Insbesondere der Wandel von einer produkt- und service-, hin zu einer prozess-orientierteren Praxis, aber auch ein gestärktes Bewusstsein für die Auswirkungen der designerischen Erzeugnisse auf die Welt, tragen dazu bei, dass sich neue Richtungen des Nachhaltigen Design herausbilden. Die damit verbundenen Prozesse laufen oftmals außerhalb wachstumsorientiertem ökonomischem Fortschritt ab, um sich sozialem Fortschritt zu verschreiben. In diesem Zusammenhang wird klar, dass Designer nicht außerhalb eines sozialen Kontext operieren können und ihre designerische Arbeit, so klein die Auswirkungen auch sind, Einfluss auf das dynamische Gleichgewicht unseres Planeten nimmt.

Unter diesen Gesichtspunkten ist es das Ziel der vorliegenden Dissertation, nachhaltiges Design als Basiskonfiguration im Design zu rahmen und es vom sperrigen Begriff der Nachhaltigkeit zu befreien, indem dessen Grundprinzipien der Transformation, Partizipation und des zukunftsorientierten Denken und Handeln extrahiert und handhabbar gemacht werden. Berücksichtigt man diese Basiskonfiguration, bewegt sich ein zukünftiges Design zwischen

Anthropo- und Ökozentrik, und wird gegenwärtige Strömungen des nutzerzentrierten Designs, die sich oftmals ihrer sozialen Implikationen nicht bewusst wird, notwendigerweise infrage stellen.

Mit dieser Arbeit, die insgesamt sechs Jahre einnahm, stellte sich die Erkenntnis ein, dass nachhaltiges Design nicht unbedingt mit einer spezifischen Praxis, dafür umso mehr mit einer individuellen Grundhaltung verknüpft ist, die im Alltag verortet und ethischen Grundsätzen verpflichtet ist. Aufgrund der komplexen und ineinandergreifenden, globalen Herausforderungen die vor uns liegen, ist nachhaltiges Design zudem auf breites, interdisziplinäres Wissen angewiesen. Um dies zu belegen, beleuchtet diese Arbeit den Weg von den frühen Wurzeln des nachhaltigen Design innerhalb der Nachhaltigkeitsbewegungen, bis hin zu seiner radikalen Öffnung in verschiedene Richtungen wie etwa Design Aktivismus, Transformations-design, Design für soziale Innovation und partizipatives Design.

Darüber hinaus wird eine Neu-Formulierung der nachhaltigen Designpraxis vorgeschlagen, die sie mit dem Ansatz "*Forschung-durch-Design*" und in der Folge, durch das explorative Designprojekt, mit einem dynamischen, interdisziplinären Handlungsrepertoire verknüpft.

Schlägt man diese Konzeption von nachhaltigem Design vor, erscheinen nicht nur die zwei Dimensionen der Transformation und Partizipation annähernd selbsttätig, sondern auch die Vorstellung, dass Design Kontexte in Richtung möglicher (nachhaltiger) Zukünfte erschließen vermag. In diesem Sinne ergeben sich mehrere übergeordnete Perspektiven, die im Laufe dieser Arbeit durchgehend immer wieder auftauchen:

- 1 **Öffnen** – *Wie können Designer den Zugang zu Kontexten, Werkzeugen, Wissen und Technologien durch kollaborative, interdisziplinäres Handeln eröffnen.*
- 2 **Erzeugen (im Sinne von Making)** – *Wie können Designer Prozesse bereitstellen, die Akteure darin involvieren, mögliche Zukünfte zu erzeugen und kritisch zu bewerten*
- 3 **Transformieren** – *Wie können Designer Kontexte und Situationen von einem bestehenden in einen bevorzugten Zustand transformieren (und wie sehen die damit verbundenen Aushandlungsprozesse in Bezug auf inter- und intragenerationaler Gerechtigkeit aus)*

Das Thema der Transformation und des zukunfts-gewandten Denken und Handeln, beschäftigt derzeit nicht ausschließlich nachhaltiges Design, sondern weit darüber hinaus. Hierbei schwingt die Idee mit, Design könne zumindest anteilhaft Fähigkeiten und Werkzeuge bereitstellen, die diese Zielrichtung unterstützen. Dies zielt allerdings nicht nur auf die Transformation von Kontexten und Situationen, sondern auch Nutzerverhalten und Markimpulse. In der vorliegenden Arbeit hat die Idee von Transformation das gesamte sechsjährige Forschungsvorhaben begleitet, das sich nun dem Ende nähert.

Das dem Forschungsvorhaben zentrale Designprojekt *Neighborhood Labs* wurde von einer interdisziplinären Gruppe von Designforschern und anderen Akteuren in einer innerstädtischen, aber isolierten Nachbarschaft in Berlin Mitte durchgeführt. Dabei spielte die Entwicklung eines

Forschungskonzeptes, sowie eines auf einer partizipativen Designmethodik und dem Ansatz eines Living Labs basierenden Experimentierprozesses eine zentrale Rolle. Es sah kein vorgegebenes Ende vor und bot das Potential, von den involvierten Akteuren nach dem Ende des offiziellen Projektes weitergeführt zu werden.

Bezüglich Nachhaltigkeit festigte sich das Thema der Tauschpraktiken und Kollaboration als Grundlage der Designphasen und -iterationen. Während zu Beginn eher der Austausch von Objekten, Produkten und Services in bestimmten "*Communities of Practice*" im Mittelpunkt stand, so verschob sich der Schwerpunkt im Laufe der Projektzeit immer mehr in Richtung Wissensaustausch und der Handlungsfähigkeit von Akteuren in lokalen Transformationsprozessen, ein deutlich schwammigeres Thema, als der Austausch von Objekten oder Services. Im Projekt ließen sich drei ineinander verwobene Phasen identifizieren:

- **Tausch-Phase / Neighborhood Lab:** *Aufbau und Betrieb eines living labs und Untersuchung des Kontext - Annäherung an die Nachbarschaft und Design von Werkzeugen, die dabei unterstützen den Kontext, sowie die Bedürfnisse und Einschränkungen zu beleuchten und lokale Akteure für das Projekt zu begeistern. Die gesammelten Erkenntnisse informieren den Forschungsprozess und grenzen die Forschungsfrage weiter ein. Diese Phase brachte einige Konzepte und erste Prototypen in Zusammenarbeit mit den lokalen Akteuren auf der Fischerinsel hervor.*
- **Infrastruktur-Phase / Gestaltung von Infrastrukturen & Wandel fördern:** *Design und iteratives testen der partizipativen Werkzeuge, wie etwa der Hybrid Letterbox, die die Lücke zwischen analog und digital schließt, um Fragen des sozialen Zusammenhalts und der Kommunikation in der Nachbarschaft zu diskutieren und evaluieren.*
- **Transfer Phase / Design transfer:** *Eröffnung des Kontextes und Transfer der Methoden und Werkzeuge aus dem ursprünglichen Projekt hinaus in andere Projekte.*

Betrachtet man den Prozess dieses lange andauernden Projektes, ergeben sich letztendlich, wenn man die Trial-and-Error-Phasen hinter sich gelassen hat, prototypisch Forschung-durch-Design praktiziert hat und im lokalen Kontext untergetaucht ist, einige Schlüsselpositionen für den Umgang mit und die Vermittlung von verzwickten Problemen der Nachhaltigkeit.

Seitens der Praxis stellen sich diese in den Kategorien der untersuchenden Aktion, partizipativen Werkzeuge und Workshopformate ein, die sich aus der breiten Masse von interdisziplinären Aktionen speist, die während der Projektlaufzeit durchgeführt wurden. Diese Kategorien führen des Weiteren zu einem dynamischen Aktionsrepertoire für Transformation, welches als kommunizierbares Resultat der Arbeit vorgeschlagen wird.

Seitens der Theorie wird mit dieser Arbeit der Begriff des "*Sustainable Design by default*" also der Nachhaltigkeit als dem Design inhärenten Prinzipienkatalog, der sich durch Forschung-durch-Design speist, eingeführt. Dies bringt insbesondere mit sich, die Designpraxis, aber auch die Art und Weise wie Design gelehrt wird, neu zu strukturieren.

1.2. Abstract

When going deep into the area of sustainability and looking at the crosslinks that open up regarding the practice of design, a dark narrative appears whereby sustainable design is a failing practice, either aiming too high by trying to tackle global, inter- and intragenerational challenges, or aiming too low by focusing on, for example, material impacts of new products and services; this narrative appears to have an upper hand over one that is more positive and constructive that sees the strengths and potentials that design can bring to the challenges of sustainability. While the growth-oriented sustainable development discourse still dominates the way sustainable design is practiced, there are other streams with a more holistic view of sustainability. These streams are rooted in a post-growth / no-growth or strong sustainability discourse, which are slowly making their way into design practice through the guise of sufficiency, resilience and activism with a common theme of sharing knowledge, allowing citizens to be an active part of their community.

The dark narrative of sustainability in design as well as the call for designers to transform a practice of “un-sustainability” into one that allows “futuring”, leaves most of them shrugging their shoulders in light of how to implement the theoretical (utopian) requirements into their own practice. I argue for providing a different, more positive narrative, moving past the finger-pointing attitude towards reminding oneself what the practice of design in the context of sustainability can bring to the table.

Why there are new directions in sustainable design is largely because design has broadened beyond its product and service fixation towards a more process-oriented practice and an awareness of the impact designers have on this world. In these processes, designers are often taken outside the boundaries of growth-oriented economic progress towards social progress. They are continuously reminded that they cannot operate outside of a societal context and that their work has an impact on the Earth’s dynamic equilibrium (however small it might be).

Thus, the aim of my work is to re-frame sustainable design as a default configuration, stripping it from the unwieldy term of sustainability and extracting its core features of transformation, participation and future-focused thinking. Considering this core configuration, design is bound to be situated between anthropo- and eco-centricity, putting into question current user- and human-centric design approaches that tend to marginalize the everyday context and wider implications of the designed product or service.

Through an investigation that spanned the last five years, I have come to realize that sustainable design has nothing to do with a specific practice, but rather with a mindset which is, at its basis, tied to ethical considerations rooted in everyday life. It is moreover tied to broad, interdisciplinary knowledge that is needed to grasp the interconnected and global challenges that lie ahead. To make this point, in my work I am retracing the steps from the early roots of sustainable design within the sustainability movement towards its radical opening in different directions such as design activism, transformation design, design for social innovation and participatory design.

Furthermore, I propose a re-framing of the practice of sustainable design, (tentatively) linking it with a research-through-design approach and subsequently, through the design case, constructing a dynamic, interdisciplinary action repertoire for designers.

When framing this renewed idea of sustainable design, not only do the two dimensions of transformation and participation almost automatically appear in the current discourse, but also the notion of opening up contexts through design in a way that is directed towards possible (sustainable) futures becomes apparent. Several overarching perspectives resurface in the course of this work:

- 1 **Opening** – *How can designers open access to contexts, tools, knowledge and technology through collaborative, interdisciplinary action?*
- 2 **Making** – *How can designers provide processes to involve stakeholders in critically assessing and making possible futures?*
- 3 **Transforming** – *How can designers transform contexts and situations from one state to a preferred one (and how can they facilitate the negotiation-processes tied to them with regards to social equity and intra-generational justice)?*

The topic of transformation and future-focused thinking is currently engaging most of design, not exclusively sustainable design, and this thinking seems to provide an underlying idea that design may be able to provide at least part of the skill-set required to cater to this transformation. It is, however, not only the context and situations design claims to transform, but also user behavior and market incentives. In this research, transformation is viewed as a careful byline to a project which spans almost six years and is now coming to a close.

The design case for this research is the project *Neighborhood Labs* which has been run by an interdisciplinary group of design researchers, citizens and other stakeholders in a central, but isolated area in Berlin's Mitte district. It incorporated the development of a research concept and experimentation process which builds on a participatory design methodology as well as a living lab approach. It was planned open-ended with the potential of stakeholders taking over after the official end of the research project.

In terms of sustainability, the subject and guiding theme of sharing and collaboration was the baseline of the design phases and iterations. While focusing at first on the sharing of concrete objects in a specific community of practice, there was a shift to sharing knowledge, as well as to the empowerment of citizens to impact local decision-making processes, a much fuzzier subject than the sharing of objects or services. The project was run in three intertwined phases:

- **Sharing phase / Neighborhood lab:** *Setting up and running a living lab. Investigating the context and building the infrastructure. Approaching the neighborhood and designing tools for gathering insights about needs and issues within it while drawing active citizens towards the project. After this step, insights inform the research process*

and help focus the research question further. This phase produced several concepts and sketch prototypes in collaboration with the stakeholders of the Fischerinsel, Berlin.

- **Infrastructure phase / Designing infrastructures & fostering change:** *Designing and testing participatory tools such as the Hybrid Letterbox, an analog-digital bridge device, in order to discuss and evaluate questions of social cohesion and communication within the neighborhood and to activate citizens for involvement in these issues.*
- **Transfer phase / Design transfer:** *opening up the context and pushing the methods and tools outside of its initial project and creating new instances thereof.*

As I am reflecting on the process of a long-term project now behind me, such as working through trial-and-error phases, prototypical research-through-design attempts and the immersion in the Fischerinsel-context that the research group grew a part of, several key directions in the dealing with and conveying of sustainability challenges appear.

On a practical level, these directions materialize in the categories of investigative action, participatory tools and workshop formats, which are distilled from a broad range of interdisciplinary actions conducted over the course of the research, leading to an action repertoire for transformation which I propose as one of the outcomes of my work.

On a theoretical level, I argue for **sustainable design by default**, meaning sustainability as an inherent, embedded goal of any design process, integrating a research-through-design mindset in sustainable design or vice versa. In further steps, this entails restructuring the way we teach design and how design practice is informed throughout its process.

1.3. Epistemic Interest

Within this chapter, the driving forces and epistemic interest at the foundation of this dissertation are discussed. At its core lies the endeavor to reframe sustainable design towards a more socially oriented practice and to critically examine the way stakeholders participate in design (research) projects. Furthermore, a research-through-design approach is used as a research paradigm which guided the process throughout.

Background.

Ever since the rise of the environmental movement around the 1960s and with the introduction of the first prominent concept of sustainable development,¹ questions about the impact of mankind on our natural environment have arisen along with concepts on how to approach these. In the years that followed, new concepts and reports², rather than approaching from a policy- and economically-based perspective, increasingly involved stakeholders in their considerations and moved towards a social perspective.

With the topic of sustainable design, a unique problem area opens up. It is caught between the idealized concept of sustainability, which is itself ambiguous due to the inherent complexity and interwoven nature of global environmental and social issues and the pragmatic, context-aware and user-centered design practice. While in its early days it was mostly seen as a way to improve products and services regarding their efficiency, material use or resource allocation, sustainable design has opened up to new perspectives, which question current ways of production and consumption.

Sustainable design deals with so-called wicked or ill-defined problems (see Rittel & Webber, 1973; Hirsch Hadorn, Bradley, Pohl, Rist, & Wiesmann, 2006) which are characterized in a way that the problem is not directly connected to a possible solution and its implications are highly uncertain. In this sense, defining the problem is also part of the problem: “the process of solving the problem is identical with the process of understanding its nature, because there are no criteria for sufficient understanding and because there are no ends to the causal chains that link interacting open systems” (Rittel & Webber, 1973, p. 162).

¹ The 1987 report “Our Common Future” marked a crucial starting point for the European Commission’s efforts to define and promote sustainable development. One of the core statements of the report is that sustainable development “is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” There is a vital difference between this and the concept of sustainability, which will be addressed thoroughly in the first chapters of this dissertation.

² e.g. the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, The Johannesburg conference in 2002 and only recently the RIO+20 Conference on Sustainable Development in 2012 where it is noted that “people are at the centre of sustainable development”.

One important aspect of this work is the correlation between sustainable design and a research-through-design approach, mapping out transformative and participatory factors.

Problem space.

In order to briefly lay out the problem space for this work, two basic approaches to the concept of sustainability have to be introduced: One approach evolves from sustainable development, emphasizing economic and political dimensions (WCED, 1987), the other one features a more holistic notion of sustainability which considers political, economic, environmental and social aspects and has its roots in various streams of thought of the 20th century. While with the latter there are attempts to create policies and governing structures³ in order to cope with these wicked problems on a societal micro-level, e.g. in a neighborhood or urban community, these top-down approaches only scarcely reach their recipients (Fahy & Rau, 2013). On the other hand, regarding a holistic view of sustainability, bottom-up, grassroots organizations trying to tackle issues of sustainability, like crumbling social cohesion or over-pollution, within their surroundings, are often missing supporting infrastructures and appropriate methods, tools and courses of action. Robinson notes that sustainable development, as promoted by the UN, can be seen as a contradiction in terms since development and growth are continually going against ecological sustainability; it is highly uncertain if both are possible at the same time (Robinson, 2004). Concerning this basis for inquiry, one has to ask how to convey these pressing questions of a sustainable future without being normative and dogmatic⁴ in communicating issues of un-sustainability. The lively discourse within the research community (see e.g., Mebratu, 1998; Fahy & Rau, 2013) on how to make this clear and graspable, shows the difficulty of the endeavor and a gap between the academic and institutionalized definition and bottom-up approaches and sustainable practices.

One crucial aspect of research on sustainability is pointed out by Hirsch Hadorn: “in facing the complexity of issues not only on the empirical level but also with regard to the purposive, normative and pragmatic level of societal problem solving, research gets intertwined with societal practices and policies, thus challenging the nature of scientific knowledge and opinions about its quality” (Hirsch Hadorn et al., 2006, p.123). In this work this argument fuels the application of a research-through-design approach in sustainable design.

Sustainability itself is identified as a process, an idea and future-focused concept. Similarly, sustainable design is an equally processual and future-focused area of practice, although the backdrop in terms of sustainability (regarding the underlying philosophical root, area of inquiry or

³ For example, the Eco Design certification efforts by the EU or the e-learning initiative are examples which show that despite the elaborate plans for action, the effects are still not sufficient (see UN Sustainability Report 2012)

⁴ A prominent example of this is the effort, which was originally based on an EU directive, whereby both governments and private companies encourage consumers to return their old cellular phones. Numerous companies tried to achieve this goal, but most of them failed (e.g., Deutsche Telekom, AT&T, etc.) due to the fact that their strategy was based on conveying the message that consumers had to do something for the environment.

field of application) may vary. Through the lens of design research, this dissertation deals with whether and how principles of sustainability can be integrated in design by default, stripping away the normative and finger-pointing baggage that usually comes with the term.

While the approach questions the way a majority of the design community incorporates the idea of sustainability, leaning largely on highly abstract and linear, business-oriented models like the triple-bottom line (Elkington, 1994) which comprises the three pillars of economic, environmental and social sustainability, it approaches questions of participatory approaches and infrastructures for enabling change within urban neighborhoods. The hypothesis that design – making use of a participatory methodology and striving for transformation – can impact the way we are able to process and transfer insights from the sustainability discourse towards actual practice and our living environments is the basis for this inquiry.

While on a political and policy-oriented level numerous theoretical frameworks for the approach of current complex and highly intertwined environmental and social problems exist, their transfer to actual living environments often fail or overlook basic, local requirements (see e.g., Fahy & Rau, 2013; Hirsch Hadorn et al., 2006). Especially in various areas of sustainable design (see e.g., Cipolla & Peruccio, 2008; Fuad-Luke, 2002; Fuad-Luke, 2009; Vezzoli, 2006; Vezzoli, Ceschin, & Kemp, 2008) and participatory design (see e.g., Binder et al., 2011; Björgvinsson, Ehn, & Hillgren, 2010; Buur & Matthews, 2008; DiSalvo, Louw, Holstius, Nourbakhsh, & Akin, 2012; Ehn, 2008) there have been numerous attempts to approach this gap between institutional guidelines and finding actual solutions on a local level. I argue that (sustainable) design may provide citizens with appropriate tools and methods to bridge the gap between theoretical models of sustainable ways of living and their actual practical application in urban living environments which are largely tied to everyday practices. This hypothesis follows the assumption that the role of design is changing towards a more open and socially oriented practice which seeks to collaboratively create and enable an infrastructure for transformation within local urban contexts.

The assumption that designers are greatly responsible for the negative impact of products on society and the environment has inspired many designers over the decades to go off the beaten track in order to follow a design which tries to impact and redirect current practices towards more sustainable ones.⁵ On the fringes of their respective fields, designers and design researchers have begun to mediate and promote knowledge directed at grasping and tackling sustainability challenges within urban neighborhoods (Fry, 2009; Manzini, 2005a, 2005b).

Examples like community gardens, sustainable co-housing or time bank projects can be found within the DESIS Network⁶ which includes several design labs and universities who, amongst other

⁵ Viktor Papanek was one of the critics of a design practice embedded in the industrialized world with its cycles of production and consumption.

⁶ The DESIS Network directs its efforts towards the design for social innovation and sustainability and originated at the Politecnico in Milan.

things, try to engage in emerging sustainable ways of living. Some designers have started to realize that design in its current form can be part of the solution or at least the re-direction of sustainability challenges (Walker, Manzini, & Wylant, 2007). While in sustainable design the focus used to be the impact on a material and processual level, reducing e.g., the amount of materials used or exchanging one material because it uses less energy in production, in the last decades it has opened up to facilitating social change in urban neighborhoods. In this dissertation, I focus especially on the transformational, participatory aspects of sustainability which include citizen empowerment, equity and participation in decisions regarding one's own living environment.

There are numerous shapes this *transformational capacity* can take within design.⁷ I explored and critically investigated predominantly transformative approaches which take into account the notion of user or citizen participation, such as design infrastructuring, design for social innovation, transition design, transformation design and design activism. A designer is, in this sense, not merely a producer of artifacts but can be viewed as an enabler of social change (Fuad-Luke, 2007), and design can be framed as “an act of choosing among or informing choices of future ways of being” (Blevis, 2006, p. 2). This shift towards a more open, collaborative and social way of designing also brings about the inclusion of stakeholders in the design process; they are not merely seen as informing subjects in a user-centered design process, but as equal partners (see e.g., Sanders & Stappers, 2008). This northern European approach to participatory design, which is traditionally deeply rooted in a political and democratic movement, serves as a basis for methodological inquiries in this dissertation.

Here, several prominent examples such as design for social innovation, design infrastructuring, transformation and transition design as well as design activism back the investigation. While *Design for Social Innovation* aims at new ways of thinking about how design can affect social change towards sustainable futures, *Design Infrastructuring* (see e.g., Björgvinsson et al., 2010; Ehn, 2008; Karasti, 2014; Redström, 2008) describes an approach, in which these participatory ways of including stakeholders are combined with infrastructures that are provided by the designers/researchers in order to enable citizens to actively engage with their neighborhood and create possible solutions for the identified problem.

Transformation design was initially framed by the UK Design Council within the prematurely disestablished ‘do-tank’ RED, specifically bringing together designers and policy-makers to frame a new approach to design that is able to tackle complex economic and social challenges⁸ (Burns, Cottam, Vanstone, & Winhall, 2006). Transition design (Irwin, 2015; Irwin, Kossoff, & Tonkinwise, 2015; Tonkinwise, 2015), aims at pushing further the boundaries of design for social innovation and proclaims a “design-led societal transition toward more sustainable futures” (Irwin, 2015, p. 229).

⁷ Amongst others there is Social Design, Sustainable Interaction Design, Transformation Design or Design Activism.

⁸ The work group's call to action especially targeted the design of new public services in an attempt to bring together policy-makers, designers and other stakeholders. They “use product, communication, interaction and spatial designers' core skills to transform the ways in which the public interacts with systems, services, organisations and policies” (Burns et al., 2006, p.19).

Finally, design activism is “design thinking, imagination and practice applied knowingly or unknowingly to create a counter-narrative aimed at generating and balancing positive social, institutional, environmental and/or economic change” (Fuad-Luke, 2009, p. 27). Some of the perspectives overlap or complement each other and all of them are orienting their practice against the backdrop of sustainability one way or another.

1.4. Design Research and Knowledge Production

This chapter provides insights into the underlying research-through-design (RTD) approach, which was followed during the course of this dissertation. Furthermore, it clarifies the dominant paradigms within design research, such as practice-based research, research-through-design and research-led practice. It addresses the question of knowledge production in design and provides an argument for the integration of RTD as a research paradigm for Sustainable Design.

Introduction.

First of all, there is no single definition of design and for that matter design research. Design is a flexible activity, diverse and ambiguous in nature, and it's impossible to tie to a single discipline or field. Over the years design has broadened from an activity deeply embedded in the production of (commercial) artifacts to one which is able to influence and shape social learning processes (Buchanan, 2001; Dilnot, 1998).

What we in turn call design research is essentially the continuing search for design's capacity for producing new knowledge, both for theory as well as for practice, and conceiving and projecting future ways of living.⁹ The assumption that the activity of design may generate knowledge beyond the traditional boundaries of research (regarding theory, methods, etc.) is at the core of design research and guides this work. This idea carries an understanding that design, in all its ambiguity, is a multi-dimensional activity which is able to synthesize heterogeneous information from diverse fields and is not exclusive to trained designers.

“One purpose of Design research is to produce knowledge useful to those who design: design knowledge that designer and non-designer (individuals, communities, institutions, companies) can use in their processes of designing and co-designing” (Manzini, 2009, p. 5).

In design, similar to other fields, research describes a systematic inquiry with the goal of creating new knowledge (Archer, 1979). While in earlier years design research leaned on epistemological, theoretical and methodological paradigms from the humanities, natural or engineering sciences,¹⁰ quite recently it has developed a fragile autonomy and a more self-conscious approach to research.

The notion of design-oriented research (Cross, 2001) or in more general terms practice-based research has been animatedly discussed amongst designers and design researchers alike with assertions that there is a “reemergence of design-science concerns” (p. 49).

⁹ Research has always been implicit in design, within or connected to practice (Brandes, Erlhoff & Schemmann, 2009), and it has been present ever since individuals recognized design as something that could be taught (Owen, 1998).

¹⁰ In “The Science of Design: Creating the Artificial” (1988), Herbert Simon formulates the science of the Artificial in opposition to the science of the Natural, which he argues has been predominant in the 20th century.

Herbert Simon's "sciences of the artificial" was arguably one of the first attempts to describe design as both a distinct subject matter and form of research (Grand & Jonas, 2012). Cross makes the case that design is a basic human ability and consequently design knowledge resides firstly in people, not only in the designers but the non-designers alike. Secondly, he states that design knowledge resides in design's inherent processes, in the methodology attached to the tactics and strategies of designing and lastly in the designerly artifacts themselves which embody the knowledge that was embedded in them and speak to the world. He summarizes this as designerly ways of knowing (Cross, 1999).

Nevertheless, and despite its newly found self-assuredness, design research is still in a phase of orientation. This is in part due to the search for a fitting research paradigm for design that provides enough scientific rigor¹¹ and relevance to practice and research alike. The way knowledge is framed in terms of meaning, status and use differs greatly in science and design (Fallman & Stolterman, 2010; Grand & Jonas, 2012) However, what are design research's distinct qualities when it comes to the generation of knowledge?

The field, which has gone through different phases of evolution and a certain "disciplinary anxiety", can look back on a diverse history in design academia, practice and research. Its emergence can be linked to both design practice's need to tackle complex design problems and design academia's need to follow certain academic structures and paths¹² (Bonsiepe, 2007). In terms of setting the stage for design research, Erlhoff and Brandes (2009) argue for the "in-betweenness" as a quality of design. Design is not only a practical application of knowledge in the form of designerly artifacts, nor does it happen spontaneously or without context (Brandes, Erlhoff, & Schemmann, 2009). Consequently, a practice-theory relationship (of varying quality) is inherent to design.

There is a vast body of work concerning the relationship of design and research (Archer, 1979; Frayling, 1993; Cross, 2001b; Findeli, 1994; Krippendorff, 1995; Simon, 1996; Bayazit, 2004) and an ongoing discussion on the role design research may play in processes of social change (Dilnot, 1984; Margolin, 2007; Margolin & Margolin, 2002; Meroni, 2007; Manzini, 2007).

One of the qualities of design is that it bears its unique inherent processes which differentiate it from other fields. In contrast to the analytic nature of research in science, it possesses synthetic qualities (Dilnot, 1984; Owen, 1998). Design research as a systematic search for and acquisition of knowledge related to design and design activity (Bayazit, 2004) or as Bruce Archer in a more detailed description proposes, "Design Research is systematic enquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value and meaning in man-made things and systems" (Archer, 1981, p. 30).

¹¹ Rigor in design research (and other research for that matter) is an "unyielding severity of process that leads to valid conclusions" (Biggs & Büchler, 2007)

¹² Bonsiepe touches upon the important distinction between the broad notion of design and the very clear notion of "projecting" (gestaltung) and argues that for practice-based research to be established, one needs to make this distinction. (Bonsiepe, 2007).

While no simple description may fully summarize this science of the artificial (Simon, 1996), it provides a basic understanding of the position design research takes in the world in relation and sometimes in opposition to other (scientific) research activities that are more concerned with the natural world.

With this in mind, I am moving on to research-through-design, an emerging paradigm which provides a framework throughout this dissertation.

Sustainability research through design?

One of the aims of this work is to investigate RtD as a suitable research paradigm for sustainable design. There are a few examples of the explicit use of RtD in sustainable design (Katzeff, Broms, Jönsson, Westholm, & Räsänen, 2013; Walker, 2011; Walker, Dogan, & Marchand, 2009) which predominantly focus on the ecological dimension of sustainable design (material cultures, energy use and resource-consumption). In my thesis, I attempt to frame RtD for the use in a more socially oriented, transformative practice of sustainable design. I argue that RtD provides a suitable framework for addressing the subject matter within the social dimension of sustainable design. Sustainable design in this context requires a transdisciplinary approach¹³ that allows for iterative use, adaptation and transfer of research methods (Hirsch Hadorn et al., 2006).

Design in general and sustainable design (and Sustainability Research) specifically are concerned with ill-defined problems, meaning problems that are complex, global and interconnected. According to Manzini (2015), it is directed towards a

"complex social learning process by which everything that belonged to the mainstream way of thinking and doing in the twentieth century will have to be reinvented: from everyday life and the very idea of well-being, to the large, socio-technical eco-systems in which we exist. Design is part of this learning process, and it could and should play a major role in it." (p. 53)

This leads to the assumption that no single discipline can provide sufficient means (in terms of methods) to assess, re-frame or even solve the aforementioned problems. It is Rittel's assumption that when dealing with such "wicked problems", such as those concerned with sustainability, the problem is not already there but is framed by stakeholders in the process and supersedes disciplinary boundaries.

In other words, in the context of sustainability, research has to "reflect the diversity, complexity and dynamics of the related processes as well as their variability between concrete problem situations" (Hirsch Hadorn et al., 2006, p. 120)

To address, define and reframe these problems, RTtD provides a framework which puts design at the core of the research. Designerly artifacts as well as processes are put in place to inform the

¹³ Transdisciplinarity in this context means the adaption, use and re-configuration of research methods which stem from outside the field of design and may be used by other fields as well..

research and potential practice of sustainable design (Walker et al., 2009). While interdisciplinarity is key to the research phase of the RTtD-process, transdisciplinarity may be suitable in the design phase regarding two aspects:

1. it provides the terrain of the research, its main field of observation
2. it eventually leads to the satisfaction of end users' aspirations.

(Findeli, Brouillet, Martin, Moineau, & Tarrago, 2008, p. 182)

RTtD, as followed in this work, allows designers and researchers alike to assess problems from both perspectives, practice and theory. In an attempt to address the complexity and diversity of sustainability, Hirsch Hadorn provides an overview of how to structure such research according to a systems, targets and pragmatic/normative level. Here, three basic questions, each related to “empirical, pragmatic, normative and purposive aspects” (see Figure 1), arise.

Firstly, if processes (of transformation, social change, political participation, etc.) constitute a problem field, then where is change needed? Secondly, what are preferred practices in such processes? Thirdly, how can existing practices be transformed?

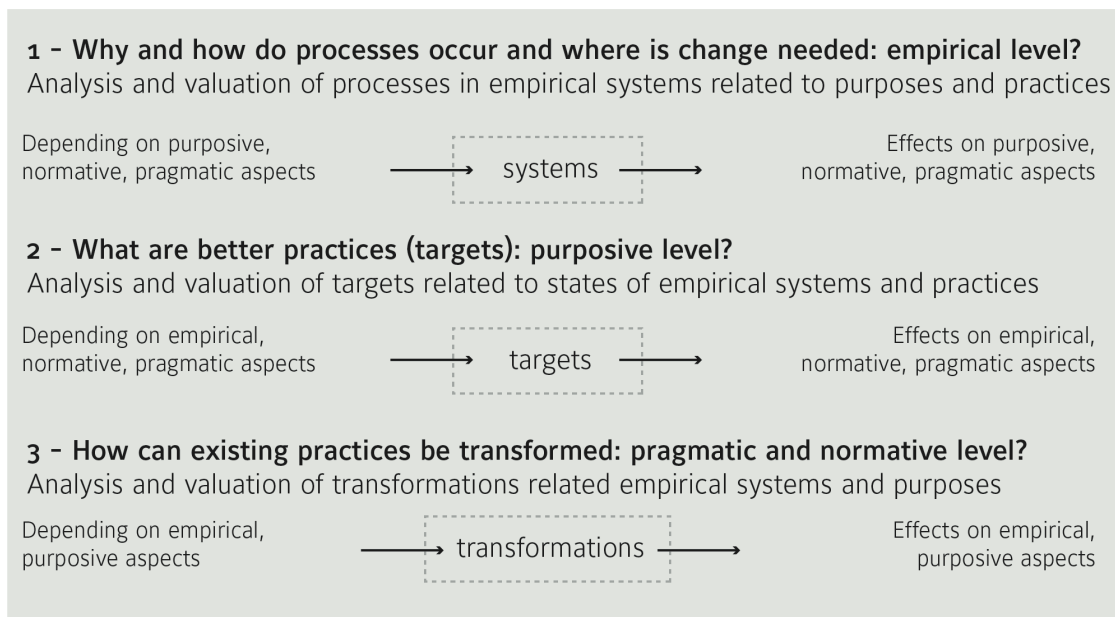


Fig. 1. Adapted from Hirsch Hadorn, 2008, p. 127

While Hirsch Hadorn’s proposition stems from the perspective of systems theory, policy-making and sustainable development, it relates to Jonas’ process model of RtD, where its three phases reflect the dimensions of analysis, synthesis and projection (Fig. 2), as presented earlier.

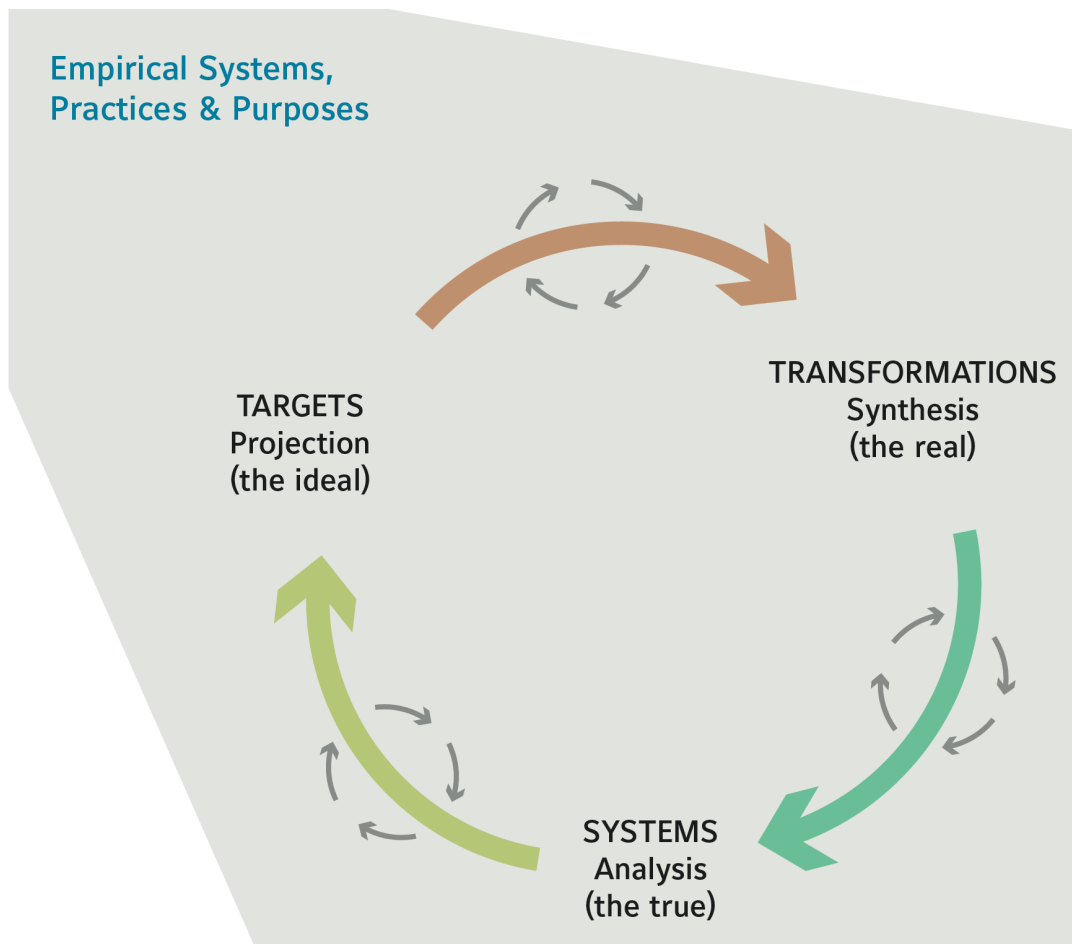


Fig. 2. Complexity in transdisciplinary projects: An adaptation of Jonas' design research process model

Regarding RtD, several aspects are vital for the process of this work:

1. *research as part of a social (learning) process leads to continuous involvement of stakeholders*
2. *iterative framing of the subject matter, problem scape and context*
3. *transdisciplinary approach to methods and tools used in the process*

Research-through-design.

This section provides a detailed view of RtD and provides the underlying framework for this work. Differences and commonalities to other approaches are laid out. Here, I am focusing on the two approaches to RtD by Jonas (2001) and Findeli (2001), who both view practice as an essential part in design research but nevertheless propose different theoretical underpinnings for their versions of RtD.

Either approach to RtD refers to Fraylings (and Archers) classification of design research in three distinct modes: research for, about, and through art and design (Frayling, 1993), categories which have been eagerly discussed and refined by the design research community (Jonas, 2007; Chow, 2010) not least by Alain Findeli (2001) and Wolfgang Jonas (2001), whose models of research through design are described further in the part that follows. The two approaches differ mostly at their foundations. While Jonas refers to radical constructivism and systems theory, Findeli draws from (American) pragmatist philosophy, a distinction which becomes clear when viewing the differences in their approaches.

For clarification, the three categories including research for, about and through design need to be elaborated on. Taking into account Fraylings initial categorization, I will go into the concepts of research for, about and through design. While the first two are well-established areas within design, the third one is still in constant debate.

Research for design refers to the area which provides information that is used by design practitioners to arrive at an end-result in a design project. This mode views design from the outside in, and researchers, in this case, provide insights for the practitioners inside the project. Research for design is often referred to as “Design Research” in design practice, e.g., in design agencies.

Research about design, on the other hand, is carried out not by designers but under the umbrella of other disciplines (sociology, psychology, semiotics, economics, history, etc. of design) (Findeli et al., 2008) which provide an observational perspective on design. Usually, this mode is not conducted by designers but by researchers outside the realm of design. Research about design is carried out using the other discipline’s inherent epistemological and methodological foundations.

Going into the most controversial and ambiguous of the three categories, and a basis for this dissertation, **research-through-design** deserves a deeper look.

First of all, one of the aspects that make Jonas’ perspective valuable for Sustainable Design is that he views RTtD as a paradigm for research rather than a method (e.g., Practice Led Research) or a strategy (e.g., Project Grounded Research). This corresponds with Sustainable Design’s need to engage with complex, multi-disciplinary, and dispersed problems both on a system as well as an operative level.

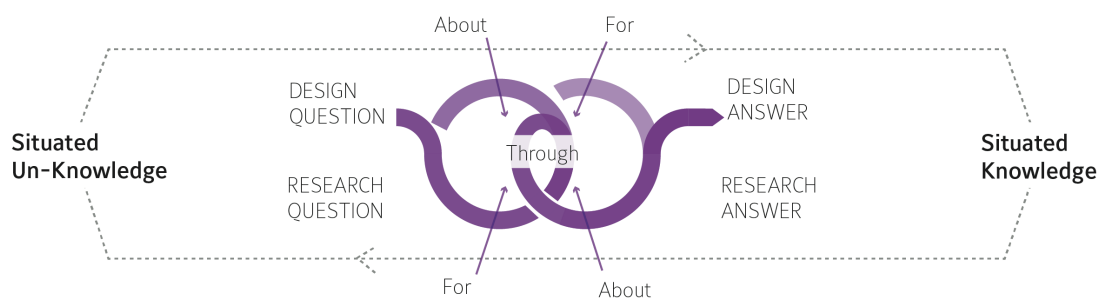


Fig. 3. Towards situated knowledge: Research-through-design as adapted from Jonas (2007). Both Findeli and Jonas argue that all categories of Design Research in various combinations may

yield viable results. According to Jonas, it is the phase of projection (the abductive step) in the process through which one is able to create new knowledge.

RTtD overcomes disciplinary boundaries and traditional theory-driven research domains (Mode-1 science) and aims at being an epistemological and methodological model for the so-called Mode-2 science which is “socially distributed, application-oriented, trans-disciplinary, and subject to multiple accountabilities” (Nowotny, Scott, & Gibbons, 2003, p. 179). This notion of knowledge production in science, highly debated amongst scholars, also brings about a discrepancy when projecting it to design research.

Despite the claims of design research to transcend disciplines and to provide socially distributed knowledge (as in Mode-2 science), it tends to fall back on paths of a traditional academic discourse (publishing papers in journals, conferences and books). It rarely uses its inherent ambiguity and transdisciplinarity to create alternative ways of distributing the knowledge it creates. There is vast potential for design research to overcome this shortcoming and Jonas argues for RTtD as the suitable paradigm for Mode-2 science.

Nevertheless, the authors of the Mode-2 thesis¹⁴ attest to a certain openness and vagueness of the concept, providing the possibilities for interpretation and adaptation to any field in research within the given research boundaries. They argue that their distinction of Mode-1 and Mode-2 science is merely an introduction into the new language of knowledge production and provides heuristics for this new mode thereof.

The discussion about Mode-2 science provides a framing for Jonas’ paradigm of RTtD. It is its inherent dynamic quality of transdisciplinarity which makes it so suitable for sustainable design. Its guiding framework is generated and adapted, its outcome might not yield disciplinary knowledge, but knowledge embedded in artifacts and theory alike, and the results are communicated not only through traditional channels but also through its participants (Gibbons et al., 1994).

Nowotny et al. (2003), provide an overview into three overarching trends in the research environment (in Europe) which include:

1. **the steering of research priorities** by research frameworks on a national and supranational level as well as a system level, moving away from “blue-skies” research towards more dedicated, theme-oriented research,

¹⁴ “Knowledge is generated within the context of application (...) The context of application describes the total environment in which scientific problems arise, methodologies are developed, outcomes are disseminated, and uses are defined. Trans-disciplinarity, by which is meant the mobilization of a range of theoretical perspectives and practical methodologies to solve problems. (...) it is not necessarily derived from pre-existing disciplines, nor does it always contribute to the formation of new disciplines” (Nowotny, Scott, & Gibbons, 2003, p. 186). For more on the subject, Helga Nowotny’s “Mode-2 revisited: The new production of knowledge” (Nowotny et al., 2003) as well as “Re-thinking science: Knowledge and the public in the age of uncertainty” (Nowotny, Scott, Gibbons, & Scott, 2001) provides an interesting overview and an introduction into the boundaries and limitations of the changing research environment.

2. **the commercialization of research** due to less adequate public funding and the rise of alternative sources of research funding (both private and industry-driven), and
3. **the accountability of science**, as in effectiveness and quality, which is assessed by research management bodies but also by emerging modes of peer-evaluation (e.g., web-based research-platforms)

In clarifying his position further, Jonas provides a “generic design process model” which combines the “macro model” of analysis, projection and synthesis (the domains of knowing) with the “micro model” of research: research - analysis - synthesis - realization which he describes as learning phases¹⁵, with projection being the phase where science and design are integrated and combined.

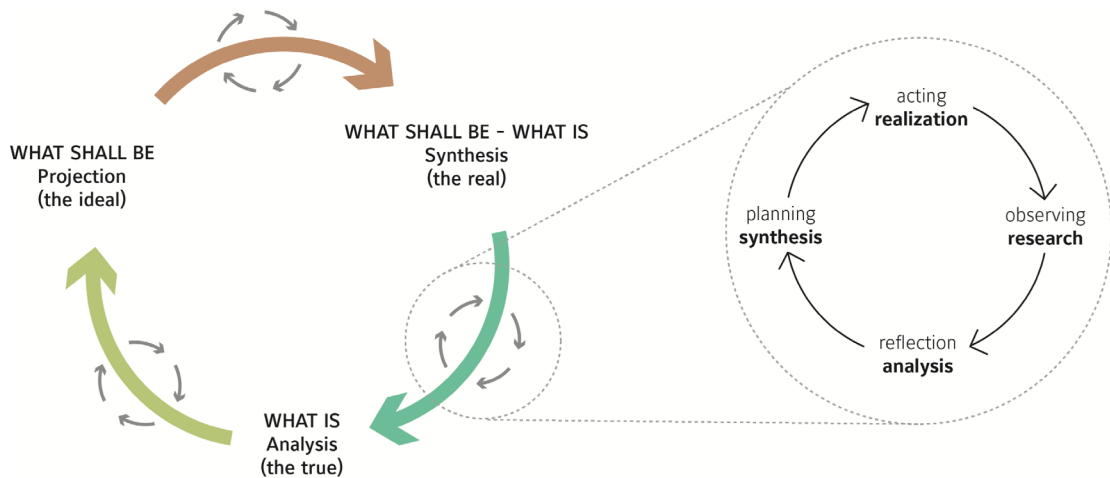


Fig. 4. Generic design process model as proposed by Wolfgang Jonas (2012)

While Jonas attests that RtD has certain weaknesses in rigor and epistemological qualities, he remains confident that grounded theory and action research could provide the basis for the development of RTD (Grand & Jonas, 2012). Despite the multitude of different perspectives on RTD, one important aspect remains that the research has a “designerly way of thinking” at its core or in other words “making/designing is a way of knowing and therefore one can research through design” (Chow, 2010, p. 10).

Project-grounded-research (PGR), after Findeli, views the design project at the core of research, informing the process and being informed by research. Findeli (2001) argues that in order for design research to be relevant and at the same time rigorous, it has to incorporate the other two dimensions of research for design and research about design, which add a new aspect to previous discussions about research through design.

¹⁵ Jonas argues that Findeli’s process model of research - analysis - synthesis - realization refers to Kolb’s theory of the learning cycles.

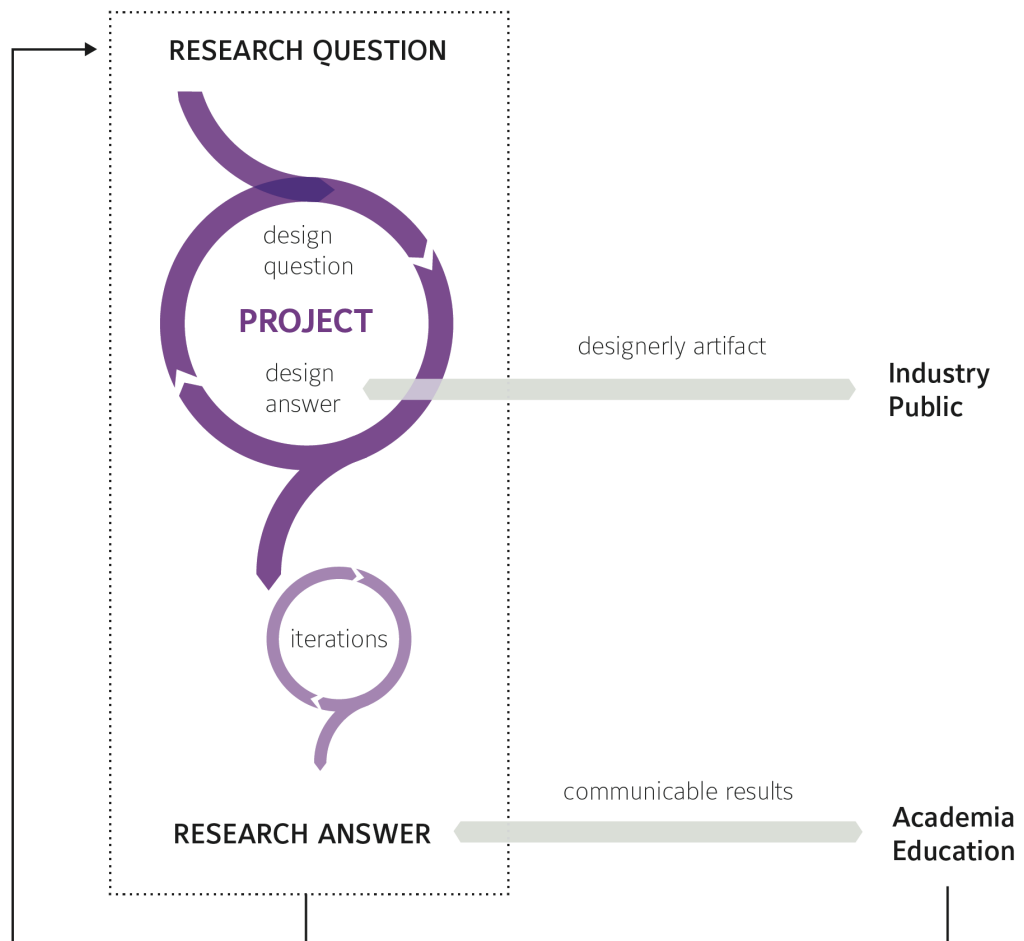


Fig. 5. PGR after Findeli (Findeli et al., 2008): Findeli and his colleagues see the design project at the core of the research project. Here, the research question gives rise to a design question. The design researcher subsequently enters the phase of the project and produces new knowledge in the form of a designerly artifact (e.g., product, interaction, etc.) which is influenced by the industry and the public and vice versa. This “design answer” in the form of a designerly artifact or embedded knowledge then provides (in the best case) insights for the research question in the form of a research answer, which provides communicable results to academia and design education. When no sufficient result is achieved, the cycle continues.

In the emerging design research paradigm of RTD, a designerly process, not a scientific one, guides an inquiry, setting off a fundamental shift in the way design research is conducted. In this light, Jonas proposes that “RTD provides the epistemological concepts for the development of a genuine design research paradigm, which is a condition for methodological development” (Jonas, 2007, p. 1).

Designers, in this respect, use design's research qualities, which are inherent in its practice, and shape the subject matter accordingly. Consequently, Jonas argues for a unique paradigm for design

research with the research objective, not the design objective, at the core and questions research-about-design and research-for-design's capacity as a knowledge creating practice.

The scientific paradigm has to be embedded into the design paradigm:

- research is guided through design process logic, and
- design is supported / driven by phases of scientific research and inquiry.

Only design research conducted under the designerly paradigm can contribute to design's methodological development and its disciplinary stability / autonomy. Both depend on each other in a circular manner. (Jonas, 2007, p. 13)

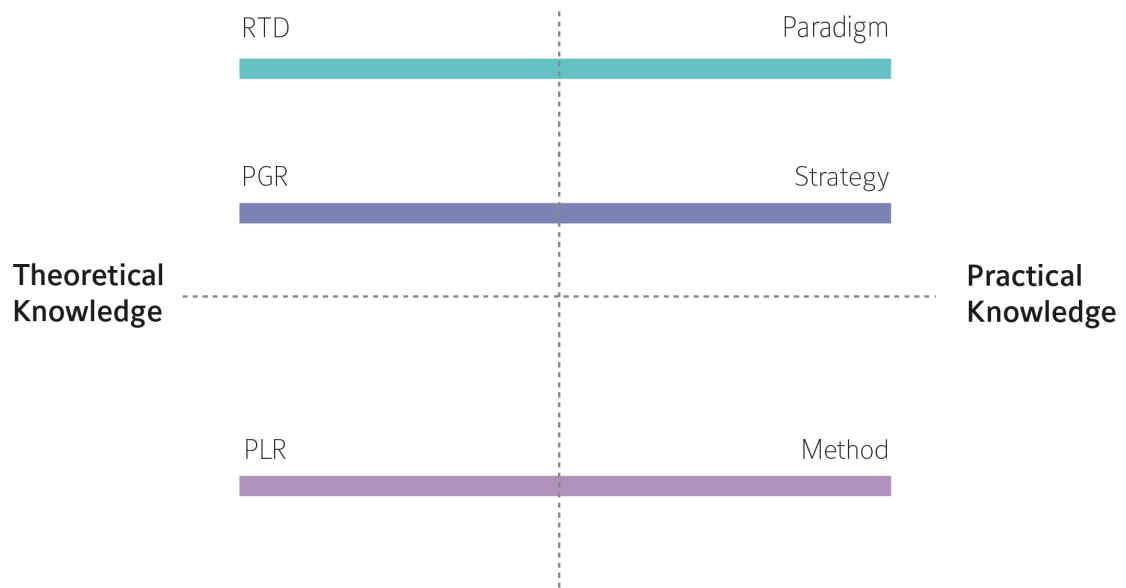


Fig. 6. In this overview (adapted from (Chow, 2010)), three major RTD approaches are mapped according to their classification in terms of practical (synthetic) and theoretical (analytic) knowledge. All of the approaches are similar but differ in perspective. Practice-led research (PLR) is defined as a method, while PGR is a strategy for research with design at its core, and RTD is a paradigm for research with design as an overarching element.

While this section shed some light on a basic understanding of RTD, in the following part, I will delve into knowledge production in design research as well as the current critiques in terms of rigor, relevance and the ability of design research to bridge the theory-practice gap.

Knowledge production in design (research).

“Design knowledge is of and about the artificial world and how to contribute to the creation and maintenance of that world.” (Cross, 2001b, p. 54)

Practice-led research (PLR) and research-through-design (RTD) have been widely discussed in the design research community as the predominant approaches for knowledge generation in design (see e.g., Findeli et al., 2008; Godin & Zahedi, 2014; Grand & Jonas, 2012; Elizabeth B.-N. Sanders & Chan, 2007; Zimmerman, Stolterman, & Forlizzi, 2010). Yet, some clarification as to design research's specific contribution to knowledge is called for. In PLR, predominantly discussed in the UK and largely focused on design education and the university context (see Cross, 1999), practice is viewed as an essential part of inquiry, providing an artifact which embodies knowledge. Its epistemological underpinnings include the idea of “tacit knowledge” (Polanyi, 2009) or “knowing how” (Ryle, 1945) and provide the basis for the claim that any designer, artist, maker or architect, in short, anyone who is concerned with the making of the artificial world, develops within their practice a specific and unique embodied know-how which, in turn, can be used to inform theory (Chow, 2010). However, there are several issues design research has to deal with which re-emerge in the current discussion: scientific rigor and relevance and the theory-practice gap.

Questioning the call for rigor and relevance.

Within the current discourse in design research, questions of rigor and relevance of the results are frequently brought up. This questioning can be seen as an eager criticism by those who wish for design research to adapt to “real” academic disciplines. However, some provide arguments concerning whether or not the concepts of rigor and relevance are suitable for design research or whether some of its strength lies in the renunciation of an approach to research that is too rigorous.

The question is often, how can design research credibly generate new knowledge? Scholars in different areas of design, e.g., interaction design, product design or architectural design, agree that for design research to be an academic discipline, aspects such as rigor and relevance to practice are vital (Fallman & Stolterman, 2010). Nevertheless, these converging aspects might make for a clash between different cultures, since design, even though it might produce content of relevance, might not comply with scientific rigor, which is required of a “legitimate” scientific discipline.

In discussing the relationship between design and theory, Brandes and Erlhoff inquire whether or not design needs an underpinning theory or several sub-theories for that matter. Since design and designing deal with the world and the “manifestations and processes” within, it should provide a “metaphysical” perspective which complements its inherent physical one. Design research clashes with other “rigorous” disciplines due to the fact that it often gets the short end of the stick when one attempts to plead their (theory) case to other disciplines (Brandes et al., 2009). Another important

point of discussion in design research is the gap between theory and practice, which is difficult to overcome when the right modes of transfer are not given. RTD might provide the necessary framework for overcoming this gap.

A theory-practice-gap.

On the other hand, designers (especially in communication, industrial and architectural design) often view theoretical discourse as “esoteric glass-bead games, played, with no noticeable impact on practice” (Bonsiepe, 2007, p. 27). While this evident gap between practice and theoretical discussion thereof still exists, and skepticism from design practitioners is still distinct, in recent years there have been more and more design research projects which specifically attempt to bridge this gap and attempt to create knowledge that is relevant and credible both to practicing designers and academics. Fallman (2008) for instance, describes some prerequisites for bridging this gap and argues for design research to be accessible, understandable and has to address current challenges in order for practitioners to be able to incorporate its findings into their practice.

In overcoming this gap, over the years various triadic concepts to design research emerged in different areas of design.¹⁶ Concerning a taxonomy and basic understanding of categories of design research, Cross makes the point that design research may be differentiated in design epistemology - study of designerly ways of knowing, design praxiology - study of the practices and processes of design, and design phenomenology - study of the form and configuration of artifacts (Cross, 2001a).

Building from this, Jonas proposes that RTD is the only approach to provide “the epistemological qualities for the development of a genuine research paradigm” (Jonas, 2007, p. 127), and he argues that it might be able to provide foundations for the development of design as a “knowledge-creating discipline” (p. 127). Here, a practice-based approach provides the opportunity to both use design's ambiguity and flexibility and extract rigorous and systematic analyses from it which then serve to add to the existing (design) knowledge on different levels.

Research practices in design.

As different research practices in design emerge, arguably confusion about the various strands develop and lead to attempts to map or cluster them (see Grand & Jonas, 2012; Chow, 2010). There

¹⁶ In contrasting the processes by Jones, Archer, Simon, Nelson & Stolterman, Jonas and Fallman, Jonas (2007) sees indication for a “generic model of the designerly research process.”

are different ways of dealing with the confusion. While, e.g., Chow (2010) sets up 10 categories¹⁷ in an attempt to systematically categorize and compare the different approaches to RTD, Grand and Jonas go deeper into the philosophical backgrounds thereof and seeks to distill the commonalities and differences in order to provide a better understanding of design research's core strengths and its role as an overarching research paradigm.

Conversely, when taking stock of design research methods and approaches from the perspective of practice, Liz Sanders and Pieter Jan Stappers propose a categorization for current research approaches "as practiced in the design and development of products and services" (2008, p.2), see Fig. 7, on a 2-axis diagram. It provides a non-exclusive snapshot where one axis ranges from "expert mindset" to "participatory mindset" and the other one from "design-led" to "research-led" (Sanders & Stappers, 2008). While this specifically focuses on practice and mixes methods, tools and approaches, parallels may be drawn to academic design research.

¹⁷ The ten categories are:

1. Name: What is it called?
2. Definition: How is it framed?
3. Propositions: What does it claim?
4. Subject matters: What does it investigate?
5. Processes and methods: How does it investigate?
6. Forms of knowledge generated: What is its outcome?
7. Theoretical underpinnings: What are its assumptions and beliefs?
8. Examples: How much is it realized?
9. Goals: What is it aimed for?
10. Background: What is the context in which it was developed?

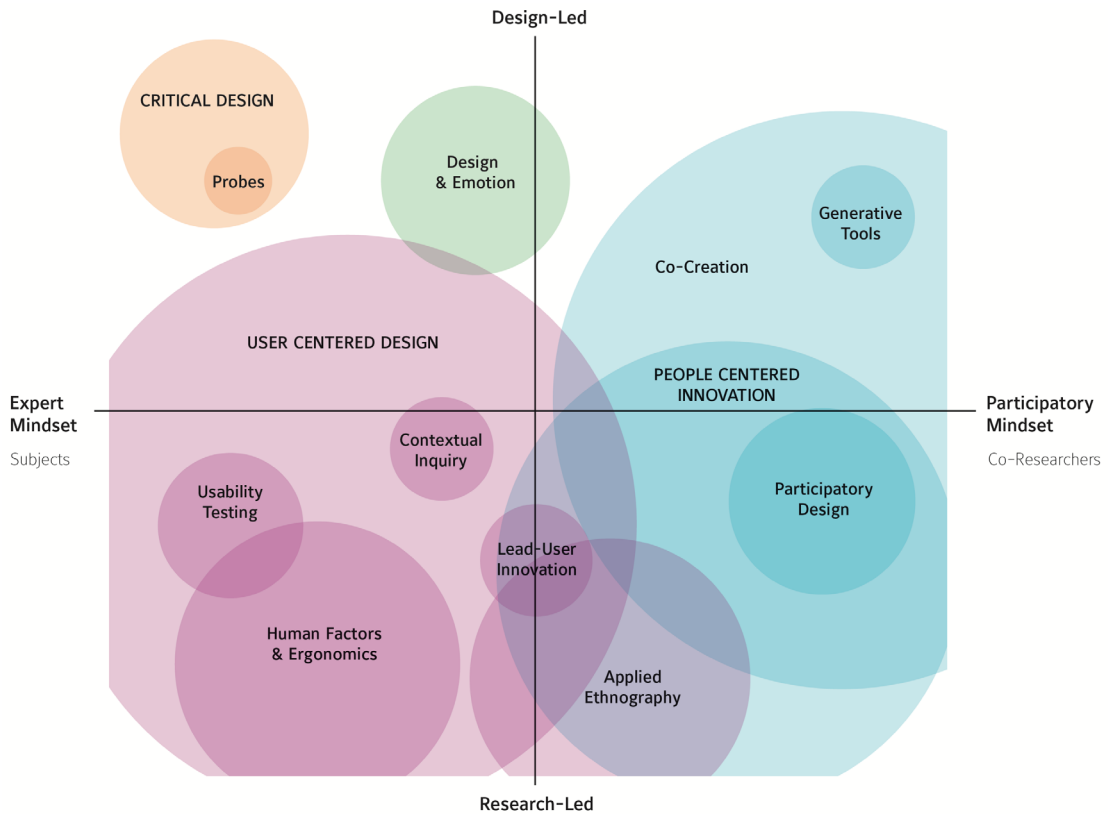


Fig. 7. Adapted from “An evolving map of design practice and design research” (Sanders & Stappers, 2008).

In the field of interaction design, similar efforts have been undertaken to describe and define appropriate methods and processes that may then constitute research which is both relevant and rigorous. In his proposition of the triangle of design research, Fallman (2008) argues that there are three extremes between which the position of a design research activity can be mapped: design practice, design studies and design exploration. These three activities arguably have their own perspective, purpose and projected outcome and use tools and techniques directed towards it. The three perspectives are similar to domains of knowing in design research as proposed by Jonas (analysis, projection, synthesis) or Nelson and Stolterman (the true, the real, the ideal).¹⁸

While the above paragraphs detailed Jonas’ RTD and gave an overview of the way knowledge production in design research is perceived, in the next section I will briefly outline some important touch points in design research.

The relation of design and science were in open discussion in the Bauhaus of the 1920 as well as the HfG Ulm (Hochschule für Gestaltung Ulm), where from 1953 Tomas Maldonado and others

¹⁸ For an in-depth overview, see Jonas’ article “Mapping the swampy ground - An inquiry into the logic of design research” (Jonas, 2012).

pushed the "scientification of design" - with the engineering and natural sciences - an approach which was fiercely contested by many designers.¹⁹

In the early 1960s, the design methods movement around Christopher Alexander, John Chris Jones and Horst Rittel shifted focus towards a design methodology which applied newly developed computational technologies as well as behavioristic and logical frameworks to design, very much consumed with trying to push Design towards the engineering and natural sciences, including their systematic methods and perspectives.

Key protagonists, such as Christopher Alexander and John Chris Jones, later turned from this approach partly because of "... a lack of success in the application of "scientific" methods to everyday design practice" (Cross, 2001b, p. 50). Furthermore, this normative framework simply did not match the ambiguity, fuzziness and commutativity of a design process.

Rittel later noted that as science concerned itself with "tame" problems and design rather deals with "wicked" or "ill-defined" ones, all attempts to scientificate design (in the sense of other disciplines in the natural or engineering sciences) would be doomed to fail.

In the decades that followed, in an effort to further establish Design as a discipline in its own right, both the foundation of the Design Research Society in 1966 and the "Design Studies Journal" provided platforms for the distribution of the idea of Design as an academic discipline. In the very first edition of "Design Studies" of 1979, Bruce Archer, one of the leading proponents of design research, argued that in light of the failure of Design to import methods from other scientific disciplines, there exists a designerly way of thinking and communicating that is both different from scientific and scholarly ways of thinking and communicating, and as powerful as scientific and scholarly methods of enquiry, when applied to its own kinds of problems. (Archer, 1979)²⁰

The design science movement was further challenged by the claim that design inherently deals with ill-defined or wicked problems (Buchanan, 1992, 2001; Cross, 2001b; Rittel & Webber, 1973). Consequently, a linear design process, which deals with neat and clearly formulated questions, that yield determinate end-results, remains a myth and "the relationship between indeterminacy and determinacy in design thinking" (Buchanan, 1990, p. 15) stays one of the major concerns of design. Moreover, Rittel's approach makes it clear that design is facing a "fundamental indeterminacy" or, in other words, it necessarily aims to tackle ill-defined problems for which a new mode of designing is necessary. Buchanan argues that,

¹⁹ The feud over the role of post-war design can be followed in the archive of the HfG Ulm, which provides a detailed timeline on events, communications and discussions.

²⁰ The relationship of design and science has been a topic throughout the 20th century, for the Bauhaus of the 1920's, the HfG Ulm in the 1950's and 60's as well as the design methods movement of the 1960's. Buckminster Fuller even called for a "design science revolution" in the 1960's, and Herbert Simon published his famous book *The Sciences of the Artificial* (1968) which explores the organization of complexity and the science of design. For a deeper look into the history of design research, it is worth reading Bayazit's comprehensive "Investigating Design: A Review of Forty Years of Design Research." *Design Issues*, 20(1), 16–29. (2014), *Design Research Now* (2007).

Design problems are 'indeterminate' and 'wicked' because design has no special subject matter of its own apart from what a designer conceives it to be. The subject matter of design is potentially universal in scope, because design thinking may be applied to any area of human experience. (Buchanan, 1992, p. 16)

Ultimately, a linear model of designing does not adequately grasp the problems designers face.

1.5. Research Design

The previous chapter provided some insight into the overall approach that was taken in this work. Moving on, in this chapter, I describe how RTD has been implemented and how the process has provided several emergent research questions. The process was informed by both the design project(s), at its, core and the reflection upon it.

The hypothesis that sustainability principles may provide a baseline for sustainable design, rendering it a default configuration, has found its way into design research; this has resulted through design activism, transformation and transition design, which all, more or less explicitly, regard some facets of sustainability as a basis for their practice. Given the nature of this RTD endeavor, placed between sustainable design, participatory design and interaction design, several intertwined questions arise,²¹ which are explored and adapted iteratively in the process, the guiding question being:

What are basic configurations of a sustainable design by default and how can a dynamic framework for transformation provide designers with instruments to approach challenges of sustainability on a micro-level?

Along with this overarching question that also targets the gap between sustainability theory and everyday practices, in the early stage of research, several challenges and sub-questions arise which include the following:

Which enabling infrastructures and tools for the mediation of ways to act sustainably within an urban neighborhood can be designed?

In this context, what are the limits and strengths of a mixed methods repertoire?

Since the concept of sustainability is deeply intertwined with everyday life and the individual reality of citizens, it has to be researched in a trans-disciplinary, practice-related way. In order to address the open questions mentioned before, I propose to approach the fragmented and ambiguous concept iteratively and practice-based through the design case Neighborhood Labs. This RTD approach enables the derivation of themes from the practical application and use of an artifact within a neighborhood setting and at the same time allows the researcher to enrich the artifact with knowledge from research.

Objective and scope of this work.

The overall scope of this dissertation can be summed up as follows. First of all, a close investigation of the area of sustainability research is needed since there is a large body of work which deals with the question of what constitutes a more sustainable practice and how one may

²¹ in line with principles of qualitative, mixed-methods research, this dissertation opens with a research question as well as sub-questions that are specifically targeted in different parts of the RTD process (see e.g., Creswell & Clark, 2017).

transform existing unsustainable ones. While a majority of these contributions weigh towards environmental issues, research that ties sustainable design to a transformative, socially-oriented practice is still underrepresented.

This work gathers and synthesizes literature with a clear focus on design for sustainability including reference points to the theoretical groundwork of sustainability and its variations. It further provides an overview of the approaches of design infrastructuring, design for social innovation, design activism as well as transformation and transition design, which deal with the implementation of possible sustainable futures.

- *re-frame sustainable design and provide arguments for a holistic perspective as well as the notion of sustainable design by default. Focus here lies on the empowerment of citizens and supporting infrastructures for the improvement and transformation of ones living environment.*
- *explore participation as an underlying requirement and fathom its qualities as well as its limits in practice within design.*
- *develop a repertoire of action for stakeholders in urban change processes which explores mixed methods, tools and paths to action.*
- *explore the process of the design case for this dissertation, which was conducted during the early phase of this dissertation, through the lens of sustainable design research. At the core of this exploration lies the participatory design project "Neighborhood Labs" which provides insights into how to approach wicked problems in urban neighborhoods supported by diverse participatory methods like neighborhood mapping workshops, collaborative prototyping and design games as well as by designing and deploying bridge-technologies which help include a broader range of citizens in decision-making.*
- *in the design project, use and adapt design methods and processes from various neighboring fields (interaction design, participatory design, design activism, design ethnography)*

I critically explore whether or not participatory design infrastructures can act as agents for change towards a more sustainable future within urban neighborhoods. Furthermore, I endeavor to establish a sustainable design research approach as the possible means to bridge the gap between sustainability theory and a practical application through design within urban neighborhoods. This research further aims to contribute to an understanding of sustainable design as a transformational, research-led practice that understands sustainability as a default configuration.

A critical overview of the current discourse within the transdisciplinary field of sustainability research on the one hand and current directions in the area of design for sustainability on the other is needed. This overview must particularly include approaches such as transition, transformation, social design as well as design activism which cater to a more holistic notion of sustainability explicitly or implicitly.

Furthermore, I seek to contribute both to the field of sustainability research by providing theoretical insights from the design case and to the field of design by providing methods and tools which bridge the gap between a theory of sustainability and its practical application. This work aims at developing a sustainable action repertoire for designers and non-designers through reflection-in-action following a research-through-design approach (see, e.g., Jonas, 2002; Findeli, 2008) which lead to a vibrant exchange from research to practice and vice versa.

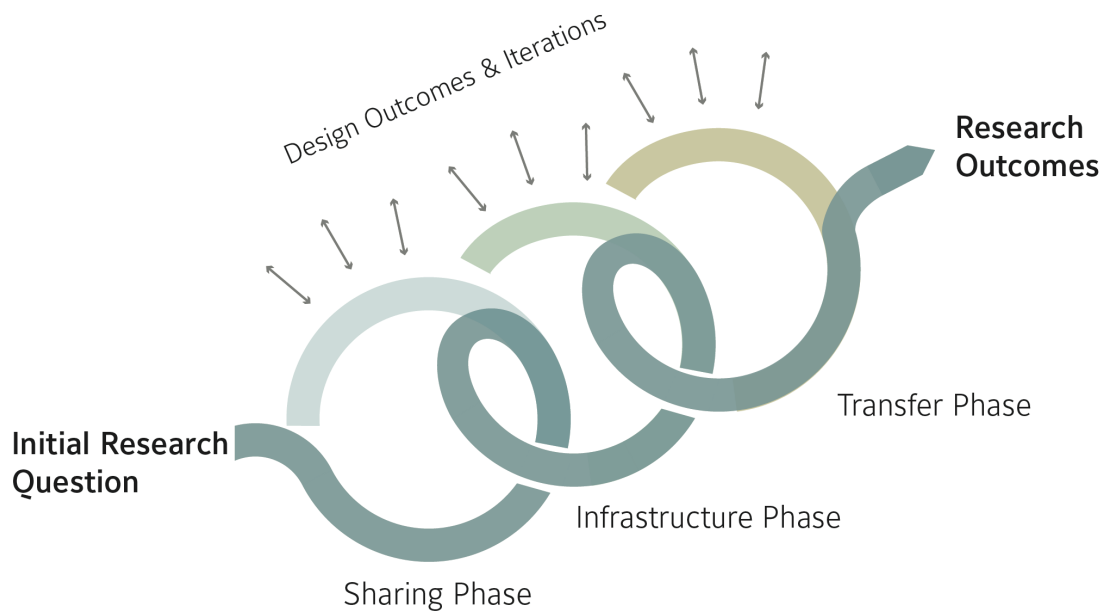


Fig. 8. The process-phases in this research-through-design project

The work provides the perspective of sustainable design by default, meaning the idea that principles and practices of areas related to sustainability are distilled and included in design research, practice and education, not with a label attached to it, but as self-evident parts of a new way of designing. While this transition of design towards a sustainable practice is a critical endeavor, in my work I propose tentative starting points and an exemplary process which allow me to distill several key methods and tools that aid this adapted process of design.

This work is built around design practice, i.e., a participatory design case Neighborhood Labs in which an interdisciplinary research group seeks to exemplify and experiment with a research-through-design approach in an urban inner-city context. It is set up as a living lab - a citizen-centric research environment which includes stakeholders such as researchers, city officials, companies and citizens in the process - in the area of the "Fischerinsel" in central Berlin including numerous active groups. The key aim of this work leads, on a practice level, to an action repertoire for transformation and on a theoretical level, to the notion of sustainable design by default.

After laying out the problem area and the knowledge gap, several main objectives include:

- *On a theoretical level, it is crucial for my work to investigate and transfer perspectives from sustainability research, especially regarding holistic views of sustainability, towards a participatory design practice and scrutinize aspects of transdisciplinarity and their implications on both sides.*
- *On a methodological level, there will be an exchange and comparison of methods in participatory design and sustainability research.*
- *On a practice level, this work seeks to establish participatory design as an area in design which can create possible sustainable futures and can provide tools which aid the transformation towards these. The design case “Neighborhood Labs” serves as a blueprint for this endeavor and forms the nucleus of the research-through-design project.*

1.6. Sustainable Design by Default

Design is growing towards a more conscious practice, which moves the design practitioner to be more socially and politically aware, immersed in wicked problems. In reference to the overview of Sustainable Design, Design Activism, Transition & Transformation Design as well as Participatory Design, all of which are embedded in practice, this work proposes the notion of sustainable design by default, which will be introduced in the following chapter.

The term sustainable design in this work is merely a placeholder for a design practice that incorporates a sustainable mindset into a research-through-design process.²² I argue for **sustainability by default**, which means that the core values and principles of sustainability are an integral part of design and not something that one adds to the design process. As previously established, the global challenges that arise due to mankind's actions are generally accepted and thus should be taken as a preexisting base condition we as designers and design researchers have to address.

Referring back to the areas of design introduced in the previous chapter, there are several examples of where the conceptual and ideological baggage of sustainability vanishes and makes way for a new practice which leans on its underlying principles by embedding them seamlessly into the practice. When stripped of its historic dead weight, such as the tradition of viewing sustainability as a triadic concept between social, economic and ecological, sustainable design may still provide a fresh perspective on processes of change in our society. But what is the essence of design for sustainability? This work sheds light on the possible links between movements in sustainability research and design practice and emphasizes the transformative attributes of dominant perspectives on sustainable design.

Sustainable design by default suggests the implementation of principles and practices of sustainability in design as a baseline within design education, research and practice.

I argue that what lies at the core of an understanding of design for sustainable change, is that it is based on interdisciplinary knowledge, the ability of designers to transcend boundaries of theory and practice and an intrinsic motivation and ethical standpoint regarding the individual practice. Sustainable design in this sense moves towards a “post-sustainable” design with new reference points.

²² Here, I am following Jonas' previously introduced argument that first of all research-through-design (as a Mode-2 science) is the perfect match for transformation design projects dealing with the challenges of sustainability.

New reference points for post-sustainable design.

All in all, most sustainable design movements are dedicated to a clear objective, e.g., a political outcome, local social change, empowerment of marginalized groups, etc., and the designer's role is to grow more and more conscious of the impact of his or her designerly products or services.

In this work, three basic directions are crucial to re-framing sustainable design towards a default configuration:

- How can designers **open access** to knowledge, tools and technology through collaborative action?
- How can designers provide processes to involve stakeholders in critically assessing and **making possible futures**?
- How can designers **transform contexts and situations** from one state to a preferred one and design the underlying negotiation-processes based on the principles of sustainability?

Opening access.

The first hypothesis assumes that this notion of sustainable design by default opens access to necessary tools, methods and processes which allow stakeholders to act depending on the challenge at hand. Sustainable design usually deals with challenges, inter- and transdisciplinary, thus blurring or even eliminating the boundaries between designers and non-designers.

Openness is an aspect which is crucial to the spreading of sustainable tools and processes. Key elements are the open source community, new ideas of open design as well as democratization of designerly tools which have been followed in this dissertation.

Furthermore, radically opening access to experiential knowledge, to tacit knowledge and explicit knowledge is a key concept. In the context of this work, the knowledge created during the process is open to everyone, without exception.

Making possible futures.

The second hypothesis assumes that sustainable design by default has the capacity to create and communicate possible futures through hands-on, participatory experiences. It is moving towards a critical culture of making and co-designing that takes into account the socio-cultural dimension of design. How can a designer frame an environment for critical making which allows for the investigation of, e.g., the improvement of the social fabric in urban neighborhoods? In this view, making is an integral part of a social learning process, putting an emphasis on the use of prototyping and envisioning techniques as, for instance, those used in participatory design projects.

Transforming contexts and situations.

The third, and perhaps most contested hypothesis is that sustainable design by default is able to transform contexts, situations, behavior and most importantly, one's own practice. The transformative aspect is found in research-through-design, sustainable design as well as the various iterations of a socially embedded design practice. When framing a renewed notion of sustainable design, the dimension of transformation almost automatically appears in current discussions. Not only is the topic engaging all of design, not only sustainable design, it seems to provide an underlying idea that design may be able to transform the contexts that its products and services are set out to be used in. Nevertheless, the call for designers to transform a practice of "unsustainability" into one that allows "futuring" has trailed off (Fry, 2009). However, it is not only the context and situations it claims to transform, but also user behavior and market incentives. In this research, transformation is viewed as a careful byline to a project which spans almost six years. There have been calls for how this transformation is measured and what can be gained from it, but reflecting on the process, there has been no suitable framework for quantifying the transformation that might have occurred.

When proclaiming transformation as one of the key aspects of a holistic view on sustainable design, one has to be careful of how to provide evidence for such transformation. During the process of this dissertation, the practices of design activism and participatory design have been taken into consideration multiple times when designing with stakeholder groups. However, in this sense, activism is constructed as a feature of a holistic repertoire of a design practice aimed at transformation, while participatory design is interesting in terms of its notion of bottom-up culture and empowerment. Especially the idea of an "action repertoire" is reflected in some of the outcomes of the "Brandis participation project" as well as some of the design games, workshops and interventions conducted in the *Neighborhood Labs* project.

2. Sustainability in Design

2.1. Re-Framing Sustainability for Design

Framing sustainability for design is, per se, a difficult, and some might say impossible, task; some may even say it is, in general, failing (Fry, 2017b). I argue that when stripping sustainability of its normative, prescriptive features, core characteristics come to light which can be linked to core characteristics of design. In the following part, an attempt is made to shed light on some of the current approaches to sustainability and sustainable design and to propose a re-framing of the practice of sustainable design and to provide a tentative link of sustainable design and a research-through-design approach.

Consequently, this chapter aims to retrace the steps from the early roots of sustainable design within the sustainability movement towards its radical opening in different directions such as design activism, transformation design, design for social innovation and post-sustainable design.

This chapter provides the critique of sustainable design on which this work is built and seeks to clarify the current position of the social, transformative dimension of sustainability which is taken on in the case studies.

The paradigm shift in both sustainability research and sustainable design towards the strengthening of the social perspective of sustainability is described, starting from the very beginnings of the more ecologically minded sustainability movement, e.g., the eco design movement, and moving towards social design, the ethical turn in design or post-sustainable design.

The chapter is concluded with an overview of participatory design and the notion of participation which has been a vital part of this work.

2.1.1. The Roots of Sustainability

When attempting to establish RTD as an approach for sustainable design, a closer examination of the history of sustainability and how it made its way into designerly practice is necessary. In this chapter, I will present a short overview of the concept of sustainability²³ as it made its way into policy making, grassroots initiatives and the public eye.

Historically, the idea of sustainability as it is presently discussed in western societies,²⁴ emerged in very different areas of predominantly scholarly discourse, such as the biosphere, conservationism, population growth, global equity and justice. While its rise is nevertheless closely linked to the environmental movement of the 1960s, there still is no unified framing available, which some view as an advantage. There are, however, certain aspects that reappear in the discussions. With the rise of the “sciences of the artificial”, concerns about sustainability also encompassed engineering studies, architecture and design.

Before sustainability became a global movement as well as an academic theme, it started out with considerations of how mankind would be able to sustain its existence on a planet with finite resources. More specifically, it discussed the idea of a dynamic equilibrium of various systems on our planet that are inherently interconnected and co-dependent. In this respect, sustainability quite literally means “the ability to sustain” (our lifestyle, our environment, our planet, etc.), while leaving the moral question of “what to sustain” to be discussed and debated over.

In ethical terms, “... present and future persons have the same right to find, on the average, equal opportunities for realizing their concepts of a good human life” (Ott, 2003, p. 60). This arguably broad interpretation might not be the best starting point for questioning the notion of sustainable design nowadays, but rather provides the essence one may reflect back on in the plethora of descriptions, definitions and frameworks of sustainability. It has found its way into everyday language,²⁵ in the Oxford English Dictionary there is even a specific reference to ecological balance which supports the argument that the predominant approach to sustainability remains an eco-centric one. Ekardt (2011), Fry (2009) and other scholars agree that sustainability relates largely to the limits to (global) growth and the un-sustainable lifestyles tied to it. However, sustainability is not only related to economic growth debates, but it tends to critically reflect on Western culture, being

²³ For a more detailed general history of sustainability, Jeremy L. Caradonna’s book *Sustainability: A History* might be of help as well as Margaret Robertsson’s *Sustainability: Principles and Practices*, to name only two of a multitude of books on the topic.

²⁴ This work is rooted in a Western society and, therefore, focuses on the approaches to sustainability developed within. While other sustainability philosophies would provide interesting insights and might be an area for future research following this dissertation, for this particular work, they are out of scope.

²⁵ Of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged or relating to a lifestyle involving the use of sustainable methods for a sustainable society (Merriam-Webster Dictionary).

framed as sort of a remedy. One unifying theme remains that sustainability refers to the search for a framework which facilitates the provision of a long-range future.

In this search, concepts emerge, become prominent or even dominant for a time, and then decline. At any given time, there is a mixture of new ideas accepted by few people, dominant ideas that form the major base for conventional wisdom, and older ideas whose force is waning. No doctrine, or set of doctrines, has emerged as the enduring light to illuminate the past and guide the future. (Kidd, 1992, p. 2)

In this light, Fry (2017b) argues that sustainability as a discourse and a practice has failed not only because of the fragmentation and diversity thereof, but due to two distinct reasons:

- The concept is not grounded in an analysis of what is actually un-sustainable. It focuses largely on environmental and ecological impacts.
- Humankind is not able to surpass its anthropocentrism, and solutions proposed to the pressing challenges do not address the deep underlying problems.

While mankind may not be able to transcend anthropocentrism, the realization of this fact and confronting this knowledge leads to ontological transformation²⁶ (Fry, 2017b).

With regards to overcoming the traditional three-dimensional model, Ott and Döring (2001, p. 60), proponents of the concept of strong sustainability, make the case for a useful separation of the term of sustainability into the following levels of discussion:

1. Idea
2. Concepts
3. Guidelines (resilience, sufficiency, efficiency, etc.)
4. Dimensions (environment and nature, social systems, economy, education, culture, etc.)
5. Management rules in single dimensions
6. Objectives (targets, time frames, set of instruments)
7. Indicators
8. Implementation, monitoring, etc.

Furthermore, they argue that reasonable ideas such as sustainability can only be actualized through concepts, institutions and policy making. An actualization of ideas through concepts is

²⁶ Fry proposes the notion of ontological design in a previous publication, where designing is closely related to considerations of being in the world and existing within it, a concept which extends well beyond the scope of this work.

embedded in the realities of a “non-ideal” world which may support or impede actualization (Ott, 2014).

Although sustainability and sustainable design for that matter are conceived to be truly global movements, it has to be noted that a lot of the key dates, events and publications within my dissertation draw from a European and North-American perspective. The well-established models of sustainability spring from this ‘Western’ as well as predominantly top-down perspective (Brocchi, 2013), which this work seeks to challenge.

Reading material on sustainability is abundant and stretches the boundaries between research and practice. Even though it has its roots in academia and policy-making, there is a multitude of influential books and publications which are put forth by grassroots movements, private companies or individuals, providing new ways of living and acting sustainably. These might include network-enabled sharing practices, access to (digital) education, knowledge repositories concerning participation in processes of urban change, awareness of un-sustainable effects of man-made products, or urban sensing tools, to name but a few.

Sustainability considered as a state of mind requires recognizing,

“the dynamic, cyclical, and interdependent nature of all the parts and pieces of life on earth, from the soil under our feet to the whole planet we call home, from the interactions of humans with their habitats and each other to the invisible chemical cycles that have been redistributing water, oxygen, carbon, and nitrogen for millions of years.” (Robertson, 2014, p. 3)

In addition to the latter, what is needed is a continuous, deep education and involvement of citizens in the process of understanding, shaping and recovering the world and finding new approaches to re-establishing a dynamic equilibrium of the systems on the planet. To do this requires a balance between a population’s activity and the carrying capacity²⁷ of its environment. Consequently, sustainability is defined by trade-offs between different interrelated factors.

To illustrate this point, I will give a short example of the aforementioned trade-offs. When a manufacturer designs a new phone from a sustainability perspective, despite leaning on established tools such as Life Cycle Assessment (LCA) or a cradle-to-cradle approach,²⁸ which accounts for material flows in a development process, he can never factor in all processes that influence the product before, along and beyond its life-cycle. While you may design for disassembly or re-cycling, the materials used from the start may be delivered from a country, where working conditions are questionable. So, you have improved the product on one end and taken into account that it may worsen at the other end. Conversely, while you might sell your car in order to instead use a car-

²⁷ Carrying capacity in ecology is defined as the maximum, equilibrium number of organisms of a particular species that can be supported indefinitely in a given environment.

²⁸ This approach has been established primarily through the book *Cradle to cradle: Remaking the Way We Make Things* (McDonough & Braungart, 2002).

sharing service to get around, your ecological footprint might not be diminished due to the fact that you use a car more frequently.

Current positions in sustainability-related fields are fragmented and diverse, building on various origins, making the term itself almost useless to put into practice. Nevertheless, this ambiguity can also be viewed as one of the strengths of the concept. This becomes clearer when looking at the recent history and the specific features of prominent roots of sustainability.

Fragmentation and conceptual roots.

While many refer to the Brundtland Report of 1987 as providing a push for sustainability in design, one of the earliest known records of the term sustainability may be found in the field of forestry in the east of Germany. In his *Sylvicultura Oeconomica* (1713) Hans von Carlowitz pinpoints the first thoughts on sustainable forestry. He reflected on the sustained use of forest land, fostering an equilibrium between timber usage and replanting of trees regarding Saxonias mining explorations. So originally, the concept of sustainability was framed out of the conflict between exploitation and overuse, e.g., as mining ore drove wood scarcity (Mauch, 2014).

Sustainability gained traction in research as well as with the public around the time of the rise of the environmental movement of the 1960s and 70s (Robertson, 2016), marked by several essential publications which quickly reached popularity.²⁹ In 1962, Rachel Carson's *Silent Spring* provided the breeding ground for environmentally oriented movements, describing destructive effects of pesticides on the environment and, following the publication, the predominant optimism regarding technological progress hit a bump. At the same time, and perhaps in part because of the book and the subsequent skepticism, the environmental movement grew strong in the United States and in Europe.

When looking deeper into the concept of sustainability as it emerged in the 20th century, it can be traced back to several interrelated strains of thought and notable roots³⁰ (Kidd, 1992). The term "sustainability" only came into play in the early 1970s, being framed differently in different areas of research (Goldsmith et al., 1972); it quickly progressed from a concept, predominantly discussed in the academic world, to a global movement with grassroots organizations as driving forces for change.

²⁹ Key publications were found in fields such as ecological economics, biology, political science and sociology: *Small is beautiful - economics as if people mattered* by Schumacher (E. F. Schumacher, 1973), *What now, another development*, (Hammar skjöld, 1975) in Sweden, Rachel Carson's *Silent Spring* (Carson, Darling & Darling, 1962) or *Sustainable Society* by L. Brown (Brown, 1982), *Limits to Growth* by the Club of Rome (Meadows, Meadows, Randers, & Behrens, 1972)

³⁰ Although sustainability was an issue before the 20th century, I will focus on its emergence in the course of the 20th century, since it coincides with the rise of design research.

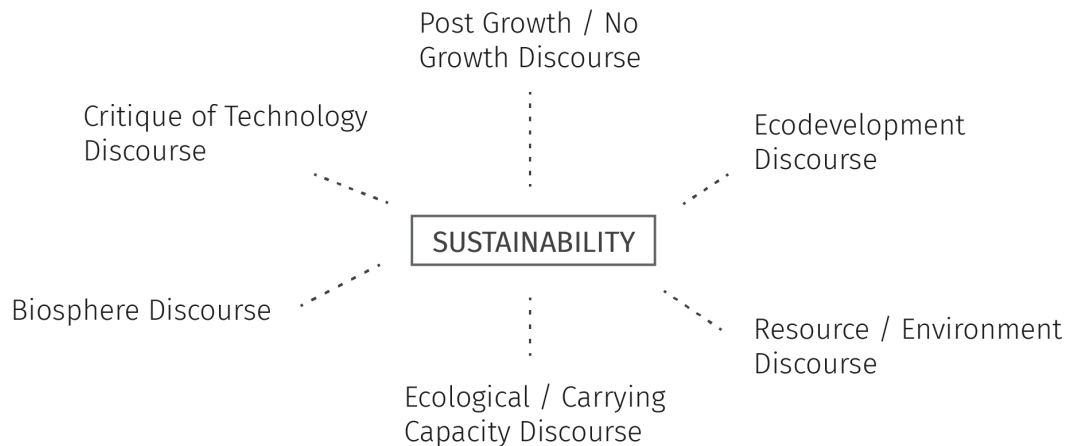


Fig. 9. Roots of sustainability: Several strands of the sustainability discourse emerged in the 20th century (adapted from Kidd, 1992; Caradonna, 2014)

One of the issues visible in all of the discussions is that they are, in large part, normative and prescriptive, which made it difficult for their underlying ideas to be established.

1. **The ecological root** is probably the largest stream in the discourse on sustainability. The dominant thought here is, that the earth's carrying capacity is limited in terms of "physical phenomena" and that an overburdening thereof will lead to a population cut below that limit.
2. **The resource root** refers to the possible "limits to growth" which "is based on two premises: Levels of human living are constantly rising, with mounting use of physical resources. Despite technological progress we are spending each year more resource capital than is created" (Kidd, 1992, p. 6).
3. **The biosphere root** is concerned with an intergenerational equity approach, which makes way for a "cyclical ecological system", where people are living on the provided capital (economically, ecologically and socially) and take into account future generations.
4. **The ecodevelopment root** is specifically seen as an approach to development³¹ which aims at integrating sound ecological management with economic and social objectives. It served as the basis for the current sustainable development agenda which is pushed forth by the UN.
5. **The critique of technology root** is supporting the claim that technology has "predominantly dehumanizing and disorganizing effects". A movement critiquing technology-based innovation lead to the *appropriate technology movement* which

³¹ In terms of the UN's definition of: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

permeated into design in the shape of the critical engineering movement or the critical making community.

6. **The no/post growth root** points towards the idea of a steady state economy, which does not operate on the premise of continuous growth. Most proponents argue that continuous growth is physically impossible and that a no-growth economy would be able to push ethical and social values. Recently, the no-growth position has been softened and some argue for sustainable growth. Despite being quite popular in the 1960s and 70s, in light of the shift of most large economies towards neo-liberalism (in the early 1980s), the no/post growth discussion quieted down noticeably, being reinvigorated recently by the concept of sufficiency.

While sustainable design cannot be traced back to one specific root, there are certain discussions which have been led in design as well. Kidd (1992) argues that while most of these roots are related to physical concepts, ethical principles may be of critical importance to sustainability, a view which will be elaborated on when presenting sustainable design approaches. Within the sustainability discussion, or rather the many different streams of discussion, social-ethical approaches are on the rise. This is not only as a reaction to the dominance of eco- and econo-centrism, but also due to the dawning insight that technological progress will not be able to counteract the impact that mankind has had on the planetary equilibrium. Thus, flexibility and compliance of the social system and the individual is the key to sustainability (Brocchi, 2013).



Fig. 10. The architects Amir Djalali and Piet Vollard made a “subjective attempt to historically map the different ideas around the relationship between humans and their environment.” Their timeline interconnects philosophical streams with protagonists of sustainability ideas as well as with pop-cultural indicators and opens up a perspective on the multitude of angles that can frame sustainability (here especially the relationship to nature).

It can be agreed upon that the term as well as form and content of sustainability is highly diverse. Brocchi (2013) retraces an interesting baseline in the sustainability discourse, which consists of two distinct traits of definitions of sustainability: one negative and one positive one. This is consistent with approaches to sustainable design, where key publications may be mapped to either a more positive or a more negative point of view regarding sustainability. In other words, some argue that design may be able to provide some sparks to work towards sustainability, some argue that it might be able to prevent the steep decline of the earth's biosphere, some simply argue that design is not able to contribute at all to the goals of sustainability.

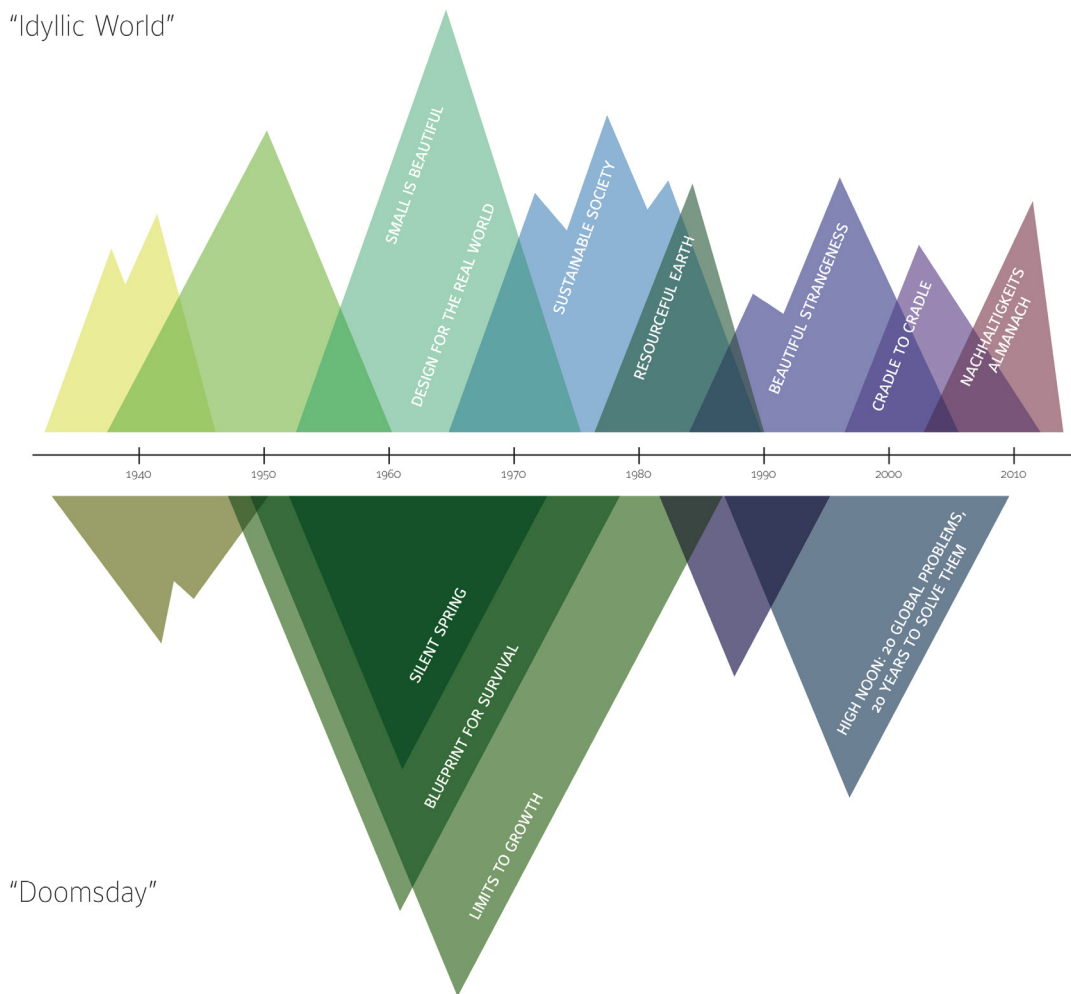


Fig. 11. Selection of doomsday vs. idyllic world publications

Limits to growth and global impact.

While sustainability was considered a loose concept of ideas and perspectives before, in the 1970s it was supported by a range of organizations, global or local, that drove the idea of sustainability further. The notion of living sustainably became popular along with a multitude of approaches on

how to follow sustainability in everyday life.³² The year 1972 marked a key date regarding public awareness of sustainability, when The Club of Rome published *The Limits to Growth*³³ (Meadows, Meadows, Randers & Behrens, 1972), which documented a study undertaken by a group of researchers at the Massachusetts Institute of Technology (MIT). The study included an analysis of the “world problematique” based on a computerized model (World3) which enabled the simulation of future scenarios for the world, and they argued that unlimited growth is not possible on a planet that only provides finite resources.

This is discussed as a watershed moment in the history of sustainability which provided another view on the state of the world, alternative to the paradigm of economic growth and technological progress. It suddenly became clear that there is a possibility that the aforementioned growth might be in opposition to the given finite resources on our planet. The Woodlands Conferences as well as the Mitchell Prize³⁴ promoted a view of sustainability as a transition from growth to a steady state in terms of economy and social policy.

In the late 1970s, when the first uses of the term sustainability came up in the United States, they were rather “statements of a broad political and ethical philosophy justifying a “no-growth” society” (Kidd, 1992, p. 15). Ecological concepts were then a fundamental part of this philosophy. Within the UN, such concepts were tied to equitable rather than no-growth economies.

In England, in the United States, and in the U.N. “sustainability” emerged in the context of broad social, economic, and political goals, rather than in the context of more narrowly defined resource management and ecological concepts. (Kidd, 1992, p. 19)

One of the first private research facilities to be concerned with Sustainability, the Worldwatch institute, rather provides information about issues such as climate change, food and agriculture as well as the environment and society. They represent a more eco-centric view on sustainability, and in their mission statement they note that the institute,

delivers the insights and ideas that empower decision makers to create an environmentally sustainable society that meets human needs. Worldwatch focuses on the 21st century challenges of climate change, resource degradation, population growth, and poverty by developing and disseminating solid data and innovative strategies for achieving a sustainable society. (Worldwatch Institute, 2018)

³² The do-it-yourself culture of the 1970s, resulting from an economic crisis, is one of the examples that re-emerged in the late 1990s.

³³ This publication is sometimes named “the doomsday book” since it takes catastrophe as its predetermined path which reflected the state of mind of the times.

³⁴ The Mitchell Prize and Woodlands Conference are hosted by the Cynthia & George Mitchell Foundation and provide an early example of a critique of growth following the Club of Rome’s “Limits to Growth” (<http://cgmf.org/p/woodlands-conference-mitchell-prize.html>).

Along with the dissemination of the idea of sustainability came the realization that there are no final and global solutions to the complex problems that we face nowadays. With Rittel's and others' framing of wicked or ill-defined problems, a concept which would have vital importance in the development of sustainable design, the notion of sustainability as a utopian concept grew stronger and along with it a growing concern for the feasibility of sustainable solutions.

With the 1980s World Conservation Strategy (International Union for Conservation of Nature and Natural Resources, United Nations Environment Programme, World Wildlife Fund, Food and Agriculture Organization of the United Nations, & UNESCO, 1980), techno-centric optimism, meaning the view that we would be able to find solutions via technological progress, faded and made way to a multitude of frameworks and perspectives, like the basic concept of the three E's that puts more weight on the interplay of three perspectives: the economy, environment and equity. Ideas of sustainability found their way into urban planning, economics, biology, agriculture, architecture and design as well as in the public, becoming a cross-sectional theme (Caradonna, 2014, p. 137).

The reports and conferences at the time were carefully optimistic regarding the capacity of societies to transform and to counteract economic, ecologic and social depreciation. There was a consensus amongst sustainability theorists and practitioners, that growth might not be the appropriate paradigm for societies to thrive on. To reach a social equilibrium, there would have to be different concepts to implement. The rise of neo-liberalism in the Thatcher and Reagan era during the 1980s largely suppressed these considerations.

Sustainable development, the policy perspective and un-sustainability.

In the discussion of sustainability, the aspects of top-down and bottom-up implementation and circulation of sustainability principles and practices have always been present in terms of policy making and grassroots engagement. When focusing on design in the context of sustainability, the aspect of prescribing rules and guidelines versus facilitating "organic" change becomes important.

At the end of the first great wave of environmentalism in the mid-eighties, the discourse on sustainability reached a turning point when it was widely discussed on a political level within a newly founded commission within the United Nations as well as within the United Nations Environment Programme (UNEP) in their World Conservation Strategy. It was at that time, when organizations and individuals looking for ways to define sustainability from the bottom up and as a reaction to the "great growth debate"³⁵ in the years before (Caradonna, 2014), that they were provided with a counterpart at the policy-level. In the late 1970s and early 1980s, the term sustainable development was coined (Clark & Munn, 1986) and further described during the work of the World Commission of Environment and Development as:

³⁵ In the 1970s, there was an international debate on whether or not growth was the right paradigm to base societies on. This debate was fueled by the Club of Rome's *The Limits to Growth* (Meadows et. al., 1972) and other key publications, such as the *Blueprint for Survival* (Goldsmith et. al, 1972) and *Small is Beautiful: Economics as if People Mattered* (Schumacher, 1973).

meet(ing) the needs of the present generation without neglecting future generations' needs.³⁶

The idea of Sustainable Development as a political concept and guiding principle was molded into a policy instrument by the commission around Gro Harlem Brundtland during the “Our common future” conference (WCED, 1987). The outcome of the conference was to provide a policy concept and guidelines which acknowledge the impact humans have on the Earth, provide a framework for redirecting man’s impact and work to contain the damage that has been done (Madge, 1993).

Due to the complexity of the tasks that lie ahead, the outcome at first yielded no practical explanation or guidelines on how to address the problems. It did however transfer ideas from a largely academic, theory-driven context to a policy level. In their report, the UNEP emphasizes the factor of absolute poverty, meaning that basic human needs such as sanitation, nourishment and shelter cannot be met on a daily basis, in the considerations of sustainable development. The conservation of the natural support systems on Planet Earth is interrelated to this factor.

We recognize that poverty, environmental degradation, and population growth are inextricably related and that none of these fundamental problems can be successfully addressed in isolation. (Brundtland & others, 1987, p. 42)

However, there are several issues with the framing of sustainability in this context. Its values and parameters remain ambiguous and have been criticized since its idea is primarily tied to the well-being of future generations, without actually providing guidelines on how to specifically develop the present society towards this goal, however utopian it might be (Ben-Eli, 2004; Seghezze, 2009).

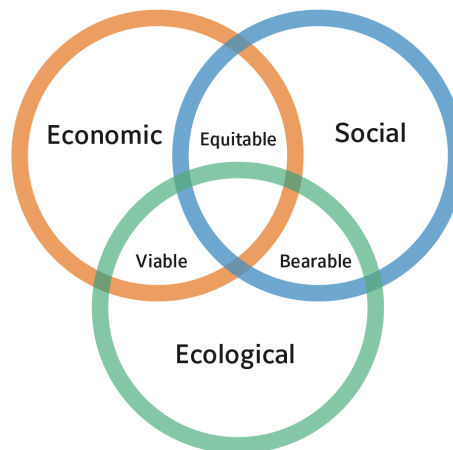


Fig. 12. The interplay between social economic and environmental perspectives where the focus is on a balance between the three, creating an equitable society, in a viable environment in bearable social circumstances.

³⁶ The basis for this definition was provided in the United Nations Environmental Program (UNEP) report from 1978 where the authors' noted that "Sustainable Development means that the needs of present and future generations must be appropriately reconciled" (provide page number for this direct quote).

Although becoming one of the more dominant perspectives on sustainability, the approach has been criticized as contradictory, arguing that it has been built on the imperative of growth³⁷ (Fry, 2017a; Lele, 1991; Redclift, 2005; Robinson, 2004; Sneddon, Howarth, & Norgaard, 2006).

While at the end of the 1990s the concept was widespread all around the world, being included in policies, economic analyses, education, transportation, urban planning, design and so on, it was largely associated with ecological or green values. This reflects the notion of *environmental or eco design* which dominated the discussion on sustainability in relation to design (Madge, 1997). Focusing on the resource level, meaning which materials are used for production, whether they are biodegradable, re-useable or recyclable, it moved towards the conceptual level of products, i.e., how can we plan and develop a product taking into account its environmental impact. This is when the concept of Life Cycles or Cradle-to-Grave and software-based tools such as the Life Cycle Assessment (LCA)³⁸ came into play. These concepts have been criticized since although they take into account a wide range of quantifiable systems surrounding an industrial system, they run into difficulties dealing with aspects which are not necessarily quantifiable, such as the social impact or cultural transformation.

The UN Summit on Climate Change, which was held in Rio de Janeiro in 1992, was the first to carve out measures against global un-sustainability. One of the major outcomes of the conference were the 27 principles of sustainability, published in the Rio Declaration. The Rio conference also produced the “Agenda 21”, a non-binding, voluntarily implemented action plan (UN, 1993) which was meant for larger corporations as well as for all levels of policy-making and was adopted by 178 governments.

³⁷ For the sake of clarity, this discussion on sustainable development will only be touched upon here. For a deeper look into the topic, the UN website provides historical information about sustainable development as well as guidelines, policy information and more (<https://sustainabledevelopment.un.org>). There have been attempts to clarify and reframe sustainable development, e.g., through the five dimensions framework focusing on three dimensions of place, permanence and persons (Seghezzeo, 2009), or the five pillars framework incorporating environment, culture, politics, society and economy (McConville & Mihelcic, 2007).

³⁸ Life Cycle Assessment was coined in the early to mid-nineties (Curran, 1996) and is mostly used for the assessment of industrial systems but also in engineering and industrial design processes.



Fig. 13. The seventeen global goals for Sustainability show the shift from environmental and economic concerns towards more social and ethical concerns. Following these goals, major research programs have been set up in the EU and Germany which also consider design as a major contributor to sustainability. (retrieved from <https://sustainabledevelopment.un.org/>)

After the Rio summit, the UN held subsequent status-conferences (Rio+5, Rio+10 and Rio+20), where the progress on the set goals was analyzed and discussed. In these summits, more hands-on recommendations have been developed and subsequently published. The recommendations developed have been specifically targeted to reach a broader range of people and to inspire political action as a consequence. Building on the 2030 agenda, the UN has published several information booklets and online sites supporting the implementation of the previously identified sustainable development goals, which will be monitored and pushed forward over the course of fifteen years, leading up to a further evaluation. One of the lessons learnt from previous attempts to implement sustainability goals is to encourage individuals and initiatives alike not to crumble in light of the immense global challenges, but to start acting even on a small, individual scale.³⁹ However, as mentioned before, sustainable development is to be viewed critically as it has the notion of continuous progress and economic growth at its core. It relies on the disposition that mankind directed towards anthropocentrism disregards its entire existence for the benefit of its own interests (Fry, 2017b).

The metaphysical dimension of this disposition established world-making practices based upon flawed and perpetuated foundations of knowledge. The

³⁹ The UN publishes “The Lazy person’s guide to saving the world”, an online repository of possible actions, which playfully addresses the issue of encouraging people to start acting despite the gravity and complexity of global challenges. Amongst the steps you can take are for instance calculating your carbon footprint, how to save energy in your home, shop sustainably etc.

most obvious example here is ‘capital logic’ as it asserts the necessity (for capital) of unceasing economic growth as the basis of a global financial system - a ‘logic’ to which the reformism of sustainable development actually subscribes. (Fry, 2017b, p. 122)

Large scale projects by the UN and other worldwide organizations were complemented in the mid-eighties by smaller NGOs and local, bottom-up initiatives and individuals acting on the recommendations of the UN.

While there has been considerable progress regarding the agreement on sustainability principles and practices on a policy-level, e.g., through the UN Sustainable Development Goals or the action plan, which followed the latest earth summit, shifts in the political landscape both in the US and Europe have forced new perspectives regarding, e.g., de-colonization of development (a discussion which also came up in the design research community). Following the agreements of the UN summits and other conferences, several policy instruments have been developed.

Policy instruments for sustainability.

Ever since the introduction of Sustainable Development, the principles of sustainability have slowly permeated into policy-making and brought forth widely used guidelines and directives such as the Leadership in Energy and Environmental Design or LEED for buildings (U.S. Green Building Council, 2016),⁴⁰ or the Ecodesign directive put in place by the EU in 2009⁴¹ which assesses material effects, energy use and efficiency and provides top-down regulation and rules that help companies evaluate their products especially regarding energy efficiency.

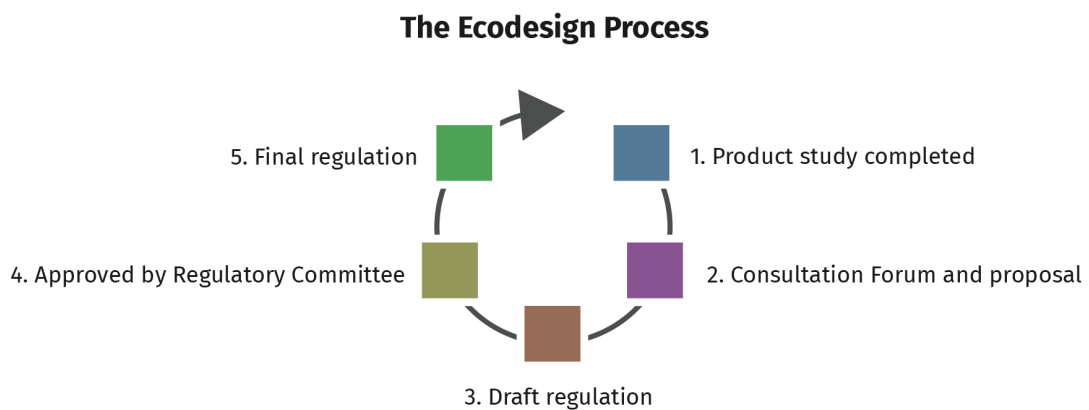


Fig. 14. The ecodesign process as a standardized tool to be used by corporations when pushing products to market. Ecodesign - Growth - European Commission (2018, September 06). Retrieved from http://ec.europa.eu/growth/industry/sustainability/ecodesign_en

⁴⁰ Retrieved from McConville & Mihelcic, 2007.

⁴¹ Retrieved from http://ec.europa.eu/growth/industry/sustainability/ecodesign_en

While LEED has been developed specifically for buildings, housing and neighborhood developments, the ecodesign directive targets energy-related products and has, for instance, led to the phasing out of incandescent lightbulbs in favor of more energy efficient and energy-saving lightbulbs. Both initiatives have been widely adopted throughout the world.

A more recent development is the action plan for a circular economy, which goes further into providing guidelines for transforming the process of a growth-oriented economy. In the report's introduction, the action plan is subsumed as an "essential contribution to the EU's efforts to develop a sustainable, low carbon, resource efficient and competitive economy" (2015, p. 3), and is supposed to substantially contribute to making the Sustainable Development Goals (SDG) which were set by the United Nation (UN) as a result of the 2015 UN Sustainable Development Summit in New York. While possibly a step in a more ecologically and economically sustainable direction, the action plan neglects completely the considerations of sufficiency and consistency.

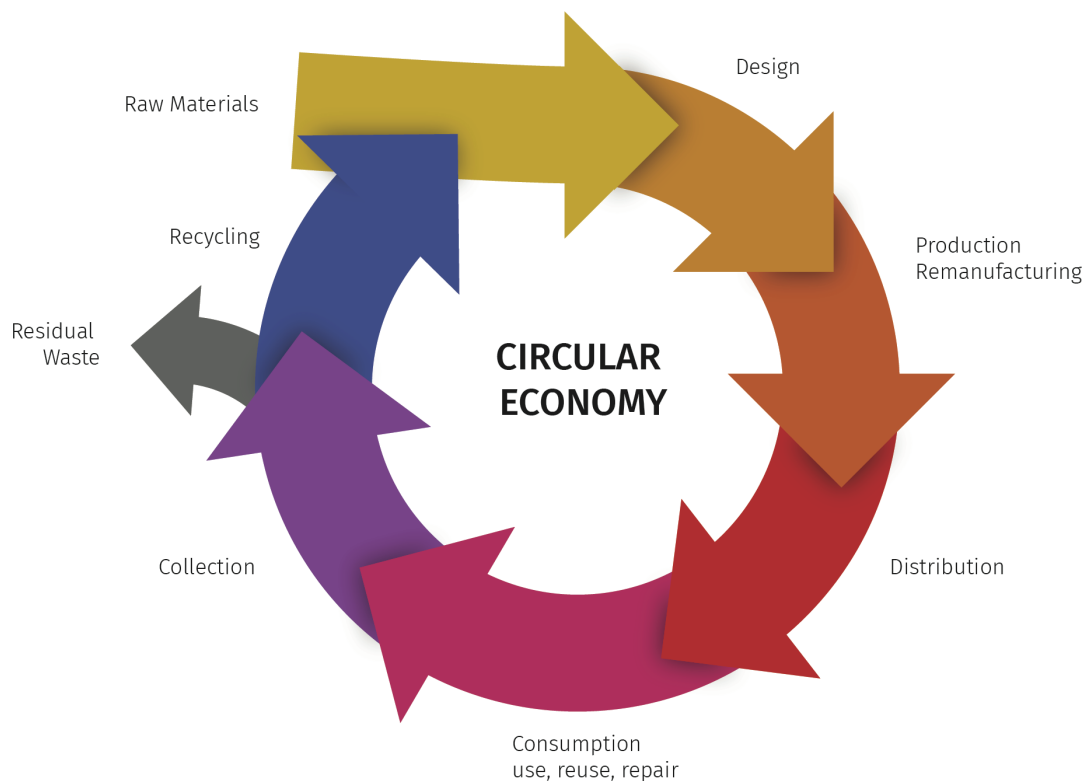


Fig. 15. Schematic view of the circular economy model as proposed by the UN.

The UN's circular economy model is the logical consequence of other life-cycle concepts and lifts them up at an institutional level. While the previously mentioned concepts and models of sustainability depict changes on a policy-level, the next section will go into current directions in sustainability which are focusing on developing conceptual models.

Strategies of sustainability.

Alongside the still dominant model of the three dimensions of social, environmental and economic sustainability, the three E's, the triple bottom line, the five pillars of sustainability, and the

dynamic equilibrium behind sustainable development, several other strategies and conceptual models of sustainability have been developed. The following strategies and frameworks of sustainability provide some informative basis for a more holistic understanding of sustainable design.

Weak vs. strong sustainability.

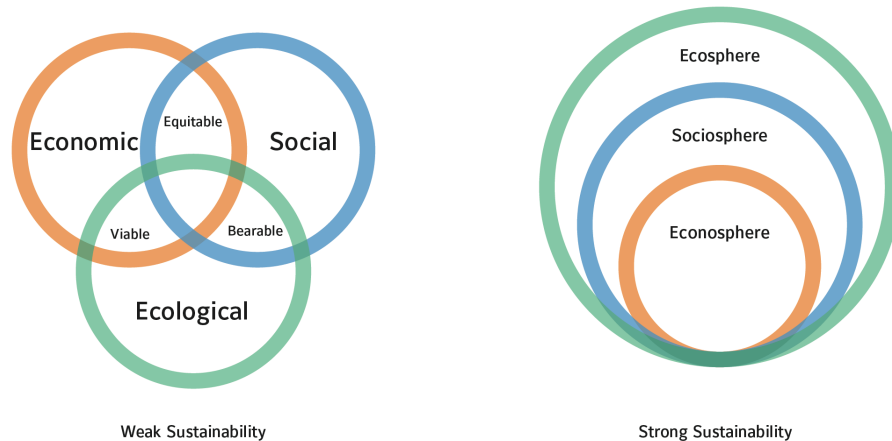


Fig. 16. Weak sustainability vs. strong sustainability

The concept of strong sustainability is rooted in the field of environmental economics and opens up a perspective of inter- and intra-generational justice. Considering that the triadic model of sustainability has produced any list of objectives deemed important (e.g., the 17 goals of Sustainable Development), Ott (2014) makes a case for constructing a comprehensive theory of sustainability and to move away from the predominant triadic sphere model where all dimensions are treated equally. In their argument for a distinctive discussion of sustainability beyond its arbitrary and ambiguous use in various fields, Ott and Döring (2011) propose a model for distinguishing different debates on sustainability (Ott & Döring, 2011). The idea of strong versus weak sustainability is tied to Rawls' account of the 'veil of ignorance' and the notion of sustainability as an ethical concept. Far from providing a comprehensive ethical theory, it rather applies principles from discourse ethics, theories of justice and environmental ethics to formulate an idea of sustainability (Ott, 2004). In terms of justice towards future generations the following inquiry is made:

- *Are there any obligations to future generations at all?*
- *Should responsibility for the future be based on an egalitarian-comparative standard or on an absolute standard?*
- *What can be considered a 'just' legacy? (Ott, 2004)*

At the core of the concept of strong sustainability is the econosphere, which is encompassed by socio- and finally the ecosphere. In accordance, weak sustainability is illustrated by the well-known triadic model where economic, ecologic and socio-cultural dimension overlap and where each is

treated equally. Conceptually, weak and strong sustainability diverge on the question of what legacy (Ott calls it 'bequest package') is left to future generations in terms of capitals (natural, man-made, human capital in economic terms).

Absolute poverty, while presenting a wicked problem in itself, in this view constrains environmental protection and vice versa. Furthermore, the focal perspective of sustainability (a long-term intergenerational perspective and an appropriate use of natural resources) may shift in light of moralization and politicization of questions of absolute poverty.

Similar to the concept of strong sustainability, the five core principles framework argues for the carrying capacity of the environment to be an overarching factor, but builds on a cybernetics background, putting an emphasis on the underlying system structure in order to understand the boundaries that define possible outcomes. The concept aims at developing the 'design parameters' that are projected to bring desired results (Ben-Eli, 2012). Sustainability in this case is described as a specific desirable state of a system which itself has an internal structure which may be influenced by intervention. The conceptual framework allows people to operationalize it. Sustainability here is defined as,

"a dynamic equilibrium in the processes of interaction between a population and the carrying capacity of an environment such, that the population develops to express its full potential without adversely and irreversibly affecting the carrying capacity of the environment upon which it depends." (Ben-Eli, 2004, p. 2)

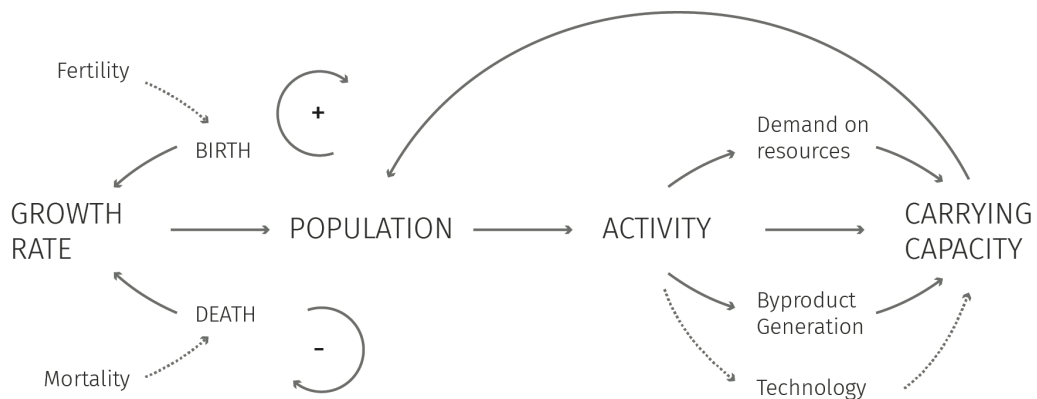


Fig. 17. Sustainability and the notion of the carrying capacity: Fostering the alignment between individuals, society, the economy and the regenerative capacity of the planet's life-supporting systems. (adapted from Ben-Eli. 2004, p.2)

By emphasizing the social and spiritual domain in the discussion on sustainability, Ben-Eli takes into account the changing perception thereof and acknowledges the fact that sustainability itself has to be rooted in the social sphere, tied to ethical considerations. Three different perspectives on the issue are apparent, one of which is dismissive and argues that things could be fixed along the way, one which is almost remorseful and proclaims that humanity has reached its limits, and finally one that Ben-Eli argues for as most intriguing: systemic patterns of stress reflect a failure of "concepts,

beliefs and practices to adapt to new possibilities and changing demands” (Ben-Eli, 2012, p. 7). Following this is the challenge of consciously overcoming the gap between these and possible futures and their changing demands, a prospect that designers may be prepared to face.

In the conceptual framework, which is specifically oriented towards action, five domains forming an integrated whole⁴² are portrayed:

The Material Domain: Constitutes the basis for regulating the flow of materials and energy that underlie existence.

The Economic Domain: Provides a guiding framework for creating and managing wealth.

The Domain of Life: Provides the basis for appropriate behavior in the biosphere.

The Social Domain: Provides the basis for social interactions.

The Spiritual Domain: Identifies the necessary attitudinal orientation and provides the basis for a universal code of ethics.

While the aforementioned holistic conceptual frameworks focus on an ethical stance of sustainability, each putting the environmental equilibrium at the foundation of the concept, the following one revolves around the guidelines of ‘sufficiency’ which complement ‘efficiency’ and ‘consistency’ considerations and questions current growth-oriented economies and the attached value-systems.

Efficiency - consistency - sufficiency.

The triad of efficiency, consistency and sufficiency as a conceptual view on sustainability has dominated the discourse in Germany. While efficiency and consistency were the drivers in sustainable innovation, sufficiency has been regarded as difficult to convey as it challenges the predominant ideal of economic and technological progress and the underlying consumerist, growth-based economy. **Efficiency** is directed mainly towards the more efficient use of resources such as raw materials or energy and postulates getting the same or more with less (energy, material, time, etc.). **Consistency** rather works within the boundaries of the planetary support system, meaning that it uses ecologically sound technologies that use the planets ecological systems without harming them (Linz, 2004).

The idea of **sufficiency** emerged in the German environmental research community around the 1990s with the foundation of the Wuppertal Institute for Climate, Environment & Energy. At its core, sufficiency inquires what “enoughness” can mean in our industrialized, consumerist societies and opens new perspectives on a post-growth economy (Jackson, 2009; Paech, 2009; Paech, 2012; Stengel, 2011). It describes the search for the right measure with regards to one’s own needs not only

⁴² The Sustainability Lab connected to this conceptual framework put the five domains and attached principles into the actual development of a Beduin Community in the Negev Desert. The project is “designed to leverage Bedouin’s traditional values, know-how and experience with modern-day science and cutting-edge technologies” (Project Wadi Attir, retrieved on 26.3.2018 from www.sustainabilitylabs.org/projects/#project-590).

materially, but also psychologically, socially and culturally (Fischer et al., 2013). Furthermore, sufficiency seeks to drive and implement changes on a policy-level while questioning the paradigm of continuous growth and global prosperity. In Germany, the main focus lays on energy sufficiency as one of the key regulatory elements in our society (Schneidewind, Zahrnt, Zahrnt, & Cunningham, 2014).

In its broader framing, sufficiency corresponds with the approach of strong sustainability in a way that it attempts to balance individual needs with the needs of the planetary boundary systems. While strong sustainability is rooted in ethics and environmental economics, the theory of sufficiency is more directed towards the industrial economy (Huber, 2000) and policy making and environmental research (Linz et al., 2002; Schneidewind et al., 2014). Nevertheless, it is not purely a political or economic issue but primarily a social one. Sufficiency argues for a fundamental change in behavior regarding the way people frame prosperity as a universal goal, and it focuses on social rather than technological innovation in approaching sustainability challenges.

In contrast to the common criticism of sufficiency, Paech (2012) argues that its reductionist approach does not necessarily mean relinquishing every material possession, but rather freeing yourself from “Wohlstandsschrott”, meaning the clutter of prosperity and symbolic acts of purchasing. The social pressure of belonging to a specific group or scene prompts us to buy more, without really needing it, creating a sort of feeling of frustration of having to maintain one’s possessions and to ‘self-actualize’ frequently (Erlhoff, 2006). Ultimately these tendencies create more strain on people since consuming also means dedicating more time, money, space and ecological resources to it than necessary. Thus, the actual benefit resulting from the act of consumption is put into perspective.

Sufficiency counters with the following question of “how can ‘overfilled’ lifestyles and ultimately society as a whole be freed from ‘energy slaves’, consumption and comfort ‘crutches?’” (Paech, 2009, p. 26).

Interestingly enough, the key claim of sufficiency is proclaiming the ‘4 lessens’⁴³ (Sachs, 1993; Schneidewind et al., 2014), which are founded on the idea that we need to lessen our speed, our distance, the encumbrance of our acquired possessions and the role of commerce and the market in our lives. In other words,

"sufficiency is about the quality of ‘being in the world’. About finding the right relationship to space and time, to possessions and the market." (Schneidewind et al., 2014, p. 14)

⁴³ The German term of the 4 E’s: Entschleunigung, Entflechtung, Entkommerzialisierung, Entrümpelung (Sachs, 1993) was translated by Schneidewind & Zahrnt into the 4 lessens.

Recently, there has been discussion of including the overarching idea of lessening dependencies, which Brischke (2014) describes as an emancipation in the form of strengthening self-determination and reducing alienation from oneself and one's surroundings.

It is this perspective that provides several anchor-points important for design and a re-conceptualization of sustainable design. While efficiency and consistency are longstanding companions of sustainable designers,⁴⁴ the notion of sufficiency is interesting for re-framing sustainable design itself. It requires a considerable change in the way design is taught, providing young designers with a broader skillset to understand contexts, re-frame problems and integrate stakeholders in current global challenges on a local scale. Sufficiency provides a basis for sustainability by default and calls for decoupling the practice of design from the notion of consumption and reaching beyond problem solving in short-range processes towards creating infrastructures and repositories for dealing with the challenges at hand, an argument which is expanded in the following chapters.

⁴⁴ E.g., efficiency in terms of the design of more energy efficient services or products, consistency in terms of using less raw materials for a new product and tying it to a cradle-to-cradle-approach.

2.1.2. Sustainable Design: A Critical View

The previous chapter has provided an overview of significant aspects of sustainability and has opened up a viewpoint on sustainability for design which leans on approaches that are rooted in a post-growth discourse. It introduced conceptual frameworks and strategies which might provide a suitable foundation for a way forward. The following paragraphs introduce and provide a critical view of sustainable design and design for social impact.

An inventory.

Designers master cross-boundary thinking, the integration of other fields into a design process, the jumping out of the comfort zone of their own field. This is what makes designers strong facilitators and sometimes the glue that holds a process together. In this sense Jonas (2001) proposes that “design should be conceived as an expert discipline of a special kind: for integration, relation, and meaning” (p. 66).

The status of design being a frequent topic for discussion brings up the question of where the design profession is headed. There is a noticeable shift in “firstly, where design skills are being applied, and secondly who is actually doing the designing” (Burns et al., 2006, p. 10). This leads to the necessity of a systemic approach, including a theory for the practice of design, when design is seen as a solution-oriented practice which is confronted with “complex entities of different types (material, cognitive, and social)” (Jonas, 2001, p. 67).

In general, sustainable design provides a contradictory narrative regarding the practice of design. On the one hand, it carries the load of global ethical and sometimes normative values, on the other hand, it provides ‘on-the-ground’ heuristics for action. Between this dichotomy, it becomes clear that sustainable design in its current form might be outdated and is in need of a renewal, of a stripping-down to its core and the capacity to transform current un-sustainable courses of action into sustainable ones.

With the realization of sustainability itself as being a utopian concept and unattainable goal, several challenges and opportunities concerning sustainable design emerge that are closely tied to how design is being transformed towards a process-oriented practice and an important component in a competitive market that strives for innovation (Manzini, 2016). While there is the faint acknowledgement amongst designers that the current practice is in large part un-sustainable and needs to be changed for the better, it seems to be largely unclear what ‘the better’ might be. The discourse on design and sustainability has come into being relatively recently since “most sustainability experts are not interested enough in design and designers are not interested enough in sustainability” resulting in a “twofold deficit” (Brocchi, 2013, p. 55) which should be structurally overcome with every debate on sustainable design. This structural change in which design is truly connected to a sustainable mindset is an inherently political act, since it questions all that is design (Mazé, Olausson, Plöjel, Redström, & Zetterlund, 2013). Many view sustainable design as being

contradictory and not capable of providing the practical, hands-on knowledge that can be applied to the contexts of design practice in academia or the industry.

Most earlier instances of sustainable design are labelled as such after the fact, but a broader scope of design has been evident in different strands of 20th century design.⁴⁵ Since the 1980s, with the broader dissemination of the idea of sustainability in society, there has been a transition from more narrowly focused perspectives on ‘green design’ or ‘eco-design’ to finally the use of ‘sustainable design’, allowing a broader interpretation and critical perspective on the relationship between ecology and design (Madge, 1997). Nevertheless, while approaches to sustainable design still largely have their emphasis on the environmental spectrum and human impact on the ecosystem, most of them underestimate the correlation of designerly artifacts with the social fabric. Design, seen as a re-directive practice, may prove valuable in the face of these large-scale problems. As a practice embedded in consumer culture, however, it certainly does not slow down the cycle of new products and services, but rather speeds it up (Fry, 2009). Perceptions of design and sustainability vary, and a multitude of different strategies, which range from design for disassembly, design for recyclability and for re-use, etc. (subsumed as *design for x*) (Chapman, 2005, p. 7), to slow design (Fuad-Luke, 2002), social design (Dilnot, 1984; Manzini, 2007) and transformation design⁴⁶ (Jonas, Zerwas, & Von Anshelm, 2015), emerge.

In addition to these approaches, overarching design philosophies appear that are including a sustainable mindset at the core of designerly actions (Fry, 1999, 2009). Design research has provided a path towards changing the socio-ethical dimension of sustainability, which has long been ignored (Vezzoli, 2006). Even so, for sustainable design to have any impact, it has to open up to sustainability research and vice versa (Brocchi, 2013).

Viktor Papanek, who looked at developing a perspective of social responsibility in design in the early seventies,⁴⁷ attempted the re-direction of designerly practice. He proposed the idea of design as being basic to all human activities and proclaimed that,

integrated design is comprehensive: it attempts to take into consideration all the factors and modulations necessary to a decision-making process. Integrated, comprehensive design is

⁴⁵ To name examples, the HfG Ulm, operational between 1953 and 1968, viewed design as a holistic, collaborative practice capable of transforming society. The initiative of the “Schweizer Werkbund”, ‘Die gute Form’ which was Max Bill’s attempt to qualify sustainability for design through the analysis of products according to holistic criteria. It has to be noted that the ideals of sustainability are also found in the most prominent totalitarian systems that, for example, stress community, localism and the natural environment as much as grassroots sustainability initiatives (Fuhs, 2013; Spitz, 2015).

⁴⁶ Transformation design appears in different contexts. The UK Design Council published an article on it calling it a “nascent, but growing community of practice” (Burns, Cottam, Vanstone, & Winhall, 2006, provide page number), the design consultancy Awaken Group calls it “design thinking 3.0” (cite date and page number) and the logical consequence of experience design, and in Germany, the Birkhäuser publishing group recently published a collection of essays on the topic, trying to spark the international debate on responsible design and a new attitude of designing.

⁴⁷ Papanek called for designers to be generalists in order to fathom the full extent of their work’s impact. He was one of the first scholars to connect design with the degradation of the earth’s dynamic equilibrium.

anticipatory. It attempts to look at existing data and trends and to continuously extrapolate, as well as interpolate, from scenarios of the future it constructs. (Papanek, 1985, p. 322)

His call resonated with the environmental movement of the 1970s, and his pursuit of the ideas of do-it-yourself, low-tech design (inspired by indigenous peoples) and open source was unparalleled. Papanek's proposition for designers to work in and with developing countries is often considered a typical Western world position of arrogance that follows the assumption that "Western" industrial designers are the only ones with the skills to help the disadvantaged. His proposition does not take into consideration that in developing countries (if at all), a very different breed of design is emerging from its context.⁴⁸ Which perspectives arise when it is viewed against the backdrop of environmental disasters, mass migration, social unrest and inequality?

Years earlier than Papanek, and taking a different approach, Buckminster Fuller was seeking to develop more efficient technologies and prefabricated designs that "do more with less" as most prominently with his dymaxion house and the geodesic dome. He participated in the "World Design Science Decade", which aimed at framing design as a practice that could address global challenges and in its course anticipated core goals of the sustainable development movement (Margolin, 1998).

Sustainable Design comes in different guises and a re-direction of design into different paths has been attempted over the years while never quite being able to alter the current culture of design.

"The critiques and visions of Fuller and Papanek, as well as others such as Gui Bonsiepe, Tomas Maldonado, and John Chris Jones, have continued to ripple through design schools and conferences, but have never strongly threatened the underlying premise of design practice that the role of the designer is to work within the system of consumer culture and to provide services to his or her clients." (Margolin, 1998, p. 85)

Interestingly enough, design practitioners are still so occupied with their established ways of working and design researchers conversely are not transferring their insights into practice. The realization that design can be an agent for change comes mostly from outside of design, where it seems to gain interest with philosophers, anthropologists, sociologists, psychologists and others (Fry, 2017a). However, there are certain streams within design that are proposing new ways to attempt this shift in practice in a variety of ways.

Design activism draws from existing activism frameworks and seeks to implement them in a designerly practice (Fuad-Luke, 2009; Julier, 2008; Markussen, 2013; Thorpe, 2011); *design for social innovation* strongly focuses on a systems and services perspective that fosters bottom-up social innovation (Manzini, 2007; Vezzoli & Manzini, 2006; Walker et al., 2007); *post-sustainable design*, as probably the most radical view, builds a new design philosophy on the rubble of a failed practice and

⁴⁸ This argument has re-emerged in the de-colonizing design discussion starting in 2016. The platform www.decolonizingdesign.com provides some insights into the discourse.

discourse of sustainability (Fry, 2017b); and lastly, *participatory design* seeks to integrate stakeholders in various ways in order to address global challenges and to democratize innovation (Björgvinsson, Ehn, & Hillgren, 2012; Björgvinsson et al., 2010; Bødker & Kyng, 2018; Regger & Bunders, 2009). Note that these streams are interdisciplinary and blur the boundaries of their respective practices.

One of the crucial aspects of sustainable design is that it is concerned with ill-defined problems. This means that there may never be a final solution but incremental changes that, in turn, transform the problem space. Nevertheless, the underlying requirement of designers to tackle massive, radical change in our societies is difficult to grasp and slowly makes way for a conscious transition of practice and an incremental transformation of tools and processes. Eventually, this transition may lead to an overall improvement of our un-sustainable society, but firstly it addresses change on a small scale, focusing on everyday practices.

The last decades have shown that while some of the directives, guidelines and accords regarding sustainability might have had a small impact, the call for radical change (in behavior, ways of production, ways of living) has not produced the intended results of changing existing (designerly) practices into preferred ones (that allow futuring⁴⁹). Here, the political implications of design also come into play. To this regard, the sustainability as well as the sustainable design discourse have been led in a consensus-seeking way, reflecting the current international stance on politics, in some way not taking advantage of the potential of the various summits, conventions and reports that have been held since the 1980s.⁵⁰ The controversy sustainability evokes in design and other fields, the dissensus which could potentially provide new approaches to tackling the challenges we are facing evaporates in the endless discussions on terminology and overarching philosophies.⁵¹

"Despite the revolutionary potential of the Club of Rome and the Brundtland report, struggles to change underlying structures or to reduce inequities are foreclosed in 'post-political' sustainable development discourse, in which the focus is on narrowing the gap between ideals and applications, between policy declarations and the design of implementations." (Mazé et al., 2013, p. 85)

While all of these attempts position design as a central component in the transformation towards sustainability and emphasize a holistic view of sustainability (sometimes in different terms), making

⁴⁹ In Tony Fry's work futuring, "at its most obvious, means giving the self (as the embodied mind acting in the world) a future" (Fry, 2009, p. 113). He argues that while being in the world we are also being of the world, a condition which is both social and biophysical, leading him to the conclusion of community being a crucial cornerstone of futuring.

⁵⁰ Note that in the discourse on sustainability there has been considerable work on the implementation of guidelines into practice. The UN has attempted several summits and conventions which have produced how-to guidelines, guiding websites and the like, however, measuring impact has always been an issue. The Designers Accord provided a platform and manifesto regarding sustainable design but was closed down after its funding expired (www.designersaccord.org).

⁵¹ In a previous chapter, I briefly outlined the roots of sustainability as well as provided insights into the dispersed nature of the sustainability discussion, tied to specific disciplines and their vocabulary.

clear the responsibility designers hold for their works impact on the world, only a few look beyond design as a driver of economic growth and development.

Framing sustainable design.

When looking at the world of design today, sustainability is no longer a fringe phenomenon. In many instances of designerly work and across all fields of design, designers are reminded of their role and responsibility. Design professionals and researchers alike map out new territories which allow them to have an impact on sustainability issues on a local or global scale. One of the critical issues and one reason for its stagnation is that sustainable design is often ideological, prescriptive and dogmatic. Rather than asking “how do we want to live in the future”, it proclaims “we need to live this way, or else we will not be able to sustain future generations”. This begs the question of how designers could take on the role of re-directive practitioners, following a more rigorous way of defining challenges and problems as well as more fundamental ways of tackling them (Willis, 2006).⁵²

The general view of what designers do is still surprisingly outmoded, as is the way it is taught at most design schools, clinging to a traditional view of design which is directed towards the past. On the one hand, the notion of the designer as a creator of beautiful objects permeates discussions and the "author-designer" is a much-desired goal for many aspiring young design practitioners. On the other hand, the designer as cog in the wheels of a consumerist society, entrenched in project work for large corporations is an equally favored way to go. In any case, it would be naive to condemn these ways of practicing design, since most design curricula are constructed to produce exactly the aforementioned types of designers, and the process of shaking off this mode of working requires determination and a broadened viewpoint on design.

Sustainable design, similar to any practice with a focus on sustainability, is highly controversial as it questions the way design is taught and practiced. In introducing his notion of a sustainable designer, Fuad-Luke borrows a basic definition of design as,

"the act of deliberately moving from an existing situation to a preferred one by professional designers or others applying design knowingly or unknowingly."
(Fuad-Luke, 2009, p. 5)

While with the right mindset and the right definition of what preferred situations might be, this framing might miraculously turn all designers into sustainable designers, a different framing would be appropriate which states that sustainable design is **a practice where designers consider the material and immaterial impact as well as the impact on inter- and intragenerational justice of the designed artifacts.**

Not only are environmental and social changes due to human impact more visible nowadays, they are also measurable and quantifiable on an economic and financial scale, thus fueling the emergence

⁵² Here, a vague connection between research-through-design and a new practice of sustainable design shines through.

of sustainability approaches in design (Chapman & Gant, 2007). Designers are continuously made aware of the fact that they help shape systems, things and processes that have considerable impact on the world (be it environmental impact or social impact). What is missing in the development of sustainable design are the visions of sustainability which provide views of alternative futures and of different ways of acting and doing (Manzini, 2006b).

Furthermore, nowadays still dominant approaches are leading to “reforming consumer culture rather than contributing to a new vision of professional practice” (Margolin, 1998, p. 89), making it necessary to not only take into account the broader visions of sustainability, but the incremental changes that can be applied directly to the practice. This does not change the fact that we are more aware of economic, ecological and social limits than before, we are aware that, as designers, we contribute to un-sustainable ways of living. Designing is still tied to the systems of the industrial revolution, and it is only now being realized that it may operate outside the “expansion model” inside an “equilibrium model” of the world (Margolin, 1996, p. 24), which still operates inside the logic of global development and growth, a view which could be criticized as not reaching far enough. This approach would require a considerable shift from existing consumption patterns that could be envisioned in different scenarios., e.g., focusing on longevity of products as well as the user-artifact relationship, moving towards the "use of services instead of products and engaging with fewer products through less consumption" (Margolin, 1996, p. 26).

What is at the core here is an understanding that design can act as a **re-directive practice** and has the capacity to envision possible futures which take into account economic, ecological, social and cultural boundaries, without necessarily being limited by disciplinary constraints.

With the heightened awareness of environmental crises and their correlation with human existence on Planet Earth at the end of the 20th and the first decade of the 21st century, environmentally-friendly products were on the rise. With this development, a new lifestyle has emerged which follows the notion of sustainable consumerism and prides itself on the possession of the latest "environmentally friendly" products. This is countered by a lifestyle of abstinence and renouncement of consumerism and promotes a new idea of 'less is more'.⁵³

As introduced in the previous chapter, the idea of sufficiency has mostly existed in the shadow of efficiency and consistency, which was the focus for quite some time, whether in products or services that use better and less materials and are built for easy disassembly or even repair and, in a best-case scenario, are recyclable. Certainly, for product design this inherent focus on materiality is understandable, but along with this focus came a disregard of perceiving the designed artifact within its context. Now, sustainable design has partly moved from these "end-of-pipe" approaches to discovering more socially-oriented ones, which target the prevention of un-sustainable actions and the re-direction of everyday practices. Interestingly enough, the early approaches to sustainable

⁵³ The movement of LOHAS (Lifestyles of Health and Sustainability) and LOVOS (Lifestyles of Voluntary Simplicity) has been covered by, e.g., Thomas Edelmann in "Widerspruch und Zukunftsversprechen - 1980 -2010" (Fuhs, 2013).

design were largely “symptom focused” (Chapman, 2009). This perfectly describes the way sustainable design is mostly practiced. Symptoms are discovered and remedies for the symptoms are then put in place, such as, e.g., bad air quality in cities which is followed by legislation that requires stronger filters for diesel-engine cars. While it is clear that better filters might improve air quality (in theory), this perspective does not take into account interconnected or underlying issues at hand, e.g., factories, livestock, server-farms, etc. that also pollute the air; the social indicators are disregarded. Thus, inducing positive social change can only be achieved when designers approach the core of the challenge, not only treat symptoms.

To this end, Chapman and Gant (2007) suggest a broader but more elaborate framing that, nevertheless, is still constrained by the boundaries of the econosphere.

"Conventionally, sustainable design is understood as a collection of strategies, which broadly include: products designed for ease of disassembly and recycling; designing with appropriate materials to ensure a reduction in environmental impact; design that optimizes energy consumption and considers options for alternate sources of power; and design that considers longer lasting products both in terms of their physical and emotional endurance, to name but a few."
(Chapman & Gant, 2007, p. 4)

Despite including the notion of emotional endurance, this framing falls short of including an even broader understanding of sustainable design, which takes into account the socio-cultural implications of designerly artifacts and integrates stakeholders in the process. To reiterate, the challenges we are facing within sustainable design overarch the disciplines and prompt inter- and transdisciplinary processes. Consequently,

"designing for sustainability not only requires the redesign of our habits, lifestyles, and practices, but also the way we think about design. Sustainability is a process of coevolution and co-design that involves diverse communities in making flexible and adaptable design decisions on local, regional and global scales." (Wahl & Baxter, 2008, p. 72).

In contrast to the former, this view makes a participatory, inclusive mindset a crucial element to any sustainable design process. Following this train of thought, sustainable design must be an activity which involves different stakeholders and operates within certain limits, which are defined by the planetary support system, rooting it in a view of sustainability that has nature as an overarching boundary-system in which all the other systems such as cultural, social and economic are confined and limited by.⁵⁴

In conclusion, design in the realm of sustainability becomes rather process- than product-oriented; in a so-called ‘ethical turn’ (Felton, Zelenko, & Vaughan, 2013; Fry, 2009; Manzini, 2006a; Willis, 2006), it extends its range from material to immaterial aspects while emphasizing the

⁵⁴ This view relates to what I have introduced as the concept of “strong sustainability” as proposed by Ott and Döring (2008).

designer's responsibility towards her or his actions. Following this short introduction to sustainable design, I will briefly introduce streams in design that deal with social impact and transformation through their practice, such as design as activism, transition and transformation design, design for social innovation and participatory design.

2.1.3. Designing for (Social) Impact

New directions of designing for change, such as design activism, transition design as well as design for social innovation and sustainability have been developed over the last decades, pushing the agenda of design for social impact and societal transformation.

Design and 'the social'.

In the early 1980s, design theorist Clive Dilnot took up the topic of design in relation to society ("design sociology") arguing that in the making of the discipline of design, its relationship with its social environment is neglected. Rather than reflecting on the artifact within its context, it has often been viewed in an isolated fashion, e.g., through product analysis and other methods. He continues that,

"design thinking/communicating is, however, distinguished by its relation to its material embodiment in the world. This relationship is operational but also transformative and interactive or reciprocal, i.e design thinking and communicating has its end in the material transformation of human social relations achieved through (in design's case) transformation of the material surroundings." (Dilnot, 1982, p. 11)

While the latter still reflects on design's current state at the time, Dilnot hypothesizes the changes that design might undergo conceptually:

"In this context the significant level of transformation lies at the level of concepts: ordering, planning, is centered upon, obviously, concepts of order and of transformation. In this context design thinking has the same operative value as design forming did in the age of products." (Dilnot, 1982, p. 12)

Around the same time, Viktor Papanek imagined what the design profession (especially industrial design) would look like if it were dedicated only to human needs within the boundaries of the earthly support system. He imagined the design of 'teaching aids' for education on all levels, new research and study programs, new medical devices, new ways of transportation and so forth. When we look at design nowadays, much of his tale has become true for certain fields of design. He did not foresee the diversification of design into as many sub-fields as we have today, submerging in a multitude of fields including education, health or transportation to name a few.

Regarding the proposition for designers to work in and with developing countries is often considered a typical Western world position of arrogance and following the assumption that 'Western' industrial designers are the only ones with the skills to help the disadvantaged. It does not take into consideration that in developing countries, (if at all) a very different breed of design is emerging from its context. In the early eighties, he also argued that, "this reassessment of the ethical dilemma faced by designers in 1984 is not to imply that the problems of the poor and needy have

been solved. [...] in spite a threatening economic situation, designers must contribute to real human and social needs. (Papanek, 1985, p. 39)

In terms of design for sustainability, we have seen the evolution of social design from its origins in Viktor Papanek's work to current proponents, the rise of design activism, the development of design infrastructuring in the Scandinavian countries as well as transformation design in Germany and transition design in the US. These movements all provide valuable insight regarding a broader framing of design and might allow for a more precise re-direction of design in the context of sustainability. Irwin (2015) proposes a continuum of design approaches which ranges from Service Design to Design for Social Innovation and finally to transition design which has been widely acknowledged (Boehnert, 2018; Scupelli, 2015; Tonkinwise, 2015). Along this continuum, service design ranges at the one end of the spectrum, being a mature discipline and rooted in existing socio-economic paradigms, while transition design is positioned at the other far end, radically re-shaping the aforementioned paradigms.

As mentioned before, at the core of these directions in design lies its understanding as an inherently political practice and an agent for change. What is evident nowadays is that more design practitioners are aware of design's capacity to transform a given context, environment, product or service towards sustainability and to induce change (Willis, 2006). Nevertheless, designers, when expanding their practice beyond its focus on problem-solving, rarely take into account the political implications of sustainable design (Mazé et al., 2013).

Quite frequently, the social dimension in sustainable design is marked as the un-identifiable or obscured element in the process. It is presented as the fuzzy, unpredictable human factor, the participants in a process or the users of a product or service entangled in their everyday life (McMahon & Bhamra, 2015) Despite this fact, the basic elements thereof, often described as equity, resilience,⁵⁵ human rights, health and safety, have been part of designerly practice for a long time. It is a matter of how they were framed and which role the designer takes on. Concepts such as "using instead of owning" (Erlhoff, 1995) have emerged as new paradigms that question current conceptions of products, their use and how they are embedded in a social context. Creating an awareness of the social impact of designerly activities can be a starting point for a rethinking of design (Bieling, Sametinger, & Joost, 2014).

To this end, only recently a call to action, known as the *Montréal Design Declaration* was developed during the World Design Summit in 2017 and has received broad recognition by universities, design

⁵⁵ Resilience has especially come up in the discourse regarding urbanism, sociology but also psychology and environmental research. This concept is said to provide a new perspective for viewing sustainability. Resilience signifies "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (see e.g., Walker et al., 2004). Although this view has come up strong in the current sustainable design discourse, it is not within the scope of this work.

associations and studios as well as NGOs and policy makers alike, subscribing fervently to the UN's 2030 SDGs and proposing a list of projects to be tackled.⁵⁶

The declaration stresses the responsibility of designers and the “intrinsic capacity of design to serve as an agent of change and a source of creative transformation” (Montréal Design Declaration, p. 3) and puts the weight of creating a world that is environmentally sustainable, economically viable, socially equitable and culturally diverse on designer's shoulders,⁵⁷ but it also recognizes the need for policy making and governance to facilitate sustainable solutions. There are several recurring aspects regarding this new culture of design:

- Awareness of diverse contexts as well as stakeholder participation is a key to the appropriate integration of designerly outcomes and processes in the wild
- Future-focused thinking allows for a transformation of un-sustainable ways of living and doing and to imagine possible sustainable alternatives
- Due to the nature of challenges that lie ahead, it is inherently inter- and transdisciplinary
- Meaningful change needs bottom-up initiative as well as top-down regulation as well as new models of governance that take into account this new culture of design

While the *Montréal Design Declaration* stresses the holistic nature of a new culture of design, seeking support across-the-board, there have also been attempts to specifically frame what the emphasis of the social dimension of design would entail and what a designer's skillset would look like. It is insightful to look at current views of the social dimension of sustainability in design. The Young Foundation remains quite broad in their description, mirroring the aspects that are carved out in the UN's sustainable development agenda:

"Social Sustainability concerns how individuals, communities and societies live with each other and set out to achieve the objectives of development models which they have chosen for themselves, also taking into account the physical boundaries of their places and planet earth as a whole. At a more operational level, social sustainability stems from actions in key thematic areas, encompassing the social realm of individuals and societies, which

⁵⁶ The Declaration proclaims the potential of design to achieve global economic, social, environmental and cultural objectives and includes a dramatic call to action of professionals, educators and governments as well as a list of proposed projects. The Declaration, signed in the presence of UN agencies, lists over 600 professional associations, design schools and stakeholders (retrieved from www.montrealdesigndeclaration.org). With a similar scope, but a couple of years earlier, the Designers Accord attempted “a five-year project to mainstream sustainability in the global creative community. Formed as a distributed knowledge network of design firms, universities, and business leaders, the Designers Accord has helped advance the conversation around the ethics, practices, and responsibilities of the creative community” (Casey, n.d. page number?). Designers Accord, retrieved April 20, 2018, from <http://www.designersaccord.org/>

⁵⁷ The full declaration is available here: Montréal Design Declaration. Retrieved April 20, 2018, from <http://montrealdesigndeclaration.org/>.

ranges from capacity building and skills development to environmental and spatial inequalities. In this sense, social sustainability blends traditional social policy areas and principles, such as equity and health, with emerging issues concerning participation, needs, social capital, the economy, the environment, and more recently, with the notions of happiness, wellbeing and quality of life." (Dixon et al., 2009, p. 78)

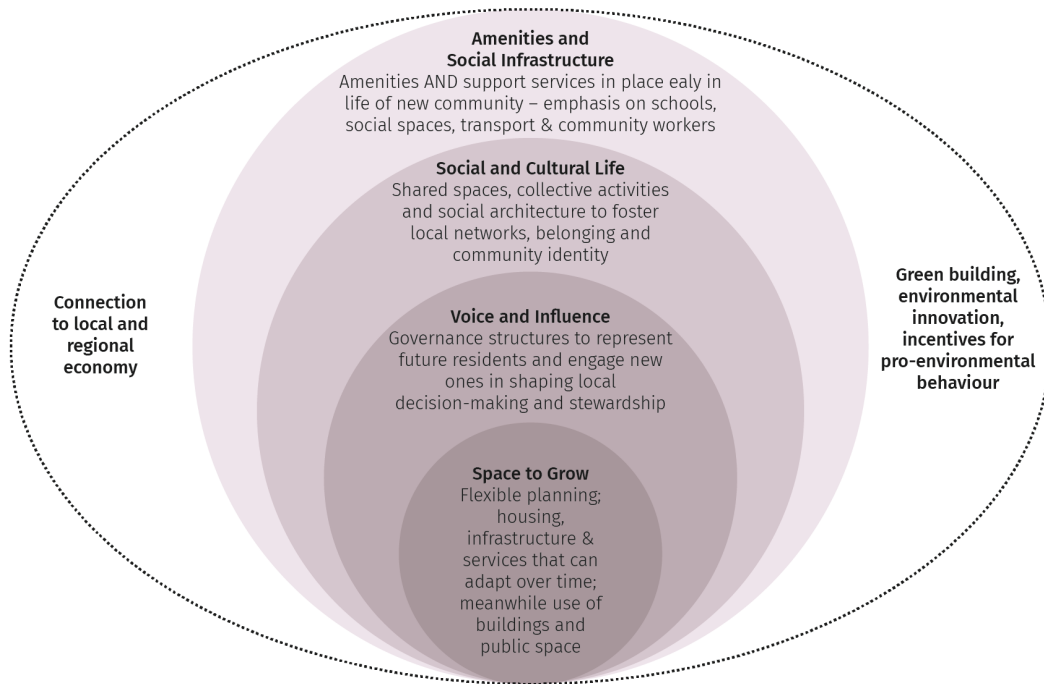


Fig. 18. Design for Social Sustainability, adapted from the framework by the Young Foundation, 2011.

Many of the elements that are included in the *Declaration* match the ones identified in this recent study in the UK. The study constructs social sustainability for design through a series of workshops and interviews with designers and non-designers as follows:

"Sustainability for design is an evolution for the theory and practice of design that effectively addresses the relationship between people, planet and economy. The key aim of social sustainability for design (as a subset of sustainability) is about understanding these complex relationships between people, planet and economy and finding a satisfactory equilibrium between all elements of the system (human, natural). As the process of designing is fundamentally about solving problems, the process needs to move beyond people (users) and redress the balance between people and the planet.

To do this, designers must be holistic, pragmatic, purposeful, immersive and capable of fully understanding and responding to change on micro and macro levels. Designers have a vital role to play in both advocacy and in catalyzing change. In order to be capable of considering the individual, the greater

community and the planet, design processes must be collaborative and cross-functional.

Here designers can act as facilitators, (working across disciplines, cultural and geographical boundaries) bringing together all stakeholders and working towards creative solutions that satisfy as many of their needs as possible (or realistic) for this to be effective the designer's skills must move beyond creating objects and into creating positive experiences.

The impacts of the changes in design processes, as well as the outcomes must be measurable on people and the planet at every level. And in spite of the complexity and sometimes negativity - designers should retain their humour, humility and creativity.” (McMahon & Bhamra, 2015, p. 381)

Most current views on sustainable design are deemed too anthropocentric, and with the call for a holistic approach to sustainable design, the relationship of the designed artifact with the people, the planet and guiding processes, such as the world economy, has to be rethought (McMahon & Bhamra, 2015, p. 386). While the construct above stays largely within the current confines of design, which is still based on problem-solving within the current economic, social and environmental system, it requires some adaptation of the design process, taking into account the equilibrium between nature and people.

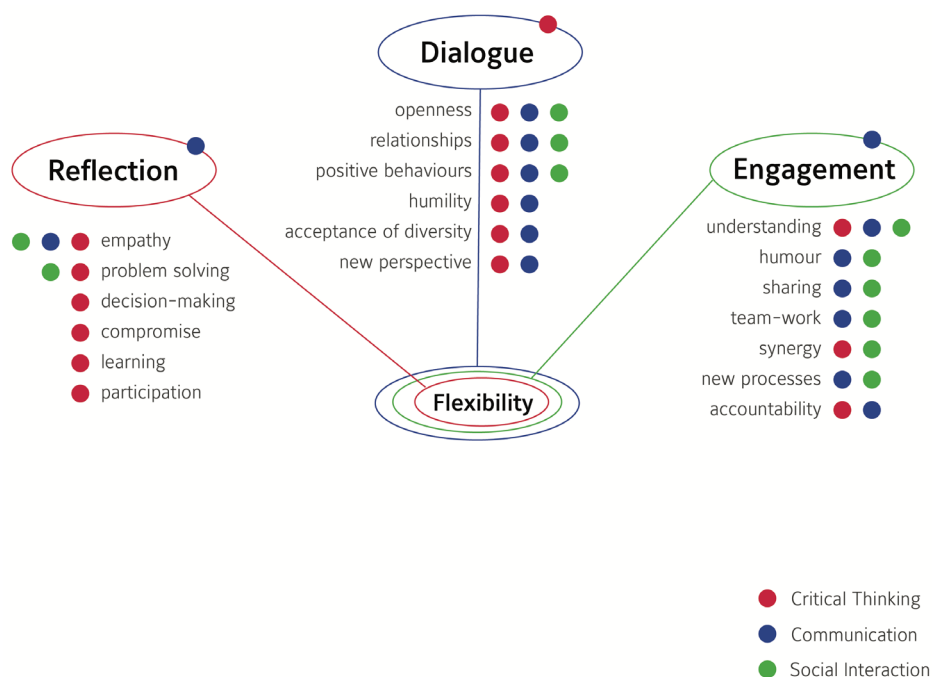


Fig. 19. For social sustainability in design, McMahon & Bhamra (2015) argue for the iterative development of key competencies which they identified through a Delphi study. They also claim that the competencies in this construct cannot be taught but have to be learned by designers considering different (everyday) contexts and perspectives outside of design (McMahon & Bhamra, 2015).

The competencies of designers in this process are changing over time and depending on the subject, the team and the phase the process is in, designers can be creators, moderators, experts of their everyday life or generalistic facilitators. Moving even further from design's anthropocentrism, Joanna Boehnert recently opened up a new view on design, questioning its current anthropocentric perspective proposing "ecological literacy" as an important aspect. Following Guattari's three ecologies (mental, social and environmental), Boehnert builds up a connection between design, ecological and socio-political theory emphasizing the effect design can have on facilitating social change, moving away from a human-centered, towards a humanity-centered focus (Boehnert, 2018).

Beyond social impact: Transition and transformation design.

Transformation design.

Very recently, two new umbrella terms, which both are clear advancements of sustainable design, have emerged from the multitude of design directions in existence. The first, *transformation design* was initially framed by the UK Design Council within the prematurely disestablished 'do-tank' RED, which specifically brought together designers and policy-makers to frame a new approach to design that is able to tackle complex economic and social challenges⁵⁸ (Burns et al., 2006). The group argued that transformation design creates distinct challenges for designers, some of which may also be found in participatory design, sustainable design or social design and have to be considered in the process:

- "The loss of personal creative authorship
- Shaping behavior rather than form
- Transformation design is never done
- Creativity happens in run-time⁵⁹, not just in design-time
- Diversity over quality
- Design becomes a pro-amateur community"

(Burns et al., 2006, p. 26)

After the abolishment of transformation design in the UK, it continued in Germany on much broader grounds. It not only asks how to push forth a new great transformation regarding "the 're-embedding' of the markets into a broader notion of society" (Jonas, 2015, p. 12) but also how to design the great transitions that are needed in light of unprecedented global challenges humanity is facing, making it necessary for design to transform its theory and practice.

⁵⁸ The work group's call to action especially targeted the design of new public services in an attempt to bring together policy-makers, designers and other stakeholders. They "use product, communication, interaction and spatial designers' core skills to transform the ways in which the public interacts with systems, services, organisations and policies" (Burns et al., 2006, p. 19).

⁵⁹ In participatory design, there has been a discussion around design-after-design envisioning or anticipating the designerly artifact's re-design or adaptation in use (Redström, 2008).

In contrast to other design theorists, Jonas acknowledges the foundations of transformation design in the work of C. West Churchman, Herbert Simon, Frederic Vester and Horst Rittel, finally arguing for design research in the form of research-through-design as the model for (social) transformation design.

As a point of reference, Jonas (Jonas, 2015), introduced practical guidelines for social transformation designers which broaden the trajectory of transformation design and deepen its theoretical foundations compared to the RED paper's suggestions. In this light, Social Transformation Designers,

- "Question the dominance of scientific approaches (we have never been modern).
- Welcome heterogeneous and contradictory knowledges (transdisciplinarity).
- Question the designer's role as external expert problem-solver (symmetry of ignorance).
- Question the designer's role as moral authority (there is no reason for this claim).
- Contribute instead to the construction and representation of societal problems (mapping controversies).
- Enable collaboration among stakeholders in general (design as integrator and facilitator).
- Enable cross-sector fertilisation (non-profit/government/business, the 'fourth sector' of social entrepreneurship).
- Create conditions that allow the breaking of social/economic/technological trajectories (awareness for multiple uncertain futures)." (Jonas, et al., 2015:131)

Michael Erlhoff (2015) provided the example of the trend of using instead of owning as being the perfectly radical approach to transformation design, since this trend requires thinking beyond products, towards services and systems, taking into account design-in-use and design-after-design. Most of the time, designerly artifacts and services target users. Consequently, they are transformed in their use, being adapted according to the real needs of the users in their everyday life (Erlhoff, 2015).

Transition Design

The second term, *transition design* (Irwin, 2015; Irwin et al., 2015; Tonkinwise, 2015) which aims at pushing the boundaries of design for social innovation further and proclaims a "design-led societal transition toward more sustainable futures" (Irwin, 2015, p. 229). Neither one claims to be new fields within design, but rather thought experiments and ventures into a re-configuration of the practice and theory of design. Both approaches include new educational programs dedicated to this new

notion of designing. While transformation design is rather seen as a broad accumulation of designerly approaches that deal with transformation, all come from different corners of design practice, transition design⁶⁰ is specifically framed out of a US-American university context.⁶¹

Whether or not these movements simply create new buzzwords which are brought into the world, they account for a new understanding in design and a fresh awareness of the change within the practice. They claim that design must play an integral part in approaching the world's most urgent economic and social issues (Burns et al., 2006) while being embedded in and aware of the ecosystem surrounding us. These approaches acknowledge that the current global situation will eventually lead to a great transformation which design is projected to play an integral part in. Similar to the argument that Joanna Boehnert presents on design moving towards the ecocene, Jonas et al. (2015) argue for transformation design to extend the current human-centeredness of design towards a "society-centered" position.

"Our hypothesis is that design thinking, meaning more than the current business hype, might support more sustainable ways of conceiving human futures, even integrating Western and non-Western thinking and value systems." (Jonas et al., 2015, p. 11)

Irwin proposes a continuum of design approaches, ranging from design for service⁶² to design for social innovation and finally to transition design. It places transition design as rooted in long-term thinking, focused on the re-direction of entire lifestyles.

The argument that is made here provides one possible direction design could take and what visions for sustainable futures could be developed that would be powerful enough to change lifestyles; it emphasizes the notion of the everyday life, co-evolution of ideas and theories of change. Transition design emerged out of the Carnegie Mellon School of Design around Terry Irwin, Cameron Tonkinwise, and Gideon Kossoff, who carved out a transition design framework which places the transition to a more sustainable society at its core and specifically takes into account the notion of cosmopolitan localism⁶³ where "solutions to global problems are designed to be

⁶⁰ The notion of transition design has been taken up by several design schools in the US, Australia and Europe. Its origins are described to be found in a variety of contemporary discourses including sociotechnical transition management theory, the transition town network, the great transition initiative and overall transitions in complex systems. Carnegie Mellon University's transition design (transitiondesing.net) provides an in-depth overview on the topic.

⁶¹ Cameron Tonkinwise provides the argument that this new term was also invented in order for Carnegie Mellon University to mark their ambition as well as differentiate this new approach to existing design practice (Tonkinwise, 2015).

⁶² Design for service is described here as a system's approach to design, which expands its scope beyond products towards services and experiences. The user's experience over time determines greatly how the service is designed. It puts user behavior and needs at the basis of the process, leading to innovative service solutions mutually beneficial for consumer and service provider.

⁶³ Cosmopolitan localism in this sense describes the way citizens are global in their use of information and technology but prioritize local production of goods and services. The current trend of restaurants only providing what grows in a hundred-mile-radius around their spots is an example of that. According to Manzini (2005), it is the balance between short (local) networks rooted in place and long networks which connect to the rest of the world.

appropriate for local social and environmental conditions” (Irwin, 2015, p. 231). This is meant as an open-ended as well as speculative vision which is to be discussed, challenged and developed further.

The authors provide four distinct areas of knowledge, action and self-reflection:

Future-oriented **visions for transitions** inform a process of sustainable change and are developed in an iterative, open-ended and speculative process. The visions take into account local conditions as well as the impact designerly solutions might have on the dynamic equilibrium of the ecological support systems. They are useful in assessing current situations against the backdrop of future solutions.

Theories of change are included from various fields and disciplines in order to understand the dynamics of change and transformation of the natural and social worlds.

There is an emphasis on the **posture and mindset** designer’s exhibit when confronted with wicked problems of sustainability. Self-reflection and a new awareness of ‘being’ in the world are called for, leading to a change in how we interact with other stakeholders in design projects.

Similar to design activism, transition design views the designer as an agent of change, providing **new ways of designing**, informed by a broad spectrum of knowledge that caters to the interconnected challenges at hand. This approach requires iterative, future-based long-term processes, which may be adapted over longer periods of time.

Transition design as a new approach broadens the notion of design as a transdisciplinary endeavor focusing on a society-centric vision which seeks to implement change and transition towards sustainable futures.

Design for social innovation.

While the emerging discipline of transition design views design within new socio-economic and political paradigms, **design for social innovation**⁶⁴ challenges existing ones and “addresses problems in social, cultural, and economic domains, often outside the context of the business and consumer marketplace” (Irwin, 2015, p. 230). Nevertheless, it provides some insights regarding the practical application of principles of sustainability in the present.

⁶⁴ Quite frequently, design for social innovation is used interchangeably with social design or design for social impact, depending on the context and protagonist. E.g., the MFA program Design for Social Innovation of the School of Visual Arts in New York City rather uses the term social design in their description (see <https://dsi.sva.edu/>).

Design for social innovation is a strategic design activity which aims at conceiving and developing **sustainable solutions** that are,

"systems of products and services that enable people to live better, consuming (far) fewer environmental resources and improving (or, in many cases, regenerating) their physical and social contexts of life." (Manzini, 2006b, p. 1)

Design for social innovation is relevant as it conceives a new type of design which operates on a system level, includes a bottom-up perspective in most of the projects and constructs the role of designers as facilitators and catalysts in interdisciplinary teams. In its context, the end result may be products, services, but also ideas, policies, social movements, interventions or combinations thereof (Björgvinsson et al., 2010). Under the umbrella of design for social innovation, numerous case studies and projects which induce social change by means of design as social innovation⁶⁵ have been conducted especially in the context of the sustainable everyday project⁶⁶ (Manzini, 2007; Meroni, 2007). They frequently implement methods that are interdisciplinary, are rooted in local contexts using local knowledge and are driven by behavioral rather than technological change (Jegou & Manzini, 2008).

"Fostering the transition towards sustainability is a question of establishing a 'virtuous circle' encompassing **social innovation** (which we recognize here in creative communities and in the new ideas and solutions they generate) and **technological** and **institutional innovation** (that can be implemented by the actors who, through their decisions, can advance the possibilities of success of promising proposals)." (Manzini in Meroni, 2007, p. 14)

Manzini (2009), argued that being a designer nowadays means that one would have to have an optimistic worldview, given the fact that the problems that we face cannot be met with the same solutions that we have traditionally generated over the years. In fact, the designerly impulse to search for solutions for any given problem (or sometimes vice versa), fails to provide the answers necessary. Conversely, products of designerly activities tend to rather create more problems than solutions.

"In particular, with reference to the expectations and behavior of people and communities, this experience teaches us that, in the absence of feasible, socially acceptable and widely recognised alternatives, an increase in the perception of

⁶⁵ Social innovations are "new ways to reach goals, especially new forms of organisation, regulations and lifestyles that alter the direction of social change, provide a better way to solve problems than previous practices and that are ultimately worth being copied and institutionalized. Social innovations can be preconditions, concomitants or results of technological innovations" (Zapf, 1989, p. 33). Both types of innovations are based on scientific progress and practical experience as well as on values of social progress such as social equity, justice and integration (Rammert, 2010).

⁶⁶ The SEP is a joint project focused on providing scenarios, activities, workshops and exhibitions that inform visions of sustainable living (retrieved from <http://www.sustainable-everyday-project.net/>).

environmental risk generates dangerous ideas and behaviour." (Manzini, 2009, p. 3)

The notion of sustainable solutions, however, can be contested in the sense that the problems of sustainability cannot be broken down to simple solutions. Instead of perceiving design as an enabler for new products or services (more sustainable or not), the role of design as a catalyst for societal transformations may be more appropriate in light of the global challenges of sustainability (Fry, 2017b).

To put this into perspective, in their manifesto for social innovation, the Young Foundation stressed that creativity and invention are integral parts of innovation but argued that innovation strives for the actual implementation and diffusion of the created ideas,⁶⁷ thus being built on very broad shoulders (Mulgan et al., 2006).

As positive as these holistic, inclusive notions of design sound, there is criticism that it cannot overcome its solution-oriented nature and furthermore is in danger of subscribing to a sort of 'participationism' where designers withdraw their capacity of being creative and are taking on the role of 'administrative actors' (Manzini, 2016).⁶⁸

All of the above-mentioned approaches, placements or ideas are pushing the boundaries of user-centeredness towards humanity-centeredness or, in terms of sustainability, towards acknowledging a dynamic equilibrium of the earth's ecological support system and taking it into account in the process of designing. The next approach, or rather action, focuses on design as activism, or more specifically, how designers and non-designers may use the broad repertoire of design for activist causes.

Sustainable design as activism.

In light of current ecologic, economic and social crises, and in opposition to a neo-liberalist society, there is a fringe group within design which actively contributes to bringing about change in different thematic areas such as green living, political participation, civil rights, gender equality or digital education, to name a few.

Alastair Fuad-Luke (2009) provided a tentative description of activism which can serve as an initial idea of what it may mean in design:

"Design activism is 'design thinking, imagination and practice applied knowingly or unknowingly to create a counter-narrative aimed at generating

⁶⁷ Here, some examples are given for the successful implementation and diffusion of social innovations, e.g., fair trade, open source software such as Linux, ecological direct-action movements such as Greenpeace, distance learning approaches such as the Open University.

⁶⁸ The notion of participation and its positive and negative aspects are explored in the following chapter.

and balancing positive social, institutional, environmental and/or economic change." (Fuad-Luke, 2009, p. 27)

While at the time this might have held true for only a small portion of the design world, now areas such as transformation and transition design or social design include activist strategies as in their trans-disciplinary practice.

Over the last decade the interest in design activism and a more political reading of design has been rising. The idea of the activist designer has inspired countless design practitioners and researchers alike. Nevertheless, as Cetin (2016) notes in his thorough literature review, it is still a fringe phenomenon within design. On the one hand, this could be brushed aside as something design has always been capable of, on the other hand, there is a new quality to current projects framed as being activist. I am reluctant to speak of design activism as it seems to imply that it is a new field in design, rather than a distinct activity which can appear anywhere from architectural design to urban design to graphic design or interaction design. In this overview, I am focusing on activism (in design) that is addressing issues which are related to economic growth or the consumerist paradigm in our society (Thorpe, 2012), since it relates most to the overarching theme of sustainable design.

In a recent study, Cetin retraces a 45-year history of design activism with Papanek's "Design for the Real World" at its starting point and provides arguments for it being a social movement (Cetin, 2016). Although design activism lends most of its strategies and practices from social movements, it possesses its own vocabulary of action. I argue that activism spans the whole of design, not being a unified social movement, but incorporating some of the vocabulary in its own arsenal. Cetin provides an interesting critical discourse analysis which allowed him to identify several consecutive phases of activism within design. He speaks of a phase of "genesis of design activism" in the 1970s, a "hibernation period" in the 1980s where the neo-liberal economic paradigm had engulfed design practice, followed by a "phase of re-invigoration" in the 1990s with the rise of a more conscious design (as mentioned before) and finally with a phase of growth during the 2000s and expansion in the 2010s (Cetin, 2016). The overall discourse is still relatively small and contested by other streams within design, such as transformation, transition or social design, or even included within them as a methodological subset. In general, activism can take several directions, from large-scale global (climate-change, animal rights, clean energy or deforestation) to small local issues (neighborhood improvement, voter participation, or right-to-the-city) ranging from anthropocentric to biocentric (Fuad-Luke, 2009).

Design activism is not restricted to any field, it can be carried out by anyone, and neither is it only carried out by designers. Usually, activism involves non-governmental groups, not-for-profit groups or is related to social movements (Julier, 2008). Rarely is activism seen in corporations or governmental institutions; it is directed towards the greater good, meaning that individual, group or corporate profits are secondary. Based on the notion that activism in design is mostly issue- and cause-oriented, there are numerous practices in design which can inspire an activist approach.

Activist designers and designer activists?

"Activists, that is those carrying out the activism, can belong to social, environmental or political movements that are localized or distributed, and that are based upon collective and/or individual actions" (Fuad-Luke, 2009, p. 5)

The momentum for design activism is largely provided by design practitioners working from the bottom up. In addition, several scholars have looked into guiding frameworks for design as activism which provide some reference for designers leaning on political theory, social theory (Chick & Micklethwaite, 2011; A. Fuad-Luke, 2009; Thorpe, 2011) or philosophy (Markussen, 2013). While most lean on theories of social movements or political theory, Markussen argues, that this one-sided perspective should be complemented by design theory.

Design activism is no recent phenomenon. Especially in graphic design, there are numerous examples of activism that date back to the middle of last century. However, in light of the global challenges that we face and the self-consciousness design (in particular product, graphic and interaction design) that is showing with regards to its role in shaping the present and the future, there is more weight on the work that is being done in terms of activist design.

As mentioned before, design is a very broad term and in conjunction with activism, it proposes a more political notion of design, a more issue- or cause-oriented practice (Fuad-Luke, 2009). However, this supposedly new frame of debate cannot hide the fact that activism in and through design has existed within the realm of participatory or sustainable design for decades and is noticeable in almost all sub-fields of design.

There are various pathways to an activist design. Some researchers argue that the move of our society past the industrial, production-oriented paradigm towards a consumer- and knowledge economy, has prompted a rise in activist design which is largely supported by information technology and complements traditional ways of activism as described in social movement theory or political action theory.

Thorpe (2012) noted that there are two obstacles in the way of clearly framing design activism. First of all, contexts in which designers may be activists are only now developing, secondly unlike social movement theory, designers have no *repertoire of contention*, meaning design is lacking a suitable framework for action. On the first point, moving away from designing as problem solving in a commercial sector, new contexts emerge, and I would argue that they have existed for quite some time, only as marginalized contexts that are now more and more recognized as valid "playing fields" for design. The social sector, non-profit or non-governmental organizations are more and more aware of the power of design. With regards to this, designers require both the suitable context as well as operating framework for activism.

While other theorists and designers look at sustainable design from a material perspective, meaning how resources are used, which materials are reusable, etc., Fuad-Luke provided an account of the designer as activist, where design (consistent with the changing role of design in society) has

the agency to provide critical interpretations of the present as well as “counter-narratives” for the future. He argues that “design can readjust our notion of beauty to embrace a multitude of truths – economic, political, social, ecological, ethical, technical, symbolic, institutional, philosophical and cultural” (Fuad-Luke, 2009, p. xxi).

Activist frameworks for designers.

Scholars agree that there is a recurring repertoire of collective action which is adapted according to context, subject, means of communication and people involved in the action (Julier, 2008; Thorpe, 2011; Van Laer & Van Aelst, 2010). In summarizing the work of several social movement scholars, Thorpe (2011) argues that these action repertoires support,

- *describing social movements in generic terms such as skills, social forms and so forth*
- *comparing actions over time*
- *exploring patterns of activism: how strategies and actions interact, the clustering of actions*
- *critiquing social movements in terms of their selection and deployment of actions from the repertoire*
- *setting action innovations in the context of the repertoire*
- *facilitating a proactive approach*

With the rise of digitally networked activism, designers have caught up with activism and there have sprung up a multitude of websites, apps and tools which support the designer as activist. These include activism handbooks by major design agencies and initiatives (e.g., *The Collective Action Toolkit* by Frog Design, *Design for Social Impact Handbook* by IDEO, or the *Freiraumfibel* by the Federal Institute for Research on Building, Urban Affairs and Spatial Development) as well as online repositories such as shareable.net, the socialdesign.de project by the Hans Sauer Foundation or The Young Foundation, which provide a vast range of activist tools, sharing strategies or action templates. However, with the increasing number of how-tos, handbooks and guides for design activism, social design or sustainable design being published, it is uncertain if and how they are actually used in practice.

In this typology of actions informed by practice, designers benefit from a reflection on which action might be the most suitable in relation to the context, involved parties and the goals. Furthermore, designers are prompted to act in a way that provides some benefit to the larger social movement the action is embedded in. Whether or not challenges may be tackled using these repositories that are often limited to a specific set of methods, is yet to be determined.

One of the benefits of action repertoires are that they are trans- and interdisciplinary. They are not bound to a discipline (Thorpe, 2011). In this sense, in sustainable design or participatory design, there are certain parallels regarding the tools and methods used by the designers. In these design movements, an action repertoire should be part of a larger repertoire of tools (designerly and non-

designerly). As such, action repertoires are not bound to any medium or technique. In the project phase of this work, the idea of a repertoire comes up frequently over the course of the interventions and actions within.

In Germany, especially regarding the notion of reclaiming public space and being active citizens in your own neighborhood or city, many handbooks, websites and calls to action have appeared in the last years. How designers act in their practice plays a vital role in this definition of design activism, which is described by Fuad-Luke as an emerging field, but can rather be seen as an alternative narration of the change that the practice of design has been undergoing since the late 1980s.

In this adapted narration, design and activism have to be closely scrutinized. In my work, the area of design practice as a playing field of activism and sustainable actions plays an important role for understanding the impact design can have on our understanding of sustainable futures.

The situatedness of global challenges require design to be participatory, highly local as well as adaptive, in order to be able to guide the process of transformation on a small scale. Thorpe argues for, four basic criteria to define design as activism:

- It publicly reveals or frames a problem or challenging issue
- It makes a contentious claim for change (it calls for change) based on that problem or issue
- It works on behalf of a neglected, excluded or disadvantaged group
- It disrupts routine practices, or systems of authority, which gives it the characteristic of being unconventional or unorthodox – outside traditional channels of change. (Thorpe, 2011, p. 6)

While this characterization of design as activism leans on work from social movement scholars, it might provide an initial framing for design as activism. Furthermore, it once again opens up similarities to sustainable design as well as participatory design activities. These differ mostly in scope, thematic area and the stakeholders involved. They all promote transformation (of a certain context or situation) by design. Design as activism mostly ranges in the category of future-focused activism and a generative practice, meaning activism that provides new notions of possible (preferred) futures instead of focusing on the present or the past. Although, especially in sustainable design or eco-design, the reactionary ideas of re-imagining the future according to a past which has been better than the present are often to be found.⁶⁹

⁶⁹ E.g., unsettling right-wing eco-sustainability groups promote localism, the homeland and a healthy lifestyle with a neo-fascist ideology as a basis. It shows that there is a fine line between these ideological views on the local and notions such as cosmopolitan localism as promoted by transition design or design for social innovation.

In this work, design activism provided certain actions and methods which facilitated the design research process but was rather an integrated component in the participatory design activities conducted with the stakeholder group.

2.1.4. Participation in Design

Participation plays an integral role not only in sustainable design, but in design in general. How users/stakeholders/citizens are included in the process of design determines its results to a great extent. In the great transformation design is going through, balancing participation and non-participation as well as defining the core competencies of designers in such processes is crucial. What follows here is a short introduction of participatory design focusing on the Scandinavian approach.

Design has an inherent quality of participation. When something is designed, it is done so with a purpose and a goal. The history of design has shown that over the last 150 years there have always been impulses to include users in the process of designing; sometimes later (in product testing or reviewing) and sometimes earlier in the process (through usability tests etc.).⁷⁰

Levels of participation.

Participation has been discussed in other fields for more than half a century. As a framework for participatory design projects, levels of participation can be identified. These levels refer to the involvement and impact of stakeholders on process and outcome.

There are several typologies of participation, most of which are rooted in the social sciences (Cornwall & Jewkes, 1995), community development (Arnstein, 1969) and health care (Tritter & McCallum, 2006) but also in museum pedagogy, most famously Nina Simon's *Participatory Museum* (Simon, 2010).

⁷⁰ One perspective on participatory design's history as well as the different approaches, principles and practices can be found in the *Routledge International Handbook of Participatory Design* (Simonsen & Robertson, 2012).

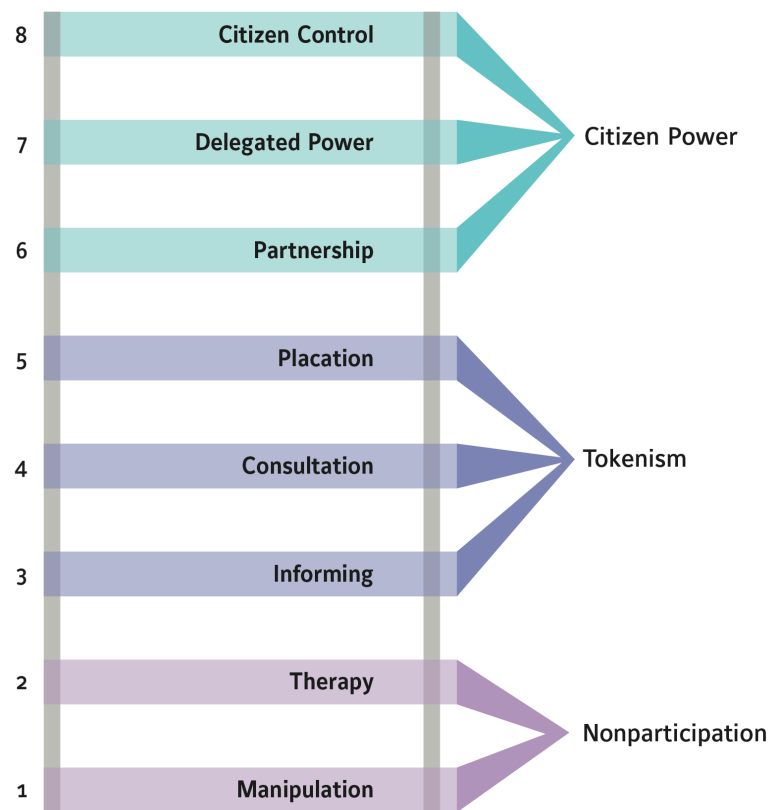


Fig. 20. Arnstein's ladder of participation provides 8 rungs ranging from manipulation, therapy, informing, consultation, placation, partnership to delegated power and citizen control (Arnstein, 1969).

The eight categories of participation can be summed up in three meta-categories: nonparticipation, tokenism and citizen power. While this rather describes participation in formal decision-making processes, it might be argued that such a normative, linear model might not take into account the dynamics of a participation process where phases intertwine and roles shift (Tritter & McCallum, 2006). Furthermore, Brodie (2009) argues that while the top rung on the ladder of participation, citizen control, is said to be the most desirable position, several questions emerge on who has power over what, which citizens are in control and what the benefits for all stakeholders might be.

In a perhaps less political context, civic participation in museums, Simon promotes the 'me-to-we design' of a participation process. She suggests five stages of participation or a 'hierarchy of social participation'. She specifically includes digital technologies and processes in her considerations, which set her hierarchical model apart from others such as the one suggested by Arnstein. According to her, institutions might move through the stages with stage five, "Collective Social Interaction" being the ultimate goal (Simon, 2010).

Referring back to the notion of Mode-2 science, the role of participation is a central concept for the creation and acquisition of knowledge especially through Communities of Practice:⁷¹

"This perspective assumes that we acquire knowledge, and ascribe meaning to this knowledge, through participation in societal practices, or Communities of Practice. According to Wenger (1998), a Community of Practice is characterized by the mutual commitment of the participants (instead of the formal structure of a project team), by sharing a common goal which is determined by all the participants together, and finally by a shared repertoire of resources which become available in due course to ascribe meaning (or to create knowledge), such as routines, words, instruments, working methods, stories, symbols and gestures. Knowledge development is then a communicative process that takes place within a shared practice." (Regger & Bunders, 2009, p. 15)

Form	Top-Down	Bottom-Up	Function
What is the level of participation?	What's in it for the government or associated agencies?	What's in it for individuals and communities?	What is the participation for?
Nominal	Legitimation	Inclusion	Display
Instrumental	Efficiency	Cost	Means
Representative	Sustainability	Leverage	Voice
Transformative	Empowerment	Empowerment	Means/End

Fig. 21. The interests in participation: White's typology of participation in a development context constructs participation as a dynamic process which changes over time and allows for contestation along the way. She further notes that any framework will be merely an analytical device since, in practice, the implementation of a participatory process might vary depending on the mix of interests or might even be misused (White, 1996).

⁷¹ In the context of collective learning, communities of practice are groups of people "who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 1998). A community of practice is based on a shared domain of interest as well as a certain practice that community members engage in. The concept hinges on a theory of situated learning (Lave, 1991) which requires social participation and learning in and through practice. This concept of learning requires new forms of knowledge acquisition and new forms of transfer thereof. It can be found in the maker community, DIY-movement, new forms of designerly practice and education where learning is taken out of the classroom, outside of institutions, into the context and the thick of the practices themselves. The process of knowledge generation is part of a learning process which is not limited to or fixed to a certain timeline with a start and end date but happens fluidly within the groups. Communities of practice, to some degree, share a domain, a practice and a community (Wenger, 1998).

Participatory design variations.

Similarly, to sustainable design, participatory design has its roots in the diverse social, political and workplace movements of the 1960s and 70s, during a time of global unrest and insecurity. Its beginnings date back to the idea of industrial democracy and started with a project by Kristen Nygaard for the Norwegian Iron and Metal Workers Union regarding the collaborative development of information systems, subsequently branching out in different directions in Europe and the United States.

"This kind of politically significant, interdisciplinary and action oriented research on resources and control in the labor processes of design and use, has contributed to what abroad often is seen as a specific Scandinavian approach to systems design." (Ehn, 1988a, p. 142)

Participatory design, in general, is a design activity that involves different stakeholders⁷² in an iterative process, dependent on their experience as well as expertise and limited by project time constraints (Reich, 1992). Such processes can take many forms and can be conducted to varying levels of participation. The original idea of participatory design is a design process which is guided by both the value of democratic involvement of users and the value of participants' 'tacit knowledge',⁷³ in addition to their formal and explicit knowledge (Thomas Binder et al., 2011).

There is a noticeable difference in the way the two approaches take on the notion of empowerment which is emphasized in either one. The Scandinavian approach, centered around **democratic empowerment**, which meant a fundamental user involvement of the worker in decisions regarding the workplace. The US/British variation⁷⁴ in turn focused on some aspects of the Scandinavian approach that were allowing for a **functional empowerment**, focusing on more efficiency, flexibility and productivity, workers essentially being fine-tuned for meeting the management's needs (Spinuzzi, 2002, 2005). From a quite narrow technology-centered perspective, Blomberg & Henderson (1990) argue for a notion of participatory design that leads to the improvement of the quality of the working lives of those for whom we design technologies, involving the users in the collaborative development of these technologies and providing opportunities to iterate the design in response to the everyday requirements of the work situation.

⁷² Some design theorists rather speak of users, participants, etc., but stakeholders in this sense are the actors in such a process (and beyond) who are, to a certain extent, affected by the design process (not only in terms of outcome but also in terms of knowledge which is generated throughout the process).

⁷³ In his doctoral thesis, Ehn elaborates in depth on the term 'tacit knowledge', in contrast to explicit knowledge, and specifically in reference to Michael Polanyi, Polanyi argued that knowledge has tacit dimensions and exists on a spectrum where, on one end, it is completely tacit, meaning semiconscious or unconscious, and at the other end, it is almost explicit, codified and structured. In participatory design, this tacit knowledge becomes an important factor in understanding the notion of reflection-in-action (Ehn, 1988b).

⁷⁴ The outcome of participatory design in the US had to be significantly different than the European approach because of the different situations regarding work environment, type of work, weaker trade unions as well as different legislature (Dykstra et al., 1991).

Participatory design has since expanded to a fundamentally human-centered as well as a society-centered perspective and is increasingly making an impact on everyday life, policy-making and the public (Björgvinsson, Ehn, & Hillgren, 2010, 2012). In contrast to user-centered design, which can be viewed as a negotiation between design and use that minimizes discrepancies, participatory design rather thrives on these discrepancies which are important factors for decision-making in the process (Redström, 2008). Users in this sense become co-designers with an equal impact on the design process, bringing their individual resources and ‘tacit knowledge’ to the table (Ehn, 2008), framing them as experts of their everyday life.

In the context of the broadening of participatory design, the notion of living labs⁷⁵ as innovation environments comes up. In short, they allow different stakeholders to be involved in an innovation setting which is usually set in a situated lab environment. In design research, especially the focus on socio-material relations instead of technological innovation plays a role. For example, Design Labs are a site for collaborative research informed by the everyday practice of designers while relying heavily on designerly experimentation through prototyping (Binder, 2007) or Design Things (Binder et al., 2011; Ehn, 2009) which are described as “socio-material ‘collectives of humans and non-humans’ through whom ‘matters of concern’ or controversies are handled” (Björgvinsson et al., 2010, p. 43).

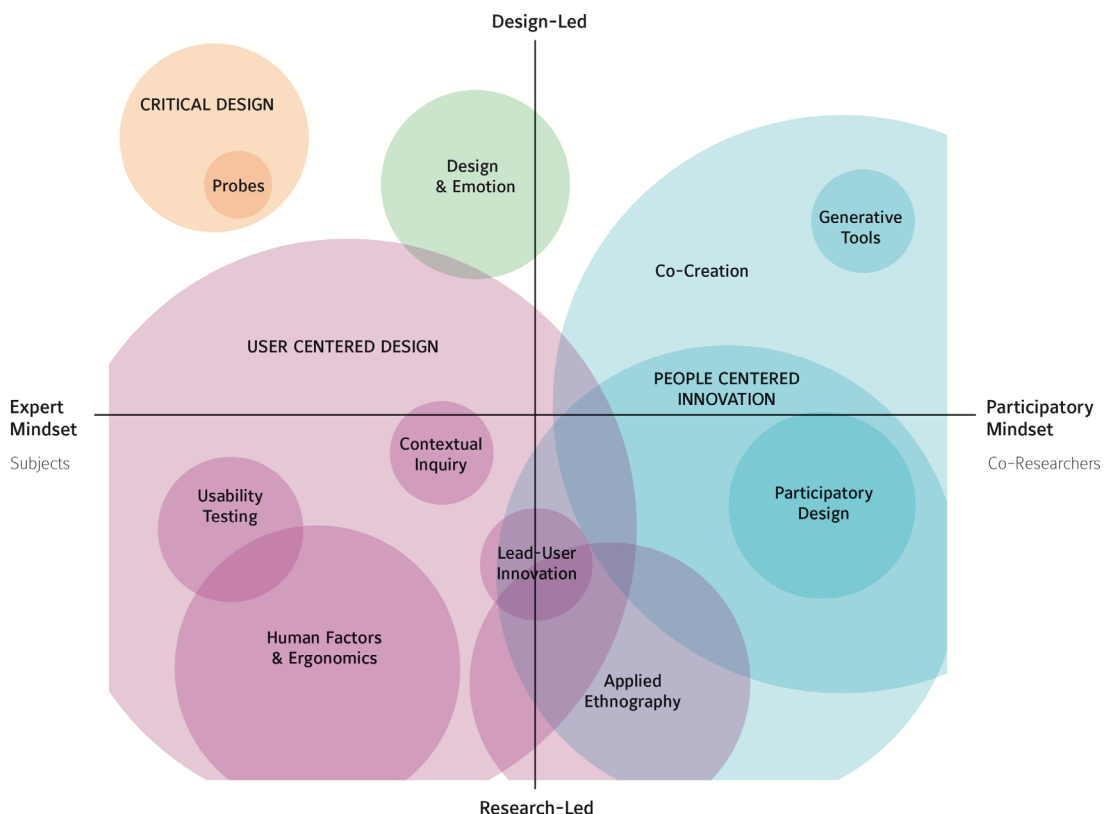


Fig. 22. In their paper “Co-Creation and New Landscapes of Design”, Sanders and Stapper map current

⁷⁵ Living labs are introduced in a later chapter, since the concept relates closely to the project conducted within the dissertation.

approaches of design (research) in terms of their participatory value. It shows that the notion of participation is not at all limited to the practice of participatory design. Researchers in this emerging context “lead people who are on the “doing” level of creativity, guide those who are at the “adapting” level, provide scaffolds that support and serve peoples’ need for creative expression at the “making” level, and offer a clean slate for those at the “creating” level” (Sanders & Stappers, 2008, p. 11).

The aforementioned understanding of participation helps see its openness but also its ambiguity. In design projects, especially participatory design, social design or transformation design, there is risk of a so-called participation fallacy, which essentially means that designers or non-designers in such processes fail to notice that “democratization of decision-making does not necessarily take the limits of our life support systems into account” (Hirsch Hadorn et al., 2006, p. 127). To a similar end, but in different terms, Manzini (2016) argues that in taking into account an emerging culture of design, along with it comes a “tangle of solution-ism and participation-ism” (p. 56) which has to be critically assessed.

He elaborates on that point as follows:

“Participation-ism is a sort of cultural aphonia that induces design experts to refrain from expressing themselves. In this case, too, the departure point is an extremely important idea: the recognition that every design process is co-design, and that it therefore must provide space for the point of views and active participation of many different actors. However, this original good idea has developed into an ideology that also is limited and limiting. In its adoption in co-design processes, the design expert’s role is reduced to a narrow, administrative activity, where creative ideas and design culture tend to disappear.” (Manzini, 2016, p. 57)

The notion of participation-ism comes with the rise of user-centeredness and co-design, pushing it towards the mainstream. Within this work, the boundaries of participation within design became clear throughout the various participatory interventions and actions undertaken by the research group in the projects related to this dissertation. While the basics of participation and participatory design form the foundation, it is the more recent development of design infrastructuring that is most relevant for this work.

Design infrastructuring.

Evolving from the Scandinavian participatory design movement, design infrastructuring concerns itself with the design and development of frameworks for designing. In this context, Ehn (2008) viewed participatory design as an activity where designers and non-designers are involved in the design practice as well as the process and are co-designing “use-before-use” (p. 1), meaning representations that make the interpretation and re-definition of use possible. Improvisation and prototyping remain important aspects in participatory design, producing boundary objects which allow for the collaborative imagining of possible uses or the critical investigation thereof.

Infrastructuring in the context of participatory design was conceived as “design after design” (Ehn, 2008, p. 4) and it is important to note that the emphasis of this approach lies on reflection-in-action and the value of prototyping as a means of developing potential futures.

"Infrastructuring entangles and intertwines potentially controversial “a priori infrastructure activities” (like selection, design, development, deployment, and enactment), with “everyday design activities in actual use” (like mediation, interpretation, and articulation), as well as “design in use” (like adaptation, appropriation, tailoring, re-design, and maintenance)." (Björgvinsson et al., 2010, p. 43)

In the context of design infrastructuring and participatory design, a fundamental mode of inquiry is “design-by-doing”, “design-by-playing” in relation to “learning-by-doing”. The iterative approach along a participatory design process is thus shaped by design games and experimental prototyping and the design of future objects of use (Binder et al., 2011). According to Ehn (2008), a participatory design can be seen as a “process of entanglement” of different design games:

"There are the many everyday professional (design)-games of both users and designers (participants everyday practice related to a design project understood as design-games).

There are the explicitly constructed specific design-games that have family resemblance with these everyday design-games (the design process as a shared design thing).

There are specific performative ‘design-by-doing’ and ‘design-by-playing’ design-games (design methods and devices understood as design-games)." (Ehn, 2008, p. 4)

In design infrastructuring, the focus tends to shift. While in participatory design projects the emphasis remains largely on design games that yield useful products and services, in design infrastructuring, the emphasis lies on creating playing-fields for design games at use time. Infrastructuring allows for the implementation of future-games (Karasti, 2014).

In reference to the project that has been conducted within this dissertation, the role of infrastructuring as a means to provide arenas for design-after-design and participatory design games as experimentation areas for use-before-use is influential throughout the process.

2.2. Excursions and Baselines

The following chapters provide introductions to fringe themes that have been important in setting up the project and conducting the research. These themes are not central to the theoretical investigation, but they have rather guided the setup of certain research parts and practice phases. Social practice theory is influential to understanding the impact of sustainability on the everyday life of citizens and as a basis for the characterization of the group of participants in the practice phases. An excursion into current sharing practices sheds light on the relationship of sharing (which is an integral part of the project phases) and the notion of sustainability. Finally, I describe the living lab research concept which has been implemented and adapted over the course of the project.

2.2.1. (Social) Practices and Everyday Life

The hypothesis that ideals of sustainability are tied closely to the way they impact everyday life are cornerstones to this work. Furthermore, practices and their affiliated situated learning experiences are a connecting factor for sustainable change. Thus, the notion of everyday life and its underlying practices, as well as the subsequently developing social practices, are introduced here.

When investigating sustainable design towards its impact on "the social" and questions of why and how societies change, theories of social practice play a major role in the understanding and framing of design especially when design is engaged in everyday practices. In this chapter, theories of social practice are introduced, and their impact on design practice and research are discussed, in order to come to an understanding of the role design can play in the investigation, support and redirection of social practices towards more sustainable ways of living.

This work circles around the question of social change within societies (especially on a micro- and meso-level) and how design or a designerly practice can address them. While previous chapters outlined the notion of change and how it is addressed and supported in sustainable design, the investigation of (social) practices within the field of social sciences is instrumental to understanding and framing sustainability with regards to the practice of sustainable design. In this section, I attempt to draw some parallels between theories of practice to sustainable design with a participatory methodology and attempt to look beyond any normative or norm-oriented positions regarding everyday life.

When it comes to sustainability research in design, there is a noticeable shift towards seeing everyday practices as a unit for inquiry (Kuijer, 2014; Kuijer & De Jong, 2011; Kuijer, Jong, & Eijk, 2013) especially in domestic everyday life settings. Questions about relevance and impact of sustainability research has arisen, since not always all relevant perspectives, by e.g. users, policymakers, companies, etc. are taken into account in the process. In design research there have been attempts to draw from numerous participatory approaches in design such as user-centered design, participatory design or co-design, in order to be able to understand users and their behavior to a greater extent. As outlined in the previous chapters, there has been a rise in awareness of the possible responsibilities designers can take within their own practice.

Over the last decades there has been increased discussion about the involvement of practice in social scientific theories. This "practice turn" as Schatzki (2001) put it, attempts to move practices towards the center of social scientific inquiry. Many sub-fields of the social sciences (e.g., science and technology studies (STS) as well as cultural studies) have developed and furthered this idea in

the last few decades⁷⁶ (Baedeker et al., 2014; Mazé, Gregory, & Redström, 2011; Reckwitz, 2002; Shove, 2007; Shove, Pantzar, & Watson, 2012; Warde, 2005), shifting the location of where “the social” happens towards practices and material things. Shove et al. (2012) describe theories of practice as having “untapped potential to understanding change” in societies, because they contribute to the understanding of social practices and their origins and transformations over time.

Reckwitz (2002) builds up an account of theories of practice in relation to other cultural theories and to major movements in social sciences. He identifies four types of cultural theories, namely textualism, intersubjectivism, mentalism and practice theory. While giving an overview of each strand’s basic properties, he notes that his account only provides an insight into the social-theoretical vocabulary, not proposing any definitive implications for empirical work within the field. Shove states that,

“theories of practice emphasize tacit and unconscious forms of knowledge and experience through which shared ways of understanding and being in the world are established, through which purposes emerge as desirable, and norms as legitimate.” (Shove, 2007, p. 12)

She goes on to note that this *resituation of the social into practice* could have considerable impact on design practice, on its understanding of material artifacts and on the embedding of designerly things into social contexts. It is of importance to understand how sustainable practices may emerge and take hold in society.

In the formation of social practices, issues of having vs. doing come up, including considerations of what has been and what will be constituting a certain practice. Shove et al. (2007) bring up the example of kitchen renewal.⁷⁷ Although this has no direct connection to sustainable behaviors, it is interesting how practices are redirected and how this redirection takes place, what factors play major roles and how the social environment impacts them. If and how people change their behavior when it comes to complex questions of sustainability like climate change, migration or species extinction depends largely on how related practices are constituted. This goes not only for individual practices but for social practices as well. In this section, the term practice has to be well-defined, in order to understand the implications for the practice of (sustainable) design. What follows is a short - and by no means extensive - account of how the term practice is used and how it is differentiated from other definitions of practice in related fields.

Theories of practice are described as loosely connected to different fields of research concerned with practice. When talking about practice, Reckwitz (2003) makes the distinction between the use

⁷⁶ Some authors like Reckwitz and Schatzki (date of publication(s)) as well as Shove (date of publication(s)) note that theories of social practice have their origin in the late work of Wittgenstein and the early work by Habermas. The so-called “practice turn”, which followed the “linguistic turn” in social sciences is described in detail in *The Site of the Social: A Philosophical Account of the Constitution of Social Life and Change* (Schatzki, 2002).

⁷⁷ the study revealed that although a lot of pressure was built up by outside sources to renew a kitchen regularly, the everyday practice had a crucial impact on the decision to actually renew it.

of the term practice as opposed to “theory” and refers to practice as that which describes a routine pattern of doings and sayings. He draws from the useful German distinction between Praxis and Praktik, which is helpful for understanding the differences between the two terms:

"Practice (Praxis) in the singular represents merely an emphatic term to describe the whole of human action (in contrast to 'theory' and mere thinking) 'Practices' in the sense of the theory of social practices, however, is something else. A 'practice' (Praktik) is a routinised type of behavior which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in form of understanding, know-how, states of emotion and motivational knowledge." (Reckwitz, 2002, p. 249)

Social practice.

Shove (2007) notes that in the accounts of Reckwitz and Schatzki, practices are seen as “enduring entities that are reproduced through recurrent performance” (p. 8). While Schatzki’s “temporally dispersed nexus of sayings and doings” (1996, p. 89) for him subsumes practice, Reckwitz defines it as,

"a block or pattern, consisting of interdependencies between diverse elements including 'forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge." (Reckwitz, 2002, p. 249)

Warde (2005) investigates theories of social practice from the perspective of consumption, an area which a majority of the field of design caters to and is influenced by. Within his work, several alternatives to the consumption-oriented approaches to design are introduced, weighing into the discussion about the shaping of the social fabric and inducing change within society. Warde gives an overview of major contributors to the theories of social practice, including their basic definitions of the concept, and subsequently sketches out its value for consumer culture. His account provides the counterweight to the noticeable shift towards renouncing consumerist aspects in design.

On the other hand, practices are described as a temporally unfolding and spatially dispersed nexus of doings and sayings. Notable examples are cooking practices, voting practices, industrial practices, recreational practices, and correctional practices. To say that the doings and sayings forming a practice constitute a nexus is to say that they are linked in certain ways. Three major avenues of linkage are involved:

- through understandings, for example, of what to say and do
- through explicit rules, principles, precepts and instructions
- through what I will call ‘teleoaffective’ structures embracing ends, projects, tasks, purposes, beliefs, emotions and moods (Schatzki, 2009, p. 89)

Here, Warde (2010) sees both the activity as well as its verbal or written representation in combination. Practice-as-entity as Schatzki coined it, is nevertheless not to be seen as isolated from its performance over time. Consequently, in order for practices to be maintained, they need to be performed by an actor or a carrier. In this understanding, the practice is only in existence when it is actually carried out, since the “doings and sayings” (Warde, 2005, p.134) need to be actualized and adapted regularly. The notion of a practice or practices performed by a carrier as “bodily and mental agent” (Reckwitz, 2002, p. 249), is further elaborated on in that each carrier holds certain reservations, pre-existing knowledge about how to do and say things and of course also bodily restrictions or limitations that can alter the way a practice is carried out. A practice thus involves the single individual and their bodily and mental agencies (Reckwitz, 2002).

2.2.2. Sharing Practices & Collaborative Consumption as Catalysts for Sustainability

After having introduced communities of practice as well as the concept of social practices and related learning processes, the subject and guiding theme of sharing and collaboration is introduced as a baseline for the design phases and iterations. While focusing at first on the sharing of concrete objects in a specific community of practice, the research group quickly shifted to the sharing of knowledge, as well as the empowerment of citizens to impact local decision-making processes, a much fuzzier subject than the sharing of objects.

Collaborative forms of use had their early rise in the 1970s energy shortage crisis, where it became a necessity for many to share resources, tools or services. The call for “using instead of owning” is tied closely to the environmental movement of the early 1970s and has steadily developed since then. People grow frustrated with buying, maintaining and then disposing of product and rather find comfort in just using instead of owning them (Erlhoff, 1995).

Sharing is used in different contexts such as the collaborative economy, the internet and concrete interpersonal relationships. In a social context, sharing is tied to implicit underlying values and can be seen as an intricate part of socio-cultural activities. With the rise of Web 2.0, a new notion of sharing has been developing for several years, being tied to a renewed culture of participation in social as well as political processes (John, 2012). Nevertheless, the promise of sharing as belonging (to society, specific interest groups, a neighborhood) has increased the pressure on people to share aspects of their life online they would not normally share.⁷⁸ This leads to the question of how sharing approaches can be mirrored back to the real world, bridging a gap between online and offline as well as empowering users to act both on- and offline.

With the paradigm of a new sharing economy based on a decentralized digital infrastructure, numerous services emerged, which either focus on sharing goods, services, knowledge, living or working space or even access to public participation processes.⁷⁹ The effects of the aforementioned approaches are categorized into either the **extension of a life cycle** or the **intensification of use** (Gsell, Dehoust, & Hülsmann, 2015) in terms of products and services, and the **intensification of**

⁷⁸ This has become an important point of discussion in the project, since the core group deals with this pressure and expresses concern of “being left out” or “not being able to communicate anymore” and not being able to make an impact on their community.

⁷⁹ The list goes on to include collaborative approaches regarding ICTs, energy, media, finance, legislation, budgeting, mobility, clothes, plant cultivation and gardening. Here, access to participation processes is seen as a sub-set to the sharing of knowledge and information.

participation in terms of platforms that enable political participation and citizen empowerment.⁸⁰

Some scholars open up an even broader vision:

"The sharing economy might serve as an umbrella concept and encompassing vision, helping to understand and guide new inventions and the institutionalization of new economic practices, roles and interactions of societal actors." (Heinrichs, 2013, p. 229)

While the ideals of the early sharing economy are based on the open source movement and grassroots sharing communities such as time-banking groups or community car-sharing, where the motivation for sharing was frequently its economic savings potential, nowadays its underlying technology is largely market-driven and profit-oriented with large companies jumping on the bandwagon.⁸¹ Most existing platforms are focusing on digital Web 2.0 technology (e.g., Bright Neighbor, Neighborgoods, Sharesomesugar, to name a few), while some play with the notion of traditional communication channels (e.g., nebenan.de, a clone of the popular platform neighborgoods, which in their initiation phase went from door to door and passed out postcards with sign-up codes) and eventually aim at using a web-platform as a medium to connect individuals face-to-face.⁸²

"'use rather than own' concepts alone will undoubtedly not suffice to reduce resource consumption to the extent necessary. It can be assumed, however, that they can make an economically relevant contribution, particularly because, according to forecasts, above all, Internet-based schemes will continue to expand further and play an important role in changing consumer patterns, due to the wide use and networking opportunities offered by the Internet." (Leismann K., Rohn H., Schmitt M., Rohn H., & Baedeker C., 2013, p. 198)

Usually, sharing practices are described as a means to improve the ecological and economic impact on society. The underlying promise of a sharing economy that it will support societies on their path to sustainability remains fuzzy since the impact of existing and emerging sharing services and systems has been marginal at best (Heinrichs, 2013). This is also due to the fact that for sharing services to have a sustainable impact, users will have to adapt some of their routines and everyday practices. What we have seen though is not a reduction of consumption or production of goods but a

⁸⁰ There has been ample criticism of platforms for political participation or activism, since the impact of the individual vote might be overestimated. Participation in votes or petitions can be done by one click of the mouse without the proper reflection on the topic.

⁸¹ Here, the example of carsharing is especially eye-opening. While in the early days carsharing originated from a community out of a socio-ecological mindset, large companies such as Mercedes-Benz or BMW have opened up the field of carsharing for the sake of promoting their brand under the guise of the principles of sharing. A sharing concept is thus squeezed into existing market-driven practices, preventing a rethinking of the approach to mobility.

⁸² A collection of sharing services and platforms is available at shareable.org as well as share.it. In *What's Mine is Yours: The Rise of Collaborative Consumption*, Rachel Botsman and Roo Rogers (2010) provide an overview of the sharing economy, although it neglects critical aspects of the concept, specifically highlighting its benefits.

multitude of services that add more products designed and produced specifically for sharing services. In addition, rebound effects resulting from adapted user behavior reduce or even reverse the previously saved resources.⁸³

In light of the rise of the sharing or collaborative economy, numerous studies have been undertaken in order to understand the dynamics and potentials of these sharing approaches (Clausen, Bowry, & Bienge, 2017; Gsell et al., 2015; Leismann et al., 2013; Matofska, 2015)

Clausen et. al. (2017) develop a typology of sharing which categorizes current sharing approaches into five different themes: context dependent sharing (e.g., couchsharing, co-housing, flexible carsharing), ecologically sensible sharing (e.g., co-housing, intermodal mobility, carpooling), socially desirable sharing (e.g., bookbenches, gratis-shops, community gardens), low impact sharing (e.g., timebanking, video- and music-sharing, online sharing platforms) and well-established services with low ecological potentials (e.g., second-hand shops, tool-lending services)

On the basis of their study, Gsell et al. (2015) paint a rather dark picture of sharing approaches regarding sustainability.

"The authors doubt that the future development of the approach will itself lead to a collaborative economy, where a cooperative method of production takes shape which produces needs- and ecology-oriented solutions and processes that do not exploit man and nature.

Current discussions and clashes around collaborative business models show that they often operate in legal limbo, promote precarious working conditions and gain competitive advantage from regulatory deficits. Many of these cases will have to be settled in court. Regulatory gaps will have to be closed subsequently and labor-, security- and data privacy standards and their implementation will have to be strengthened." (translation of Gsell et al., 2015, p. 186)

Countless bottom-up initiatives pop up that provide guidelines, how-tos, or handbooks for sharing, which are easy to use and not necessarily scare away potential users by using the uncomfortably complex term of sustainability.⁸⁴

Heinrichs (2013) argues that sharing practices could benefit from theory-grounding in the sustainability discourse. In an empirical and conceptual study, several key dimensions are

⁸³ The starting point for a rebound effect is usually an increase in technological efficiency of a product or service. Recent examples of such rebound effects are the flooding of inner cities with bikes that have been set up by bike sharing services or the extensive use of inexpensive room-sharing services that lead to increased air travel. Through sharing, individuals have money to spare which they use on other services or goods. Rebound effects are difficult to measure, since they are dependent on many different factors that are inherent in the everyday life of users and not openly accessible for research. For more details, the report on rebound effects for Enquete-Kommission "Wachstum, Wohlstand, Lebensqualität" des Deutsches Bundestages (2011) provides a detailed account.

⁸⁴ Notable examples include shareable.org's sharing-how-to as well as their online sharing resources.

subsequently identified that are valuable for understanding the impact of sharing approaches in terms of sustainability:

- the relevance of materialist and post-materialist values related to consumer practices together with a reflection of new results of happiness research in this context;
- the influence of environmental and sustainability awareness on changing consumer habits and practices;
- the broader debate on limits to (material) growth and new indicators of wealth and quality of life as the macro-political sibling of sharing economy practices;
- the disruptive development of information and communication technologies facilitating the sharing economy;
- the role of critical perspectives on capitalism and consumerism;
- the anthropological and socio-psychological discourse on homo economicus versus homo collaborans and the role of trust in human interaction. (Heinrichs, 2013, p. 229)

While the ecological and economic impact of the sharing economy is the predominant focus, the social impact of sharing is underrepresented. Limitations of everyday life and individual practices are often not accounted for in sharing approaches. Nevertheless, it was recently identified that it is not new business models that push approaches of the sharing economy but “socially innovative actors and initiatives, who advanced activities central to the cause” (Gsell et al., 2015, p. 187).

One aspect that is embedded in the first phase of the projects “sharing phase”, is an investigation of current sharing practices and approaches which have been carried out in the project as an underlying idea. The phase caters to four perspectives of sustainability, namely **economic relief** in terms of sharing goods and services with others, **reducing ecological impact** through the sharing of goods and **improving the social fabric** through collaboration, skill and knowledge sharing as well as the **empowerment to participate** in local transformation processes, aspects which are vital for the project.

By analyzing key sharing services and platforms, the project team was able to identify gaps and open questions regarding those types of services.

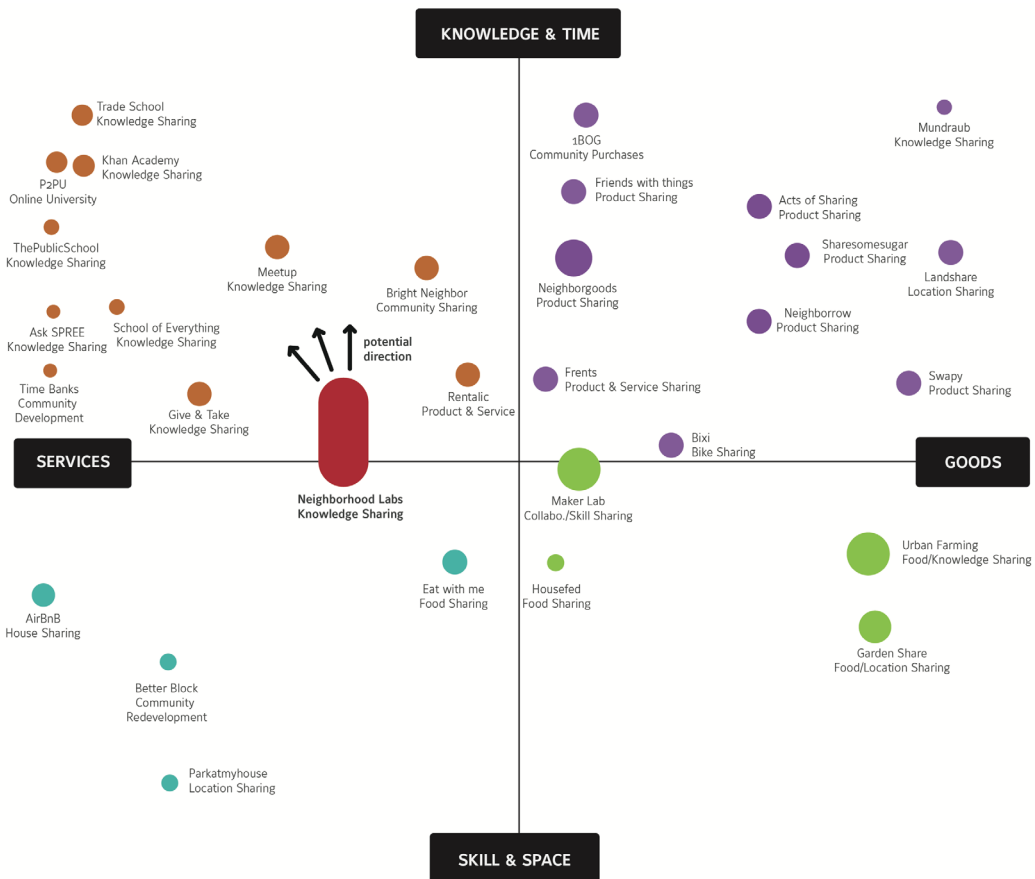


Fig. 23. Major sharing services are mapped regarding the subject and medium of sharing. The project “Vernetzte Nachbarschaft” or “Neighborhood Labs” was positioned in a sharing project matrix. The position would later shift towards a more political, knowledge-oriented direction.

Initially, the scope of the project was to implement an ICT-supported goods-and-service sharing platform; the core group of the project that was involved had reservations towards the idea and pushed the focus towards a sharing of skills, time and knowledge, which is inherent in their club life and thus a common driver and goal for the Seniors Computer Club involved in the project. Furthermore, the stakeholders wanted to involve themselves more in local decision-making processes regarding, for instance, the pathways around their club, benches and flower-beds on their island.

Sharing and sufficiency.

While the concept of the sharing economy hinges largely on the paradigm of economical and ecological savings potentials, sustainability strategies such as consistency, efficiency and most of all sufficiency (Linz, 2004; Schneidewind et al., 2014) may, in this case, provide an underlying guiding strategy for the sharing of resources, tools and knowledge, that goes beyond material and resource effects. Here, Schneidewind et al. (2014) refer to the politics of “Framing, Shaping, Enabling and Orienting - and for this last area we suggested as guidelines the ‘four Lessens’: less speed, less distance, less property and less market” (p. 157).

2.2.3. Living Labs for Sustainability

Before setting out on the task to describe the design project at the basis of this research, the living lab as a central research concept and methodology is elaborated on. This concept played a major role in the setup and running of the neighborhood lab, and adaptations thereof in other projects.

When reviewing the academic literature about living labs and related concepts, as well as practice cases not necessarily rooted in a research context, a vast majority of the examples refer to a starting point somewhere around the early 2000s. While there has been research on and within living labs since the early 1970's, the research concept of "Living Laboratories" has its origins in the early 1990s in the field of operations research focused on urban communities (Bajgier, Maragah, Saccucci, Verzilli, & Prybutok, 1991). However, the concept gained considerable traction among researchers, institutions and companies after being further developed by MIT⁸⁵ in its Media Lab and School of Architecture and Planning and when it was introduced as a major research focus by the European Commission in 2006. It has also spread to other contexts, but it is predominantly found in user-centered innovation. William Mitchell of MIT argued that it represents a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts (Pallot, Trousse, Senach, & Scapin, 2010). This focus on smart cities and smart homes has been broadened in the last couple of years.

As mentioned before, although several frameworks for the approach of current complex and highly intertwined environmental and social problems exist, their transfer to actual living environments often fail or do not take into account basic, local requirements. The Living Lab concept, although not necessarily being deployed to investigate (social) practices to fuel social innovation, can be a promising interdisciplinary approach for framing a design research project in an urban neighborhood in order to enable transformation and change.

It is characterized by the basic concept of bringing stakeholders together in a research or development process, while providing them with a research setting which is closer to actual living environments. In this respect, including new technologies or technology concepts in real-life contexts is assumed to lead to higher acceptance and impact of the products and services, as well as early consideration of their socio-ecological effects. One of the strengths of the concept is the possibility to develop, test and evaluate a product or service within a complex real-life setting rather than a closed environment.

"In the words of the European Network of Living labs (ENoLL), which was founded in 2006, "a Living Lab is a real-life test and experimentation environment where users and producers co-create innovations. Living labs have been characterised by the European Commission as Public-Private-People Partnerships (PPPP) for user-driven open innovation - *a citizen-centric research*

⁸⁵ Currently the MIT Living Lab focuses on research topics energy, health, and creative work and self-expression (<http://livinglabs.mit.edu/>).

concept and environment which includes stakeholders such as researchers, city officials, companies and citizens in an innovation process."

Some of the key principles for living labs were developed during the CORELabs project (Schumacher & Feurstein, 2007) which worked towards a standardization of the approach in order to ensure transferability to other contexts. In this context, some notable principles were derived which reflect a rather technology-centered, business-minded perspective:

- **Continuity:** This principle implies that for a Living Lab to succeed, there has to be a certain continuity in collaboration as well as a stable location. Interdisciplinary teams - or in this case people-public-private partnerships - take time to evolve and build up trust. This has shown to be a crucial aspect of the development of the neighborhood lab Fischerinsel.
- **Openness:** Many perspectives and a process as open as possible makes “rapid progress” within the lab possible. In this context, the open process will allow for users to be included whenever and wherever.
- **Realism:** They assumed that realistic use cases, situations and behaviors lead to more valid results for real markets. A subsequent assumption stated that this principle would also be relevant for a distinction from other co-creation environments (like Second Life).
- **Empowerment of users:** Users are seen as creative assets for the innovation process, who can help implement “humans’ needs and desires”. This is seen to only be possible when users are motivated and empowered to actively engage.
- **Spontaneity:** Schumacher & Feurstein (2007) claim that in order to succeed with innovations, it is important to inspire usage, meet personal desires, and fit and contribute to societal and social needs. To detect and analyze spontaneous reactions and ideas of users is seen as vital to the process.

These principles, of course, reflect the concept of living labs at a very early stage. Only 10 labs were part of the CoreLabs project. There have been other efforts to harmonize methods and tools for living labs (Mulder et al., 2007), although this has proven to be difficult regarding the spreading of the concept in numerous research areas and disciplines, all employing their unique research methodologies. One of the aims is to tap into all the stakeholders’ resources and help them benefit from each other. In that sense, researchers, citizens and designers profit from the new technologies companies or research institutions provide and, in turn, provide their knowledge and experience to influence further development. When looking at the European Network of Living labs, it is notable that, especially in the context of information and communication technology (ICT), the concept has been taken up frequently. This is, of course, only one network in which the concept has taken hold, but looking at other labs, ICTs are in the majority.

Dutilleul et. al. (2010) speak of cognitive as well as motivational barriers which affect the development and research throughout the process. Furthermore, they argue that the crucial concept of needs, which corresponds directly with the willingness of users to involve themselves in a living lab, can bear objective as well as subjective dimensions. A closer look at users' needs and requirements within such a process is needed here, since there is a wide range of possible manifestations of needs, such as concrete problems, proposed solutions, preferences or wishes. Living labs are not only used to investigate users' needs but also to "manage adoption" which means constructing "positive perception and acceptance of an existing solution" (Dutilleul et al., 2010, p. 76), which can be found in numerous cases of living labs within the ICT sector, giving rise to some criticism of the concept. Due to the broadness thereof, varying definitions and the differing backgrounds and aims of the respective driving forces, the landscape of living labs is quite fragmented (Bergvall-Kareborn, Hoist, & Stahlbrost, 2009).

While some organizations look at living labs simply as a new form of test-bed, involving users only marginally, some implement the idea of collaboration and an opening up of the development process fully, although this represents two extremes that are seldom found. It has to be noted that the descriptions of various living labs are idealized and looking at the actual execution, it does not always meet the high expectations of collaboration across the board. In particular, embedding the lab into a social context is often underestimated regarding the extra time spent for communicating with stakeholders and adapting it to their everyday life and constraints.

Pallot et. al (2010) draw similarities between the collaborative force of Living labs and the emergence of Web 2.0 or Open Source software development. The empowerment of users through platforms such as Wikipedia, Twitter or Facebook, has to be critically assessed, since Living labs also operate in physical and not only in the digital space. In the example of a Living Lab at the airport of Stockholm, the novelty of the concept created some issues, resulting in variations of setups. However, there are common emerging issues such as the lack of a governing infrastructure and the predominant emphasis on testing of already developed technologies rather than using the collaboration in early stages of ideation and development (Kviselius, Ozan, Edenius, & Andersson, 2008). This seems to be a common issue regarding the implementation of Living labs. There is a huge organizational and managerial overhead when it comes to including many stakeholders in a project. This is easily overlooked but can quickly disrupt a project. Pallot et al. (2010) compare the domain landscape of living labs to the one of design research proposed by Sanders and Stappers (2008); this definition overlaps living lab practices and participatory design endeavors and attempts a rare comparison between technology-minded approaches to test and experimentation platforms and user-centered design research approaches.

Most implementations of living labs are focused on the home and new technologies for the home.⁸⁶ Especially regarding health technology innovations in ambient assistive living (AAL), smart

⁸⁶ Details regarding the scope and direction of living labs in Europe can be found on the ENOLL (European Network of Living Labs) website <https://enoll.org/>, which keeps track of all its registered living labs.

home concepts and ICT-innovations, living labs have been the focus of numerous research institutions and companies.

To this end, the Federal Ministry of Education and Research in Germany recently commissioned a study regarding “Living Labs for Sustainable Development” (von Geibler et al., 2013), surveying the potential of living labs regarding the involvement of users in the development of sustainable products and services. Within the report, it is argued that a development of technology within such an environment impacts the way in which it is conducted and that it is more likely to have an impact on current consumption patterns and the way sustainability problems are approached. For this work, the inquiry into the landscape of living labs gave way to an adapted approach, tied heavily to the idea of design infrastructures, which will be presented in the following chapters.

3. From Neighborhood Labs to Civic Infrastructures

The following chapters provide an account of the development of the design research project Neighborhood Labs with roots in participatory design and following a living lab methodology, towards the design of civic infrastructures within this project and the ones that followed.

3.1. The Neighborhood Labs Project and its Origins

Neighborhood Labs is a design research project run by an interdisciplinary group of design researchers, citizens and other stakeholders in a central but geographically isolated area in Berlin's Mitte district. The project incorporated the development of a research concept and experimentation process which builds on participatory design methodology as well as a living lab approach. It was planned to be open-ended with the potential for stakeholders to take over after the official end of the research project. It ended up running for approximately six years, from late 2010/beginning of 2011 to the end of 2016, in close collaboration with local initiatives and individuals who currently make an effort of continuing parts of the project.

In detail, the project was started through investigating how communication between inhabitants is facilitated, how resources are shared and how practices of mutual learning among residents in this urban neighborhood are encouraged and how design can play an active role within this discourse. The topic of sustainability was woven into the project in a rather subliminal way. Local residents were involved as a potential source of social and sustainable innovation by participating as experts of their everyday life with all its possibilities and limitations. The project began with an open investigation of the needs, requirements and opportunities regarding inhabitants of the Fischerinsel, especially the core group of the *Seniors Computer Club Berlin-Mitte* (SCC), which emerged as a partner for continuous collaboration over the course of the project and beyond.

While at first the communication characteristics, limitations and drivers were of interest, the structure of the club and their way of informally conveying knowledge grew important as a key element to the improvement of social cohesion in their neighborhood.

Originally, the project was planned to involve citizens in a number of participatory design workshops, but it quickly extended beyond this point because of increased interest in the project by participants. A community of practice emerged, sharing the common interest of participating in social and political change processes in the neighborhood.⁸⁷

The overarching research question, focused on *what might be the basic configurations of sustainable design by default, and how might a dynamic framework for transformation provide designers with instruments to approach challenges of sustainability on a micro-level*, prompted a subsequent, more practice-focused question that guided the first phase of the project:

Which formats of participation, collaborative tools and techniques of making can be used and adapted to provide points of access to transformation processes for local stakeholders in an urban neighborhood in Berlin?

The first scope and objective was to co-develop ideas regarding sharing practices in the SCC and around the Fischerinsel and to get other stakeholders involved in the process. The reason why

All in all, the challenge of doing a lot with little material and monetary resources was forcing us to be creative and to find ways of producing ideas within our group. It also kept the output largely on a concept- and prototype-level.

sharing practices were the initial focus was partly due to the SCC's interest in improving the way they share computer knowledge with others. From this starting point, ideas regarding not only the sharing of formal and informal knowledge but also the sharing of skills, tools and products were discussed. The self-sufficiency and sustainability of the research project played a central role in building trust and getting commitment for the project both from the team of researchers and the local participants.

In this process, a variety of methods from design and neighboring disciplines⁸⁸ were used to frame the problem and develop the research question further.

What kind of design intervention can support knowledge sharing as a means of community building in a meaningful and effective way? How can we bridge the gap between analog and digital, local and global? How can we provide opportunities for access and stimulate interpersonal exchange between generations and create an environment for reciprocal learning experiences? How can the interpersonal transfer of intangible goods (knowledge) be designed and formalized? How can we build a base for an open, self-supported (knowledge sharing) system which can be grown by (the interest of) its participants? How can this system be designed?

In order to be able to focus on questions of a holistic sustainable design, the project sought to develop the rather technology-centered living lab towards a socially-oriented research approach. The close collaboration with a community of practice and the inclusion of local resources and existing solutions in the process is key to co-developing the neighborhood lab.

The precursory project “networked neighborhoods” and a preliminary field research has greatly impacted the choice of context and stakeholders for Neighborhood Labs. It provided the initial thematic scope which was to explore new ways to facilitate communication, the sharing of resources and to encourage practices of mutual help among citizens in urban neighborhoods. Within this context, the focus lay on senior citizens as important actors of shaping the social fabric of their neighborhoods, hence the project aimed to explore particular needs, opportunities and potentials in their cross-generational communities.

Even though it was clear that the level of citizen-participation would vary over time, it was important to be open to all stakeholders⁸⁹ as equal participants in the project. This also means being transparent regarding the research process and projected outcomes as well as developing a common goal. Secondly, as mentioned before, the project intended to investigate the citizens' needs and

⁸⁸ The methods and tools are described in detail in Chapter 4 as a part of the action repertoire for sustainable design. They include methods from interaction design such as paper prototyping, scenario building and personal development, urban design such as neighborhood mapping and collaborative walks as well as ethnography with observations, interviews and a survey.

⁸⁹ A stakeholder in this context is an entity that is involved in or affected by a certain subject matter or course of action. Stakeholders can be companies, researchers, citizens, passers-by, municipalities, policy makers, etc.

practices and integrate existing technologies in the process, instead of pushing new technologies into the community.

Thirdly, the project critically investigated the participation of citizens within the design research process and how it can be fruitful regarding the understanding and framing of sustainable design, while also bridging the gap between top-down policy-related approaches and bottom-up initiatives.

In the long run, through experimentation with and diversification of the methods and tools deployed, Neighborhood Labs informed an approach to design which oscillates between acting and infrastructuring in context.

In such a long-term research-through-design project, different results are bound to emerge along the way.⁹⁰ In short, on a process level, the project helped understand how to set up a dispersed, free-floating living lab in collaboration with a community of practice and how to engage participants in both research and design questions without overburdening them. Building trust through engagement and transparent communication was key to keeping the group together and participating.

On a practice level, numerous artifacts were produced, pushing the design process further, including analog communication prototypes such as a chalkboard-display, analog-digital bridge devices or digital platforms all focused on supporting citizens in terms of civic participation. Some of the artifacts remained on a conceptual level, some were beta-tested by groups of users, and all of them were by no means finished products but rather conversation pieces, projecting potential future uses.

The aforementioned insights into process, practice and mutual learning reflect the meta-objectives that accompany the design project phases:

- ***Re-frame sustainable design in relation to current sustainability research and provide arguments for a holistic perspective.*** Focus here lies on the empowerment of citizens and supporting infrastructures for the improvement and transformation of ones living environment.
- ***Explore participation as an underlying requirement and fathom its qualities as well as its limits in use within design.***
- ***Develop a repertoire of action for stakeholders in urban change processes to lead to a reformulation of methods, tools and paths to action.***
- ***Use and adapt design methods and processes from various neighboring fields (participatory design, design activism, social design)***

⁹⁰ Detailed results are mapped out in Chapter 4 where the action repertoire is described and the workshops, investigative actions and participatory tools are discussed.

When designing the research process for **Neighborhood Labs**, it became clear that certain facets of the living lab concept hold potential for a re-configuration of sustainable design,⁹¹ but it has to be fundamentally adapted for the design case here. The preceding project “networked neighborhoods”, which had a more technology-centered mindset lead to rethinking the way of how to enter a neighborhood setting with all its existing biases, sensitivities and history.

Arguably, one of the most important but also most difficult tasks was to get citizens to engage in the process of building up the living lab. This process is barely documented in similar projects, so the project group was not able to draw from previous experiences of other researchers. These challenges, of course, led to an iterative approach to recruiting participants and we had to spend a lot of time for preliminary workshops and discussions that would lead to nothing.

Instead of setting up a space loaded with equipment and technological tools, as is common with other living labs, the setup was approached in a slightly different way. The neighborhood itself was viewed as a living lab, with the research group as well as participants engaging at different locations in different time frames, providing a sort of mobile and networked living lab. Conversely to its original scope of technological innovation, the concept of living labs may well be useful for the investigation of bottom-up strategies for participation in transformational processes such as on the Fischerinsel. Whether or not technology is involved emerges from the engagement in the living lab and the topics brought up within.⁹²

One of the crucial aspects when forming a living lab from the bottom up, was to get the stakeholders to participate in a process which was obscure and uncertain at the beginning. In the course of the project this proved to be a difficult task especially seeing that during a long-term endeavor such as Neighborhood Labs it was impossible to get participants to commit fully in the long run, an aspect that in a later stage of the project turned out to be of less importance.

In interviews, the value of the project lay also in part in the fact that people could jump on and off depending on their interests, ideas and the current topics. One of the reasons why there was a core group including us as researchers and a group of active citizens was the initial mutual curiosity and excitement to embark on a project like this together, possibly invoking change within the neighborhood. This of course also comes with expectations which had to be adapted in the process. Expectation management is one of the more underestimated aspects in the project.

⁹¹ Especially regarding fundamental integration of stakeholders, immersion in context and the iterative approach to designing therein.

⁹² On the Fischerinsel, the core group was already familiar with common web-technologies but was open to focusing on questions regarding (knowledge) sharing from a socio-cultural perspective, allowing for technology to play a subservient role.

The project was thus implemented as a **neighborhood lab** on the “Fischerinsel” in central Berlin, where research was set to be conducted outside of a laboratory setting, within in a real life context with local citizens. The initial scope reflects two of the main aspects of sustainability on a social scale: empowerment of citizens and supporting infrastructures for the improvement and transformation of one’s living environment.

3.2. Framing the Work

Altogether, this research process spanned a period of five years, on and off, with numerous activities being conducted in a group or by myself. I will pinpoint several key activities throughout the years without going too deep into the processes. Some activities are more participatory than others, some required more activity by the designers and non-designers, some are simply conversations, discussions or interviews and some are designerly interventions without any active group involvement.

Towards civic infrastructures.

In this work, three characteristics of design are crucial to the re-framing of sustainable design, and they are embedded in the notion of research-through-design. With this approach, iterative practice loops provide both empirical as well as theoretical outcomes that, in turn, inform the overarching research question. While there have been micro-loops in certain project phases,⁹³ the project phases themselves can be seen as iterations towards a design and subsequently a research answer.

The underlying analytical heuristics are based on a transdisciplinary sustainable research framework which provides the following outcome spaces and positions when mapped to a research-through-design approach:

1. **Opening** – *How can designers open access to contexts, tools, knowledge and technology through collaborative, interdisciplinary action?*
2. **Making** – *How can designers provide processes to involve stakeholders in critically assessing and making possible futures?*
3. **Transforming** – *How can designers transform contexts and situations from one state to a preferred one (and how can they facilitate the negotiation-processes tied to them with regards to social equity and intra-generational justice)?*

The analysis of Neighborhood Labs results in a sustainable design research process model which integrates the aforementioned perspectives and is aimed at providing a distinguished view on the transformative aspects of sustainable design in urban neighborhoods as well as the co-production of knowledge in such processes. Furthermore, the process model sheds light on the relationship between the participation of stakeholders, co-design activities and the production and use of tools within the process.

⁹³ Workshops or interventions, but also participatory tools which have been used, usually started with a distinct design question.

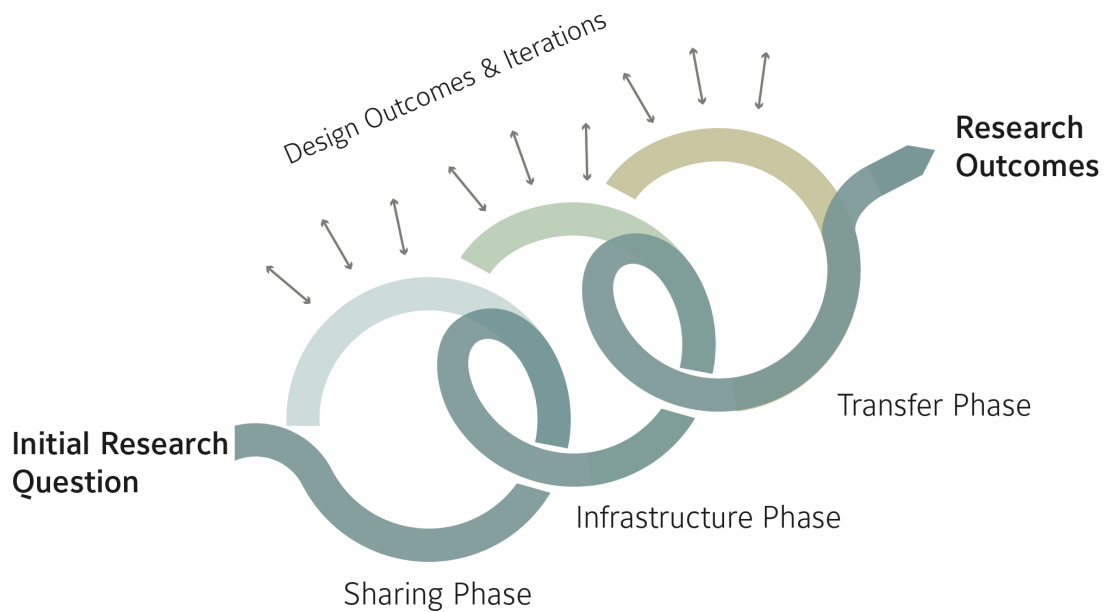


Fig. 24. RTD-process model throughout the phases of the project.

The hypothesis that design can provide the means for citizens to understand, engage with and alter processes of transformation, whether economic, ecological or social, points towards the potentials of sustainable design. Especially through the repertoire of action, but also the design process itself, these potentials were explored. However, processes of transformation are difficult to grasp in long-term projects, and ultimately, qualifying the potentials was outside of the scope of this dissertation. Nevertheless, certain traits of transformation, like the continuation of activities without the researchers or the implementation and continuous use of designed artifacts in the project process as well as the subsequent interviews and discussions that hint to a deeper understanding of change processes, provided evidence of a subliminal transformation through collaborative learning (in the project).

As mentioned before, two maxims of participation, adaptivity and integrated capacities of agency,⁹⁴ play a role in the project process. The research process was organized following research-through-design and included principles of transdisciplinary research⁹⁵ which allow for the systematic structuring of the process. Firstly, the research relied on a gradual problem constitution, integrating capacities of agency that are activated, reinforced and extended over time. Secondly, there had to be a margin for adaptation of the process itself.

⁹⁴ See Chapter 2.1.5

⁹⁵ See Chapter 1.4

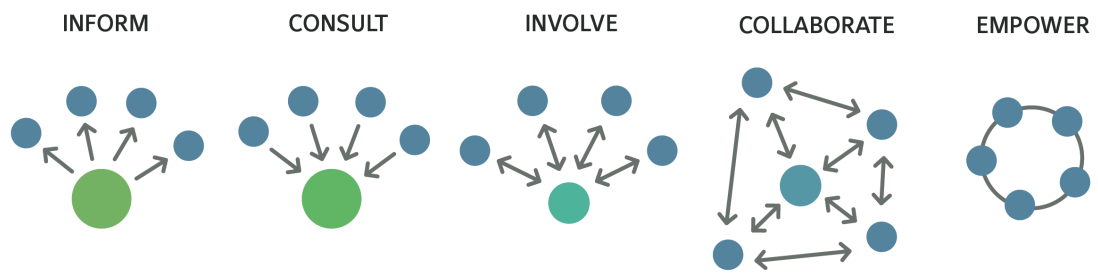


Fig. 25. The idealized view of levels of participation show the gradual shift of the roles involved.

In addition to the sustainable design principles stated above, the actions and interventions are evaluated regarding the levels of participation.

Of course, one can approach a project with all the good intentions and theoretical foundations, but in participatory research projects, there is always one unknown and incalculable aspect: the participants. While in theory, *Neighborhood Labs* was set up to allow collaboration and participation by different stakeholders on the Fischerinsel, in practice, it was designed for constant adaptation and re-shaping, since the stakeholders and changes, bumps and hindrances in their everyday lives could not be accounted for beforehand. This led to a quite fuzzy, sometimes improvisational process which had its defining points along the way. In this sense, participation was limited but more free-floating and reactive to the overall feel and dynamics of the project group. There were times when the participants did not want to meet because the weather was nice, and they wanted to go to their garden plot, other times they were not able to make it due to illness, and sometimes they wanted to have additional meetings because they were excited to share some new ideas for the project.

The notion of design being able to provide a civic infrastructure for change-making in urban neighborhoods formed. This reflected the initial research question of whether design could provide the means and processes to impact local decision-making processes as well as processes of urban social change. In this sense, civic infrastructures are, first and foremost, a form of scaffolding that operates as a framework for the development of ideas, and secondly, they are a repertoire of actions for citizens to engage with questions regarding their own everyday lives and their living environment.

What is intriguing about the process, and one of the key strengths of iterative design, are the failures, diversions and alterations that mark the path of the research process. Various diversions in the process regarding the team, outside influences, participants' health issues, financial barriers, and funny enough, the weather, played a role regarding the non-linearity of the project.

In all the fuzziness of the long-term project, one can identify three distinct, albeit open and interconnected, phases to this investigation. The first one may be described as "the sharing concept phase", the second as "the design infrastructure phase", the third as "the transfer phase", which also includes the creation of a repertoire of action based on the principles, practices and methods included in this work.

The phases reflect both the position that the researchers took, as well as the position the stakeholders in the process held. This position is always seen in relation to the analytical framework as proposed before. The process reflects the co-production of knowledge, the classification of participation within as well as the role taken on by myself as designer/researcher.

Each phase has a different focus regarding the principles of sustainable design. The sharing concept phase focused on context awareness, knowledge and tool sharing as well as social cohesion; the design infrastructure phase focused on participatory tools and knowledge sharing; and the scaling phase focused on the transfer of insights in other contexts and the adaptation of the participatory tools.

- **The Sharing Phase / Neighborhood Lab** - *Setting up and running a living lab; investigating the context and building an infrastructure; approaching the neighborhood and designing tools for gathering insights about needs and issues within it while drawing active citizens towards the project. After this step, insights informed the research process and helped focus the research question further. This phase produced several concepts in collaboration with the stakeholders of the Fischerinsel, Berlin.*
- **The Infrastructure Phase / Designing Infrastructures & Fostering change** - *Designing and testing participatory tools such as the Hybrid Letterbox in order to discuss and evaluate questions of social cohesion and communication within the neighborhood and to activate citizens for involvement in these issues.*
- **The Transfer Phase / Design transfer** - *Opening up the context and pushing the methods and tools outside of its initial project and creating new instances thereof.*

Strategies of narration.

Due to its historic development and the value systems tied to it as outlined in the previous chapters, in terms of telling a story, sustainable design is known to create issues amongst collaborators. In order to keep these differences small, a decision was taken to focus more on underlying concepts than on an overarching theme of sustainability or even social sustainability.

During the design process, different strategies of narration were used regarding the storylines for the project progress. Some were more subliminal and tied into everyday conversations in the project flow, some were used intentionally to spark creativity or to fuel a discussion within workshops or group discussions.

In retrospect, there are three distinct strategies visible which stand out and are important to be described as they are sometimes more covert or subtle. Nevertheless, this dimension is but a side note, covering it in depth would exceed the limits of this work, hence making it a subject for further study.

The **first strategy** is the overall narration of the research scope, which lies on the researcher's side, and leads to a communal understanding of the groups goals and ties the community together. All basic communication through posters, flyers, letters and such can be counted into this strategy, as well as community-sided project descriptions.

The **second strategy** is the narration of designerly approaches and processes in workshops or in the use of tools and methods. It focuses on micro-communication in the overall process. Most of the participants and collaborators in the design projects were unfamiliar with design and its related methods.

The **third strategy** relates to the reframing of results of the design project towards the research community and vice versa, often meaning the translation of results in the respective jargon.

During the process, there were numerous outcomes that stood out. Although many interesting results were produced, I will only go into, most notably, the development of the Hybrid Letterbox, the re-construction of benches as well as the design of a neighborhood network for the Fischerinsel. The topics approached with these developments are reflected in the subsequent formation of the action repertoire for transformation.

3.3. Exploring Knowledge Sharing in Urban Neighborhoods

Berlin is a multi-faceted city enriched with diverse neighborhoods and quarters (so-called "Kieze"). History has played a major part in the forming of this rich and diverse urban space. Regarding ethnicity, income level and the unemployment rate, there is often a rather harsh transition from one Kiez to another. Some are confined to a specific space, creating their own village-like feel, some blend into each other. Nevertheless, the majority of inhabitants of these "Kieze" identify themselves with their surroundings, talking about themselves, e.g., not as Berliners but as "Kreuzbergers" or "Neu-Köllners". The fragmentation of the city into numerous sub-cities, each with their own mayor and their own city center, caters to this unique way of seeing oneself in his city.

Engaging stakeholders in the project.

Finding suitable project partners in such a diverse city proved to be a challenge of its own. After getting an overview over the numerous groups and individuals who play an active role in the shaping of their neighborhoods, three groups were chosen to be contacted. This decision was based on the way they already approached issues of sustainability and inclusion into political processes and on their openness to researchers proposing yet another project to them. Another aspect was the use and employment of technological tools in their practice as well as the organizational ties to an institutional framework.

A so-called quarter management (Quartiersmanagement)- a federally funded community institution with projects ranging from organizing neighborhood events to managing local social initiatives- a timebanking organization (Tauschringe) and a seniors' computer club were visited. The objective in these initial conversations was to understand the motivations of the participants to be active, which services and objects are likely to be shared, and how their initiative is organized. Participants offered a spectrum of services ranging from mundane tasks such as transport, home repair, housesitting, babysitting and grocery shopping to highly specialized services such as language tutoring, filing taxes, yoga instructions and computer repair. The encounters with the time banks and other initiatives led to constructing design games and interventions.

During a series of observational walks, the Fischerinsel area was explored regarding its architectural specificity, involvement of governing institutions (e.g., Baureferat, Grünflächenamt, Senat), the frequency with which residents and visitors roam the area, as well as how common communication interfaces such as doorbell plates, front doors and mailboxes in residential walk-up apartment buildings are used as alternative means of in-direct communication.⁹⁶ The gathered

⁹⁶ We looked at how interfaces such as doorbell plates, mailboxes, bulletin boards, etc, are currently being used by neighborhood residents as communication interfaces, either as intended, or through creative misuse. We categorised these interfaces according to types of communication conducted through their use and reflect on their location and the subsequent effect this might have.

information was mapped visually, in order to show the activity on site as well as potential weak spots that would allow for interventions by locals.

The usage of common communication interfaces such as doorbell plates, front doors and mailboxes in residential walk-up apartment buildings were explored. These interfaces can be understood as **thresholds** that mediate transitions and interaction between the public space of the street and the semi-private/semi-public space of the corridor, staircase or courtyard, which finally leads to the private space inside of the single apartments.

Many of the thresholds that were found were creatively re-used or appropriated. Handwritten notices in corridors, stickers on mail boxes, and post-it notes on doorbell plates and doors showed that neighborly communication has found its way into the existing infrastructure, which is obviously not made for the task of providing a communication interface for the neighborhood.



Fig. 26. During the field research in the neighborhood setting, a wide spectrum of different strategies of communication and sharing was observed

The observations illustrated how existing infrastructures restrict and limit the appropriation of thresholds for the purpose of communication: the “official” communication interfaces like bulletin boards or the standard labeling of doorbell plates and apartment doors do not promote new ways of appropriation by design. Users within their everyday life experiences adapt these interfaces to fit their specific needs. Nevertheless, these adaptations towards supporting existing sharing practices are still rare.

In the course of the early observation sessions, several communication characteristics tied to thresholds were identified, which then guided the early “sharing phase” concepts along with the idea to overcome communication thresholds through designerly intervention or action. At a later stage, these thresholds would provide the impulse to design analog-digital artifacts that bridge and overcome them:

Synchronous and asynchronous communication: While immediate feedback by intercoms and telephones provide the sense of immediate or direct feedback, notes on doors provide a rather asynchronous way of communicating.

One-to-one and one-to-many communication: one of the most frequent ways of communicating with, e.g., neighbors or the neighborhood, is through handwritten notes aimed at either specific single individuals, like the postmen, or towards a bigger group such as fellow residents.

Peer-to-peer and centralized communication: While peer-to-peer sharing activities could not directly be observed in the neighborhoods that were investigated, there was one instance of a “sharing box” where unneeded things could be left which others could take and in turn leave something else behind.

Bottom-up and top-down communication: Frequently popping up in conversations with locals was top-down information by landlords, housing companies or the municipality which were mostly posted in glass-encased bulletin boards under lock and key. While neighbors most of the time were not allowed to add information, e.g., regarding block parties, community meetings and such, to the board, they created their own open information spaces on their mailboxes, the door, walkways and corridors.

Neighborhood Labs has been a collaborative effort (with my fellow researchers looking at the field through a slightly different lens), so after researching possible neighborhoods of interest, we did more observational walks, visual explorations, discussions with active groups or clubs as well as small workshops which allowed us to share our interest and shed light on our projected research.

Sharing knowledge & collaborative learning.

I have mentioned before that the thematic focus shifted during the project process. However, it remained in the realm of sharing knowledge, enabling participation and collaborative learning.

The first participatory design workshops were conducted to understand the neighborhood context, the relationships residents had with their neighbors, to gather existing knowledge sharing practices and assess the potential for sharing systems by employing tools such as propositional cards and generative tools. The activities were announced through the existing channels of the visited groups and were open to everyone. Consequently, most of the participants were steady visitors of, e.g., the quarter management’s activities or of the seniors’ computer club activities. There were, on average, six to eight participants per workshop, allowing the researchers to engage with the people more intensely, also including un-structured and free discussion.

Initially contacting groups and individuals rather than looking at the areas from an urbanistic or infrastructural point of view provided a rather subjective view of the surrounding areas. While this has been important for building up relationships, the demographics and infrastructure came into play when finally selecting one setting.

Most prominently, through sharing knowledge about the place and its inner workings and through a series of observations, walks and workshops alongside conversations with involved stakeholders, the participants were able to put forward enough pressure for the city to re-model the benches in the neighborhood.

3.4. Local Setting

It is important to note that the setting in which the projects have been conducted is crucial to the outcome and process along the way. In projects such as this, defining the setting and incorporating it in the research design is a crucial part, which determines - along with the stakeholders - the progress of the research process. The research setting in this sense is defined by the geographical boundaries as well as the stakeholders with their requirements, needs and limitations involved.

Geographical boundaries - local urban space: The Fischerinsel.

The specific, geographically constrained area of the Fischerinsel in central Berlin, formed the base to gradually build up a living lab and engage local stakeholders. Starting from scratch, with no previous involvement, it was also necessary to find an already active group in the area. In the preliminary field research, several groups in different areas were approached personally or through letters and emails which explained the research interest and called for their participation. As described earlier, the groups were mostly open for collaborating with us, but expressed concern stemming from previous collaborations, where researchers “used them for research purposes, left nothing behind and discarded them”. The issue of a long-term engagement, continuity and sustainable actions through such a project was made a pivotal topic throughout the project, since it fostered continuous participation and was directly called for by the groups involved.

When looking for a setting for the project, the preliminary research paved the way for the Fischerinsel in central Berlin. Based on a brief internet search and neighborhood walks, several active groups in Berlin were chosen to be approached for the project. They were chosen based on types of activities, location and use of online media.

This came to pass when different active groups in several Berlin neighborhoods were approached and asked whether they wanted to take part in a participatory design research project. The project proposal was presented through posters and a discussion within groups on the Fischerinsel, the Quarter Management Donaustraße and a neighborhood group in Berlin-Moabit.

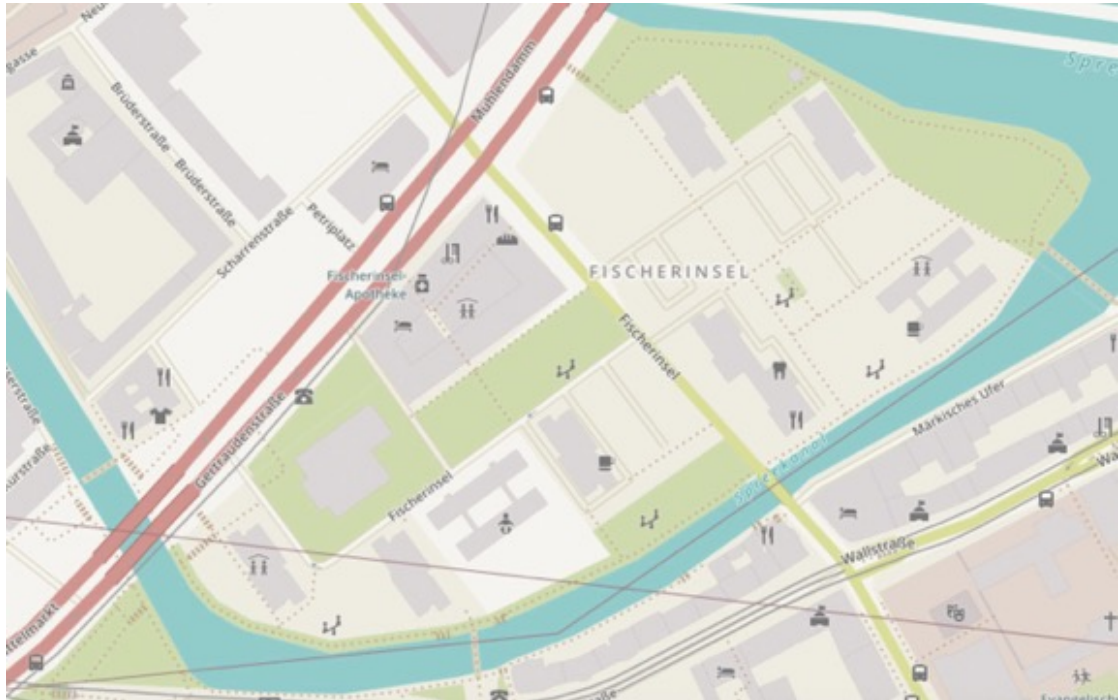


Fig. 27. The Fischerinsel, in central Berlin.

As briefly mentioned in the overview before, the Fischerkiez is a small quarter located in the southern part of the Spreeinsel in the old center of (East-) Berlin with a population of about 2200 people. One of the crucial aspects of it is that its location is fairly central and close to highly frequented places like the Museumsinsel and Alexanderplatz. It has a very central position in the city and is bordered on one side by the river Spree and an 8-lane-street on the other. It is not an official quarter, but part of the larger Luisen-quarter, which borders on one side to Alexanderplatz and on the other to North-Kreuzberg.

Originally planned and built as an area for wealthy traders and fishermen in the 15th century, the Fischerkiez evolved into a living area for the low-income population in the middle of the 19th century and thus experienced no further development, which is presumably one reason for the preservation of its medieval character until after World War II, whereby the neighborhood remained astonishingly unharmed by the bombings. During the 1960s and 70s, socialist city planners did not restore but destroyed the remains in order to build an exemplary multi-apartment housing complex. Due to the very close location of the Fischerkiez to the border of former West Berlin, these high-rise buildings were planned to represent the strong and modern GDR as well as to set an example of panel construction on a larger scale. The site was mainly inhabited by privileged and loyal GDR citizens as well as GDR functionaries.

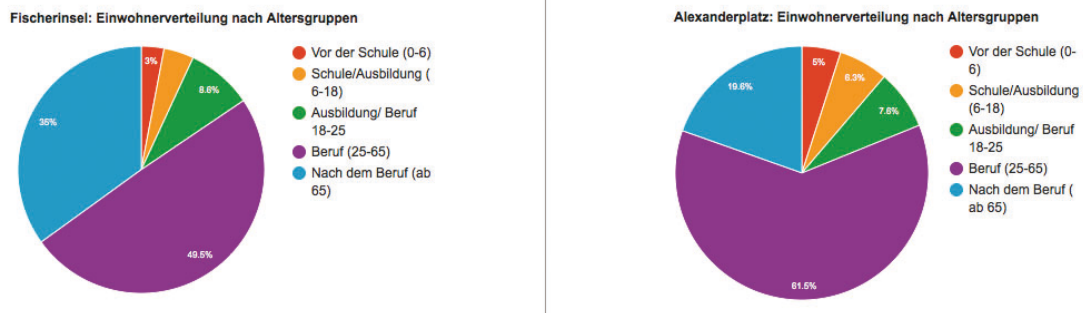


Fig. 28. Compared to the neighboring area Alexanderplatz, where only about 20% are above 65 and more than 60% are between 25 and 65, a considerable part of the population on the Fischerinsel (35%) is above the age of 65 while about 50% are between the ages of 25 and 65 (Statistics Office Berlin-Brandenburg 2011). On the Fischerinsel, a large share of senior inhabitants moved there before 1989 and regard sharing practices, common spaces and community activities with a different view than the new-Berliners who just arrived.

Before the fall of the Wall, the local inhabitants had experienced the prescribed work inputs, so-called “Subbotniks” (rus.: little saturday), unpaid voluntary work which usually took place on a Saturday. It was not uncommon for the regime to exert indirect pressure on citizens to partake in these activities, since privileges like larger apartments, cars and foreign worker exchanges were tied to it. One of the presumed effects of these work inputs was to strengthen the bonds between citizens and their ties to the socialist regime. Consequently, the participants had certain reservations towards the proposed issues and related tasks that the group were discussing, e.g., maintenance of the park benches, or cleaning the walkways around the Fischerinsel, regardless of the fact that these activities were truly voluntary and self-initiated by the group.

Despite the central position of the high-rise buildings and the close proximity to landmarks like the Red Town Hall or the Alexanderturm and Kreuzberg around the corner, rents are still affordable. The result is that younger families move there, and investors also buy up apartments and leave them empty or transform them into vacation apartments. Regarding ownership of the land and responsibilities for its care and maintenance, the Fischerinsel is quite fragmented. Some parts are privatized, and some are in public hands. There is basic infrastructure including a grocery store, three restaurants, a pharmacy, an insurance company, several doctors, a senior care facility, a theatre-pedagogic institution, a quarter center and some privately organized initiatives.

Socio-cultural boundaries.

In terms of the socio-cultural boundaries which sometimes extend beyond the geographical boundaries, the theatre-pedagogic institution “Kreativhaus” serves as a central hub for most organized activities on the Fischerinsel. They opened their doors around 1992, moving into the former childcare center on the southeastern side of the island. Within their center they offer a vast amount of wildly dispersed, diverse activities, which show the complexity of the local network.

The shared domain of interest was the common ground to start from. In the case of the Seniors' Computer Club Berlin, this involved learning to use a computer and related technologies, as well as knowledge sharing in general.

Call for quarter-management.

The socio-political measure of the Quartiersmanagement was called for frequently within the groups of participants for the project. This federally funded measure of monitoring and support for areas specified as "problematic" is linked to the program "social city", which began in 1999 with mixed success. Problematic neighborhoods or quarters are, for example, those where an increased number of crimes take place or where there is a certain percentage of inhabitants who live on social welfare. A quarter management "deals with the preservation and strengthening of social cohesion of a city quarter. Different projects, developments and measures are undertaken with a variety of partners. Quarter counselors operate as the mouthpiece of the quarter" (Eckardt, 2005).

Quarter managements were introduced in the light of a social decline and a dilapidation of urban space in certain parts of the city during the 1990s. This includes, for instance, local playgrounds, parks and common spaces. These measures are part of the federal program of the "Social City" which is set up to counter the aforementioned issues and to push social and economic change in cities.⁹⁷

One of the reasons why a quarter was chosen that has no quarter management is that, to the project team, it was interesting to look into the dynamics that develop without such a measure. Do local inhabitants become active, do they organize around topics which they are concerned about?

On the Fischerinsel, there is no quarter-management which tends to the problems regarding the neighborhood. It is not regarded as a problematic area since lots of the issues, such as immobility, loneliness of some of the inhabitants of the high-rise buildings or discontent with the run-down playgrounds, paths and benches, are beneath the surface. Numerous groups have initiated actions for change in the neighborhood. Some, like the SCC, focus on digital education for senior citizens, others like Rat & Tat focus on support structures for elderly and ill people in the high-rise buildings.

While the sheer amount of activities is not transparent and is lost on a complex website along with chaotic information displays, banners, flyer stands, etc., there are several core themes that the Kreativhaus focuses on.

The different active groups, according to the description by inhabitants, coexist but rarely interact due to widely differing living situations and diverging experiences. This would be information to be scrutinized further, since it surely represents the subjective point of view of a few. A counter-argument by one of the inhabitants was that she specifically moved to the area, into a high-rise building, "for the view over Berlin and the right to be left alone". The architectural structure and the layout of the neighborhood itself is broadly perceived as anonymous and cold,

⁹⁷ The federal funding for urban development has existed since 1999 (see http://www.staedtebaufoerderung.info/StBauF/DE/Programm/SozialeStadt/soziale_stadt_node.html)

former common rooms as well as a mall-like passage that functioned as gathering places are now deserted or used otherwise. Despite having large recreational areas such as playgrounds and greenery, it is commonly perceived as an area which you pass through on your way to the more iconic areas such as Kreuzberg or Alexanderplatz.

This setting, with its unique position in the heart of Berlin, the Fischerkiez being exemplarily formed by the historic changes the city faced over the last 60 years as well as the open and engaged groups that we worked with in the area before, informed the decision to start the research there.

Every local urban setting has its advantages and disadvantages. Here, it was quite obvious that there was already a core of active citizens to include in the project. The question rather was whether the activities needed to attract more citizens from the high-rise buildings and engage them in the process in order to allow for generalizable research results. For the most part, we failed to engage more than the core group, which consisted of eight people, for a longer stretch of time. During the dynamic process there were several attempts to open the project to others, for example, by conducting a big neighborhood workshop where different groups were invited or being present at the neighborhood summer festivities. There were certain waves of engagement which were consistent with our being engaged and producing viable, tangible results.

Active Initiatives.

Since the project was constructed in a fluid process, it had to allow a certain flexibility in terms of the groups and individuals participating in it, thus opening it up to people from outside the Fischerinsel. The Fischerinsel consequently marked the physical and spatial boundary which is frequented by a diverse group of people not necessarily bound to the place but engaged in activities there.

In search for this *community of practice*,⁹⁸ a new one formed which had different objectives, shared knowledge and tools which all circled around the connection of actors within the local neighborhood Fischerinsel. Starting as “peripheral learners” we were gradually integrated into the community of practice. The initiatives involved in the project develop a collective know-how which is drawn from working together which goes far beyond technical knowledge towards tacit, situated knowledge. According to the principles of citizen participation, there were different types of involvement in the projects which shifted throughout. Wenger-Trayner subsumes several types of participation in the following way:

“Whereas it might be quite clear which kind of common ground the members of the community cover, regarding inherent notions of sustainability or sustainable lifestyles which encompass these common grounds might vary fundamentally.

⁹⁸ Lave and Wenger originally coined the term community of practice (Wenger, 1998). It relates to the concept of tacit knowing.

Core group: a relatively small group of people whose passion and engagement energize and nurture the community

Active participants: members who are recognized as practitioners and define the community (though they may not be of one mind as to what the community is about)

Occasional participants: members who only participate when the topic is of special interest, when they have something specific to contribute, or when they are involved in a project related to the domain of the community

Peripheral participants: people who have a sustained connection to the community, but with less engagement and authority, either because they are still newcomers or because they do not have as much personal commitment to the practice. These people may be active elsewhere and carry the learning to these places. They may experience the community as a network

Transactional participants: outsiders who interact with the community occasionally without being members themselves, to receive or provide a service or to gain access to artifacts produced by the community, such as its publications, its website, or its tools." (Wenger-Trayner, E. (n.d.). Levels of participation. Retrieved June 11, 2018, from <http://wenger-trayner.com/resources/slide-forms-of-participation>)

Kreativhaus.

The mother organization of many initiatives on the Fischerinsel describes itself as "a cultural and community center with social and cultural activities for children, youth, adults and senior citizens. It is Berlin's first Theater Education Center (TPZ), Mehrgenerationenhaus (MGH), Family Center Fischerinsel (FZF), since January 2015 it is district center as well as coordinates activities for the district of Alexanderplatz and since September 2016 it is a Cultural Education Association Center. It is dedicated to the promotion of art, culture and education by means of creative play and theater." (retrieved from kreativhaus-berlin.de/uber-uns/das-kreativhaus, 05.02.2018.)⁹⁹

The Kreativhaus provided space and was open to collaboration throughout the research process.

Seniors' Computer Club Berlin-Mitte.

As part of the Kreativhaus e.V., they provide formal and informal courses to senior citizens who want to learn about novel technologies and tools. The stakeholders are active on the Fischerinsel in central Berlin and have played a major role in co-developing the early prototype of the Hybrid Letterbox, which serves as a basis for this project.

⁹⁹ In their description they give a glimpse into the vast amount of activities which seem to overburden both the Kreativhaus and the attached initiatives such as the SCC and Rat & Tat.

Their members are all above the age of 60, five of them as steady contributors to the project, making them an important partner for the testing and implementation of the project. They formed the steady core group of the research, co-developing the project as well as the attached research and design questions.

Rat & Tat.

The group formed as part of the Vernetzte Nachbarschaft project and aimed at helping elderly and immobile citizens in the high-rise buildings in tasks such as going shopping, getting to the doctors and in general going out into the neighborhood. In the project, the Rat & Tat group moved from being active participants to being peripheral participants when their own project progressed.

Nachbarschaftsinitiative Spittelmarkt.

This neighboring initiative is not directly placed on the Fischerinsel but nearby. Its members focus on the development of an active neighborhood. Although much smaller, it has a similar scope as the Kreativhaus. Their role in the research was to give impulses from outside the Fischerinsel and to test especially one of the resulting prototypes, the Hybrid Letterbox. They can be identified as “transactional participants”.

Building trust.

When presenting an initiative with the idea of a research project, trust is a factor to be accounted for. In the attempt of setting up Neighborhood Labs, one of the first questions was whether we, as researchers, would only do our project, get research results and then vanish. The SCC had their experiences and thus were very carefully where to engage their precious resources and little time. In turn, our approach was to enter the neighborhood ecosystem very slowly and carefully and eventually be part of it as active participants in the club life. We eventually seized a spot in their course plan with monthly open meetings of the “Vernetzte Nachbarschaft”.¹⁰⁰

¹⁰⁰ Participant enfants terrible: We did experience a couple of interferences regarding participants during a phase when the project work quieted down a little bit and there were decisions to be made regarding how to proceed. A new participant came into the group through the SCC who wanted to fill his free time and be active. He indicated that his background was in project management, and now, being a retiree, was looking for some diversion. While the existing group was reserved regarding his involvement, we took the opportunity and included him in the project, as it was open to everyone. It turned out that the mechanism and processes we were accustomed to through the three years of collaboration would be blown open by this participant who had very strong opinions about how a process (of innovation) should work. Interestingly enough, he proposed a way forward, and tried to force it on the group that responded by rejecting him (in sometimes very blunt language).

3.5. Concept Iterations

Going through the process of three phases in this research, and based on the respective assumptions, several concept cycles were navigated. While I refrained from going into the overall process linearly, I am pinpointing three distinct concept channels related to the phases.

In the "sharing phase", based on the threshold interfaces identified before, concepts were developed very quickly in order to get a wide range of ideas across to the group. This phase can be characterized as a fuzzy front end, where questions as well as pathways through the project were open. In the "infrastructure phase", some of the concepts discussed early in the sharing phase made their way into the second phase of infrastructure, where they evolved or provided sparks for an ongoing discussion. In the "transfer phase", no completely new concepts, methods and tools were developed, but existing ones were refined and put to use in a different context in other projects.

3.5.1. Concepts Developed in the Sharing Phase

These concepts formed the basis for discussion with the Fischerinsel group and provided sparks for feasible projects to come. The concepts were derived from the observation and mapping of threshold interfaces which were conducted before. Threshold interfaces in this sense are interfaces between communication thresholds, e.g., a phone for person-to-person communication, a door for face-to-face conversations, etc. The focus here was on identifying possibilities of sharing goods and services, but also expertise and knowledge, catering to the notion of sufficiency and identifying communication and sharing as a key to sustainable ways of living. Using a threshold interaction matrix as well as personas, approximately 50 initial concepts and scenarios were generated, which were then, together with the stakeholder group, evaluated regarding their feasibility in the project context. Some of these initial concepts, e.g., an analog-digital letterbox, were later taken up again and developed further.

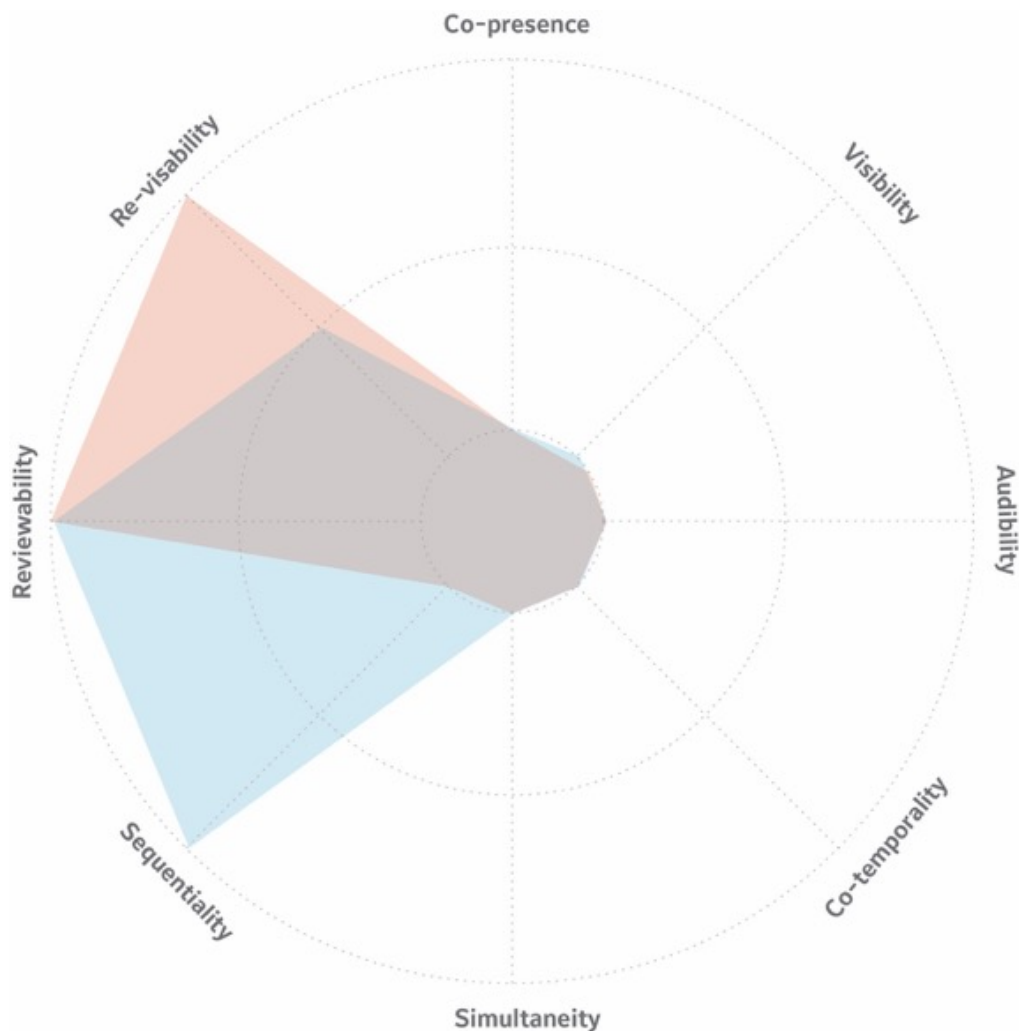


Fig. 29. The interfaces were mapped out on a specific matrix, considering the eight parameters of grounding communication characteristics (co-presence, visibility, audibility, co-temporality,

simultaneity, sequentiality, reviewability, and lastly re-visibility¹⁰¹) as well as the location of the interface (public, semi-public, semi-private or private space). This example shows the mapping of a traditional postbox in an apartment building. Here the communication is characterized as sequential, reviewable and re-visible.

Based on the following initial heuristics, the research group mapped the threshold interfaces against communication and sharing ideas, which allowed the group to look beyond traditional ways of using the interfaces and to imagine other interaction possibilities, with or without the support of technology.¹⁰² The following heuristics stand out as results of this first phase:

Promote locality: Fit into existing contexts (social/habitual/architectural).

- *Neighborhood sharing solutions, goods-based or knowledge-based are to be implemented within the local social, habitual and architectural context.*
- *Involve as many different local stakeholders as possible (landlords, residents, housing companies, city officials, passers-by, business owners).*
- *View local architectural conditions and constraints as opportunities.*

¹⁰¹ “1. Copresence: A and B share the same physical environment. In face-to-face conversation, the participants are usually in the same surroundings and can readily see and hear what each other is doing and looking at. In other media there is no such possibility.

2. Visibility: A and B are visible to each other. In face-to-face conversation, the participants can see each other, and in other media they cannot. They may also be able to see each other, as in video conferencing, without being able to see what each other is doing or looking at.

3. Audibility: A and B communicate by speaking. Face to face, on the telephone, and with some kinds of conferencing, participants can hear each other and take note of timing and intonation. In other media they cannot. An answering machine preserves intonation, but only some aspects of utterance timing.

4. Co-temporality: B receives at roughly the same time as A produces. In most conversations, an utterance is produced just about when it is received and understood, without delay. In media such as letters and electronic mail, this is not the case.

5. Simultaneity: A and B can send and receive at once and simultaneously. Sometimes messages can be conveyed and received by both parties at once, as when a hearer smiles during a speaker's utterance. Simultaneous utterances are also allowed, for example, in the keyboard conferencing program called talk, where what both parties type appears letter by letter in two distinct halves of the screen. Other media are cotemporal but not simultaneous, such as the kind of keyboard conferencing that transmits characters only after the typist hits a carriage return.

6. Sequentiality: A's and B's turns cannot get out of sequence. In face-to-face conversation, turns ordinarily form a sequence that does not include intervening turns from different conversations with other people. With email, answering machines, and letters, a message and its reply may be separated by any number of irrelevant messages or activities; interruptions do not have the same force.

7. Reviewability: B can review A's messages. Speech fades quickly, but in media such as email, letters, and recorded messages, an utterance stays behind as an artifact that can be reviewed later by either of the partners or even by a third party. In keyboard conferencing, the last few utterances stay visible on the screen for awhile.

8. Revisability: A can revise messages for B. Some media, such as letters and email, allow a participant to revise an utterance privately before sending it to a partner. In face-to-face and telephone conversations, most self-repairs must be done publicly. Some kinds of keyboard conferencing fall in between; what a person types appears on the partner's screen only after every carriage return, rather than letter by letter.” (H. H. Clark, Brennan, & others, 1991)

¹⁰² The ideas and concepts as well as the threshold interfaces are collected in the Annex.

- *Enable access control for a sense of locality and strengthening bonds between active stakeholders.*
- *Take into account complex social structures, which may alter the implementation of a sharing service.*
- *Respect local habits, routines, practices, e.g., be apartment / neighborhood bound and provide exclusive access for certain purposes and stakeholders.*

Be transparent in use.

- *Transparency in use facilitates trust amongst users, and it refers to privacy in that it should be clear to users to what extent they are involved in sharing practices.*
- *Appropriate solutions are designed in such a way that users are not obligated to participate or disclose personal information and their privacy rights are protected.*
- *Opt for clear language and a clear-cut description of what is offered.*

Foster social structures.

- *Systems must foster already existing social structures, and solutions are ideally supporting face-to-face contact.*
- *Solutions should enhance rather than replace interactions with neighbors.*

Be flexible in use.

- *To ensure an inclusive culture of use, systems must be flexible to allow for the multiplicity of inhabitants and their respective technical literacy.*
- *Must be an inclusive system, where those without a computer can still use it.*
- *System does not rely on users with access to computer systems.*

With the project still in an orientation phase, it yielded very open concepts and interaction ideas. The most prominent concept examples, some of which were taken to early prototype phase were:

Sharing point.

In general, this is a very centralized solution to sharing. It relates to the original idea of a bulletin board as a central information access point. It lets people access the neighborhood network through a booth, compartment or board in the semi-public space of the entryway or lobby. It can be understood as a system that facilitates and encourages mutual sharing.

In addition to the central sharing point, the system could include analog as well as digital ways of (remote) access (keys, pc, mobile phone). There are several aspects to keep in mind for this concept. First of all, there are different access rights that describe the relationship between the inhabitants which can be categorized as “friend”, “acquaintance”, “neighbor”, “stranger”. In order for the concept to be inclusive, we need to think about different ways to access the sharing board. For elderly people,

this might mean that there is an analog part to the sharing board, where sharing offers are printed (or a traditional visual representation of an analog bulletin board message is posted).

The second aspect is the strengthening of neighborhood ties through sharing and the personal contact it involves. If you want to borrow something or respond to a service offer, you still contact the person that is sharing.

You could also imagine the concept as a room you enter which scans your key and access level and lets you see sharing objects on a multi-touch screen or even 3D holographic images. You can offer things to share and use services and products offered by others.

We identified several different neighborhood settings which we categorized in a very simplified form as “district”, “high-rise buildings” and “apartment buildings”. The concept should be scalable to these settings (sharing boards in a neighborhood setting are connected to each other). The system

- *is semi-public*
- *centralized*
- *a combination of analog and digital*
- *peer to peer*
- *easy to use*
- *focuses on one to many, one to one communication*

Analog sharing area.

Drawing inspiration from the doormat as an object located at the last threshold between the semi-private (and in some cases semi-public) space, the analog sharing area is a decentralized concept of sharing, where the doormat (as metaphor) area is used as a “dropbox”, but also a “depositbox” for items. By dividing it up in two areas, one for taking and one for giving, the doormat performs as a sharing interface. Its location outside of the private sphere directly influences its appropriation: the objects typically found here would mostly likely be such that they are not of extremely high value. Such a doormat could also mostly be used to share objects, due to its analogue, physical character. Being peer to peer also bears influence. Once again, being person (or household) bound through its location, it will attract sharing offerings directly related to the owner of the doormat as opposed to offerings for the general inhabitants. The act of giving away objects, on the contrary, will be much more un-addressed: offerings would be made available for all passersby. Being so open in its use is also favorable from the point of view that the decision to give something away is completely left to the choice of the individual inhabitants: they have complete control of what items they are offering.

The benefits of such a concept is that it is directly inspired from existing practices and its usage does not require any knowledge of technology but merely an understanding of the practice of sharing and perhaps the understanding of which area is to be appropriated for which function (e.g.,

left for giving away, right for taking). As such, it is easily implemented. This concept leaves room for re-appropriation and adaptation by the inhabitants of the neighborhood but limits the kinds of services and products to be shared.

The nature of the neighborhood directly influences how such a sharing doormat could be used. Its lack of technical or blatantly obvious communication channels translates to neighbors being connected socially to some extent before sharing will take place. Conversely, the act of facilitating the giving away of some (unneeded) possessions might be a good catalyst in developing such social connections.

Doorbell history feed.

A classic, stand-alone doorbell only provides a co-temporal signal when both parties are co-present. Imagine if doorbells had reviewability and didn't require co-presence. The doorbell history feed is a solution that allows residents to review their doorbell usage in timeline format.

With the classic doorbell, the resident doesn't find out who was there, what somebody wanted, or how to contact the person who rang the doorbell. To alleviate this, the doorbell history feed allows visitors the option to leave a voicemail, which would be assigned to that activity entry in the feed. Another variation of the idea would be if the doorbell acted also as a snapshot button. So, each activity entry in the feed would have a snapshot of that particular moment in the doorbell's history.

This alleviates the stress of busy residents who feel that they have to wait at home in case of missing a visitor. With the doorbell history feed, they could potentially follow up with the missed visitor. Nevertheless, it invades the privacy of visitors who might not want to be identified.

While these concepts specifically targeted the notion of sharing in terms of objects but also services, they were also useful to open up an arena for debate with the stakeholders, moving past existing solutions imagining extreme use cases and future scenarios.

3.5.2. Infrastructure Phase Concepts

There were two major project streams that were proposed to the stakeholders where concepts and ideas generated in the first phase were embedded in larger scale settings and put into context:

A bottom-up initiative for social sustainability.

This started a discussion on community clean-up as a first common interest which meant improving the walkways together with other initiatives with the goal of creating a sense of ownership of the area. As a specific goal (coming from the core group), the re-modeling of a group of park benches and re-planting of flower beds in front of the SCC-club location was chosen. Through this activity, the core group intended to spread the word about the *Vernetzte Nachbarschaft*, the connected neighborhood, as a platform for exchanging ideas, specific knowledge (e.g., computers, gardening, etc.) and tools.

While this first concept relates more to the idea of bringing neighbors together, it shows that the core group of the SCC has partly taken over authorship of the project and provides their ideas of improving the social and material fabric of the neighborhood. They chose a topic which was closest to their needs and organized themselves towards this common goal. In the months that followed, the group put up an effort to organize a neighborhood event, put pressure on the local communal greenery-service and the company in charge of infrastructure on the island and spread the word of the project itself.

This would be the pivotal point for the research, since it produced a first tangible result as well as momentum for continuation. The specific project which was identified by the *Vernetzte Nachbarschaft* group created enough pressure on the local decision makers, proprietors of the land and caretakers of the greenery that they were supported fully in the process.

Analyzing the results of this first research phase, several insights emerged through the work with the stakeholders of the Seniors' Computer Club and the Kreativhaus. The reflections following this phase were as follows:

The ones that took part in the project were motivated to be a part of the information society. However, they were not interested in just learning (about) the technology, but they also wanted to use it to facilitate everyday communications with their friends and families. They wanted to meet like-minded people and strived for a sense of belonging, e.g., in a community of practice that shares common interests. In the case of the SCC, they were mostly interested in passing on knowledge from former professional life to people in need. Furthermore, the participants were eager to start something new at the current stage of their lives because they wanted to stay active and establish and maintain social contacts.

There was a certain pride in the use of current information technology in the core group of the club. They use online tools to get organized and help all of their members to do so as well.

Inter-generational collaboration and contacts were of less importance, and they emphasized the fact that all members are above the age of 65. However, they were aware that their communication goal focused on 'reciprocal learning' rather than single directed knowledge transfers, which in the future may require them to dissolve the age restriction they put in place. All participants were, in the long run, more interested in the social contact than in the learning experience. The longer they have been part of the club, the more they have grown into advisors and teachers, providing their knowledge to others.

Through knowledge exchange, supported by designerly methods, tools and interventions, the group has been fostering social interaction and creating new links between the participants.

A digital platform and hub for interaction.

In addition to the bottom-up initiative, the digital-analog hub served as a stage for all activities on the Fischerinsel, complemented by analog communication boxes in the high-rise buildings with dedicated ambassadors which redistributed the offline content. A commercial space was subleased for a period of four weeks in order to create a physical presence on site and to promote the Fischerinsel platform.

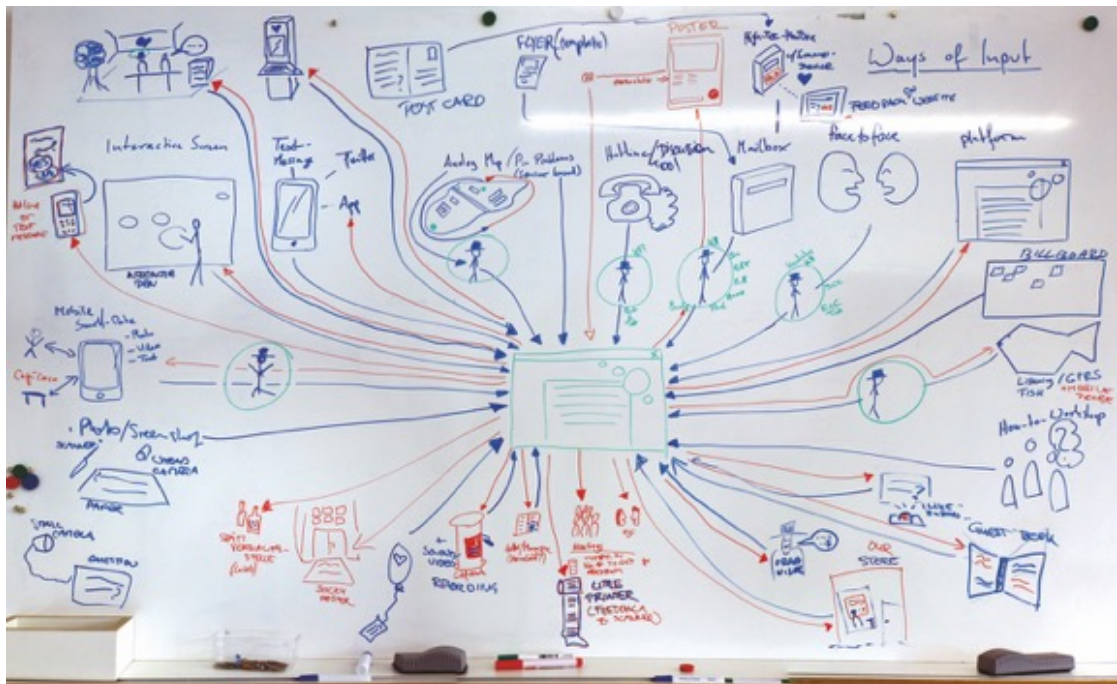


Fig. 30. Brainstorming ideas for the platform focusing on a digital-analog mix of access points.

The gathered ideas for communication and interaction points always promoted the inclusion of inactive or immobile or technically unversed citizens into the process with the goal of creating a platform of participation which deals with questions from organizing a community event to being able to participate in communal decision-making processes (e.g., regarding major construction on the island).

An **idea machine** provides a printed idea regarding the Fischerinsel (such as “we want to do a community barbecue” or “we want to plant some flowers”) when you enter an idea that you would like to post to the community. The ideas come with a location, the place and a time when the intervention or action is going to happen.



Fig. 31. Here, the example of one of the analog-digital device ideas is set in context. The idea would eventually progress into the Hybrid Letterbox, which was described earlier in this text.

As an ongoing analysis of the research process and in reflection of the workshops and interventions we did, a framework of transformation in urban neighborhoods was developed. The framework hinges on work within community organizing as well as participatory research and is a first step in identifying specific tools and methods for different phases of a participatory design process which acknowledges the different roles participants can take and the different levels of involvement that are possible within a project.

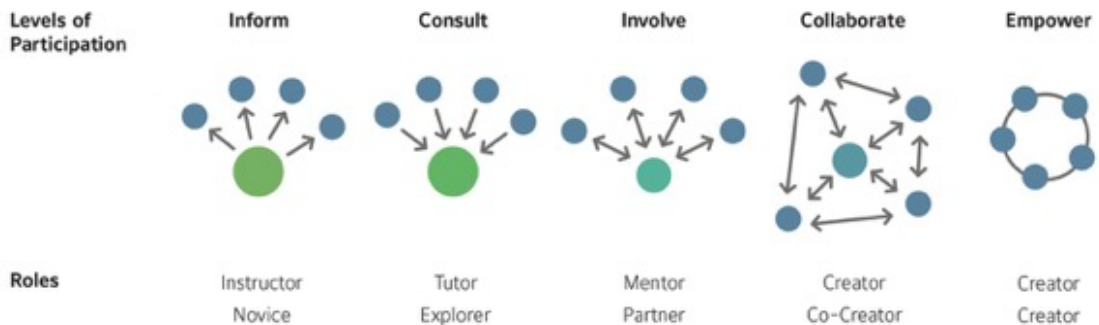
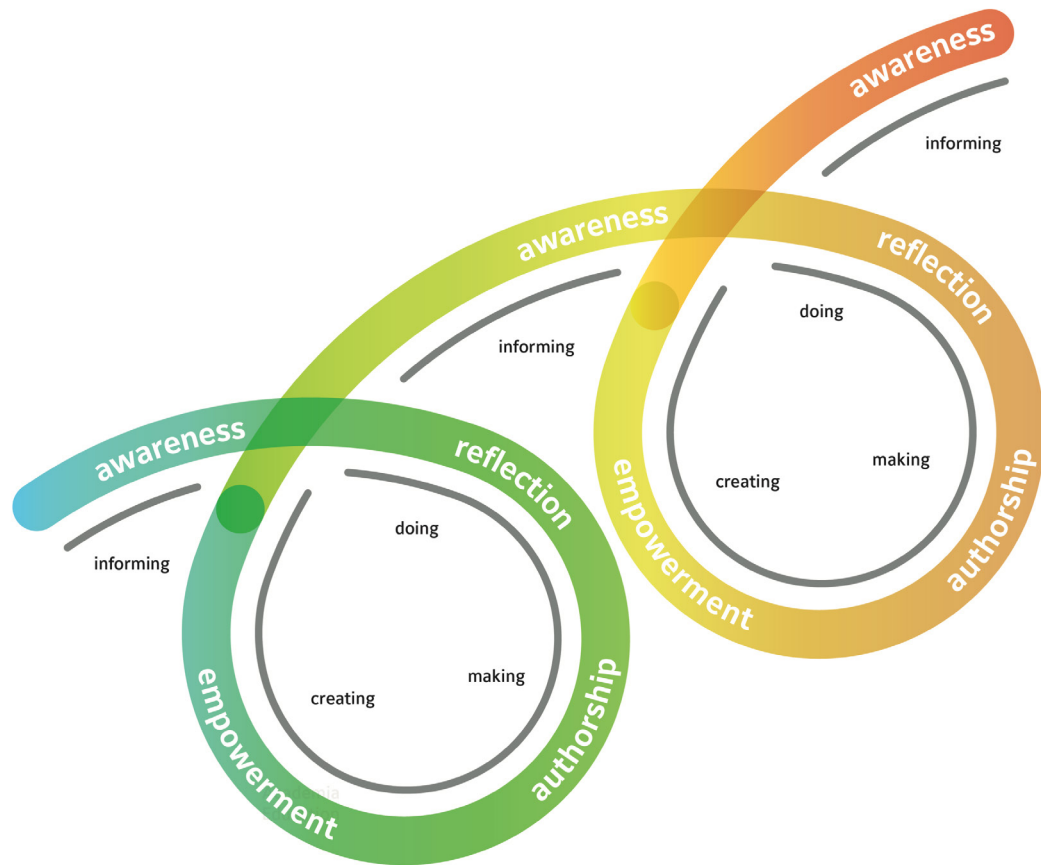


Fig. 32. Levels of participation in relation to the role-pairs that can be taken on, as well as their transformation in the process.

In a first version, the framework incorporates four stages of engagement (informing, doing, making, creating) as well as four types of participant roles (novice, explorer, co-creator, creator) and four types of ambassador roles (instructor, tutor, partner, mentor).



.....>
Cycles of Transformation

Fig. 33. The cycles of transformation in the project process show an idealized model of transformation which includes the aforementioned phases but is not necessarily linear.

Thus, this phase rather served for directing the research project and providing a guiding frame for further endeavors.

3.5.3. Transfer to Other Communities and Projects

In transferring insights from the first two phases to other communities and projects, several aspects play an important role in the process. In some, said insights reflect the ones mentioned by living lab projects which ran for a longer term.¹⁰³

It has been established that it is important to consider the **social context** in which a system is implemented. In the conducted workshops and activities, it was clear that underlying social relationships are complex and sometimes influence the process in unimagined ways. This brings us to the point that local stakeholders must be taken into account anew when entering into a new context which might have the same theme or project goal. Also to be taken into consideration is the local, **place-based context**. As realized in the threshold observations and the subsequent interventions and prototypes, the context in which interfaces exist are crucial in determining the type of communication or interaction that takes place within it. Nevertheless, the boundaries may be shifted, producing entirely different results. For example, the exterior of a mailbox, because it exists in the semi-private sphere, is best appropriated for communication that is directed to individuals with access to an apartment, specifically to the owner of the mailbox. The posting on the outside also differs from communication posted inside: a message might be directed to the owner but also implicitly directed to the other inhabitants. The re-use of existing infrastructures, such as a mailbox, billboards, message panels, etc., is a familiar sight for citizens and thus prone to be the basis for new communication interfaces and adaptations. **Being transparent and open** in the process of entering a new context and proposing this design research approach to stakeholders is key, as is being transparent in the design of a supporting design infrastructure. Considering how diverse the technical abilities of citizens are, it is of importance to allow usage for equally diverse audiences. Lastly, it is crucial to **manage expectations** from the first encounter onwards. This has not been done in the very early stages of the project and has led to fierce discussions about which goals to set collectively and which outcomes were desirable for the stakeholder groups. Later, the research group adapted to this requirement in a way that we attempted to be open regarding the trajectory and goal of the research as well as benefits for the stakeholder group.

CHEST - Pushing the Hybrid Letterbox further.

In the aftermath of the Neighborhood Labs project, the research group was presented the opportunity to push one of the more persistent concepts, the Hybrid Letterbox¹⁰⁴ further and to rethink its technological setup as well as its interface to the Internet through seed funding. In a one-year project which was funded by “Collective enHanced Environment for Social Tasks” (CHEST), a

¹⁰³ this was mentioned before in the Chapter 2.2.3 Living labs for Sustainability

¹⁰⁴ The Hybrid Letterbox is a letterbox made of wood, with a digitization-module inside, which is used to photograph postcards that are thrown inside a slot on the front. We use visual markers to determine the area where the content is written and capture the area with a camera, which then saves the image on a local server. From this server it can be distributed to digital platforms such as Twitter, Wordpress or the Hybrid Letterbox Website. It is described in detail in Chapter 4.3.4

“33 month collaborative project co-financed with support from the European Commission through Framework Programme 7” which describes its objectives as follows:

To facilitate the generation of community derived ideas that address societal challenges, supporting knowledge exchange, the development of best practice, discussion and collaborative activity.

To invite social entrepreneurs from across Europe to submit their ideas through three open funding calls for proposals, which will then be evaluated by both the crowd community and external independent evaluators, with the highest rated proposals each receiving support for continued development and realisation.

To transform the novel ideas selected into viable added value social initiatives.

To communicate the results of the project across the EU and to engage with key communities, investors and incubators active with an interest in digital social innovation to ensure the sustainability of the programme with the potential to facilitate crowd funding to finance future projects and ideas. (retrieved from the CHEST website on Nov. 08, 2017)

The objective behind this project was to seek support from peers all over Europe and to find an evaluation framework which would provide suitable criteria for the evaluation of the Hybrid Letterbox as a network of bridge devices that work both in a local setting as well as a global, networked context. Another objective, one highly supported by the European Commission, was to explore the possibility of going to market with the second version of the Hybrid Letterbox.

With regards to the notion of sustainable design followed in this dissertation, it provided insights into the process of transformation and its evaluation (and the failure of quantitative evaluation criteria). While the initial prototype was developed from a user perspective, CHEST opened up a more technological perspective, pushing the iterative design of the Hybrid Letterbox prototype further.

The evaluation framework that was applied is the Social Impact Report, which focuses on the three dimensions of “community building”, “access to information” and “knowledge sharing” and is essentially a results-based reporting method that helps assess socio-economic, environmental and political impacts of a project. The Report is based on the Social Reporting Standard¹⁰⁵ and a methodological framework by the CAPS project IA4Si (Impact Assessment for Social Innovation).

How this Social Impact Plan would be problematic in terms of viable information of a real social impact becomes clear in the description of the framework. The evaluation tool, which was required to be filled by the project coordinators, included five sections: input, outputs, impacts (social, political, economical, environmental), assessment, reports.

¹⁰⁵ <http://www.social-reporting-standard.de>

While the framework helps systematically assess the project, its criteria are somewhat debatable. It requires the choice of several social impact indicators such as clicks on online events, tweets, retweets of project news, participation in workshops and online discussion about them. I argue that a quantification of such processes is rather difficult and more descriptive methods may be required. The possible change or the impact of the Hybrid Letterbox is not easy to put in numbers, but a social impact report provides a solid argument when evaluated within the commissions and governmental bodies which fund such projects.

The social impact of the project Hybrid Letterbox is described in the following paragraph:

By engaging with a small target group, which serve as change agents in their neighborhoods, we are expecting a rise of participation in local transformation processes. By including those active citizens in frequent co-design workshops, steady engagement and thus the possibility of sustainable action is increased. The final prototypes are deployed in the neighborhoods and will involve passers-by, neighbors as well as city officials or decision makers in specific questions regarding the neighborhood, thereby demonstrating the value of the provided tools. The involved groups are expected to post their concerns or ideas for the neighborhood with these tools, thus disseminating them in a broader way.

In the project, the existing stakeholder group of the SCC was once again at the core of the investigation and by putting them first and involving them in a fundamental way, they were assumed to value the outcomes more and see the output as their own, taking authorship of the project and possibly promoting it further. The project saw an implementation of the Hybrid Letterbox on the Fischerinsel lead by the SCC and the Vernetzte Nachbarschaft group, since they are familiar with the approach we have taken and have already played a major role in developing the first prototype. As mentioned before, possibilities to participate in societal change increasingly shift towards the digital and thus exclude a large portion of citizens who might also want to be actively involved but do not have access one way or another.

The group that we worked with are expecting to overcome some of the barriers posed by novel digital technology with the help of the Hybrid Letterbox. They already started to plan further steps without our involvement. In this sense, they have partly taken ownership as well as authorship of the project and are trying to implement it further and adapt it to their needs. With the Hybrid Letterbox they are able to include more people in local transformation processes. These are, e.g., building plans for the area, construction, social events on the Fischerinsel, local election processes, development of greenery and open spaces and improvement of pathways and the overall infrastructure of the area. They are able to widen the discussion with the Hybrid Letterbox website and to include those who are not able to access the internet through the use of postcards which are then posted online. The online content was in turn communicated through posters, meetings in the Seniors' Computer Club or the Kreativhaus on the Fischerinsel.

With the proposed solution, deliberation and communication processes can be given an additional dimension, as they provide an alternative medium for discussion. The subsequent tests within other projects such as the “Mit-Mach-Stadt Brandis”, which is run in a small town of 10.000, showed that when applied to a region, the use of the Hybrid Letterbox can considerably increase discussion around certain topics, although it can never be seen as a standalone tool. In this case, we sent out postcards to all of the citizens beforehand, asking for their ideas and concerns regarding their town. The turn-out was huge and by using the Hybrid Letterbox, we successfully engaged those who were previously not participating in, e.g., online polls conducted by the city. The prototype bridged a gap between analog and digital but also between citizens and city officials, clarifying positions and possibilities for change.

In a second project “Vernetzte Nachbarschaften NRW” three hybrid letterboxes were being tested on different sites, combining their inputs on a central Hybrid Letterbox website and each addressing site-specific problems by way of asking questions of “how do you want to improve your neighborhood” or “what is especially missing in this area”, collecting answers provided by local citizens and making them available to a general public for further discussion. Here, a connection between city officials, decision makers and citizens has been established in the course of the project.

There was an initial stakeholder workshop which brought insights regarding the extent of use and several alternative user scenarios put forward by the stakeholders. This initial workshop consisted of the five core members of the SCC and two members of the UdK who guided the workshop. In this workshop, we planned the use of the Hybrid Letterbox in a local grocery store that is in the center of the Fischerinsel and frequented by many inhabitants of the Island. In the workshop, we collected all ideas regarding the use of the Hybrid Letterbox on a large paper wall, clustering them according to importance. The SCC members then decided on the most relevant topics and devices, a mode in which the Letterbox would be used. They wanted it to be accompanied by a series of informational posters which were put up two weeks before the event in order to create awareness on the Fischerinsel. After the collection and analysis of the results, these were then posted again on large A2 prints all across the Fischerinsel.



Fig. 34. Gathering insights on the Fischerinsel at a shopping center.

The topic that the SCC wanted to address with this was the missing greenery, shabby pathways and the planned construction of a new high-rise building. The answers were collected in the Letterbox and the passersby were drawn into a discussion regarding the topics, making them aware of the problems and pointing them towards future gatherings of interested parties who want to address the problems. The process showed that many people were reluctant to provide their ideas on the topics and in discussions it became clear that there was another pressing topic to be dealt with, which the SCC was aware of, but did not want to address: A new construction site on the Fischerinsel where many Fischerinsel inhabitants felt that they did not have any say. Nevertheless, we had approximately 30 conversations during the Saturday event and 20 entries into the letterbox. The unanimous choice of the supermarket entryway was later evaluated as difficult, since many of the potential participants were either not from the Fischerinsel, did not have time for a conversation or did not want to be approached by us.

A concept evaluation workshop involving stakeholder groups was run by the SCC on March 19, 2016. On the day of the event, the turnout was unfortunately very slim, even though it was communicated through all channels, both locally and digitally. On three posters the major answers were clustered and presented to the participants. One other poster pointed towards an event where concerned citizens could meet and discuss further steps. The major answers concerning the three questions “Are there current concerns on the Fischerinsel?”, “How do we want to create floral oases?” and “How do you imagine a lively Fischerinsel?” demonstrated a great interest in the topics brought up by the project group. Unfortunately, due to the delay of the project, the process was halted after this analysis.



Fig. 35. Final event with the Seniors' Computer Club and their guests.

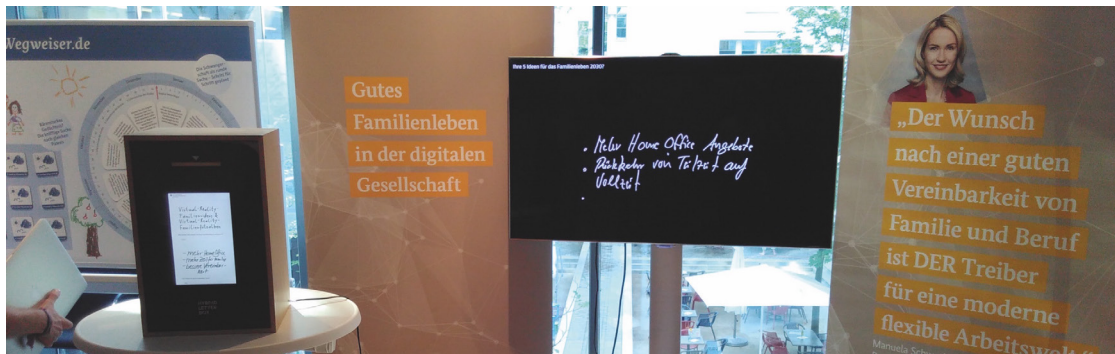


Fig. 36. Event at the Federal Ministry Open Days (Bundesministerium für Familie, Senioren, Frauen und Jugend), where the Letterbox was used in combination with a TV screen.

The short events shown above each ran one or two days, testing the status quo of the Hybrid Letterbox Prototype. As a result of conversations with the ones using the Letterbox during these events, a short how-to document was created, illustrating the most important features and settings of the Letterbox.

Mit-Mach-Stadt Brandis.

The Mit-Mach-Stadt Brandis project was setup within the framework of the “Innovationskommune Sachsen”¹⁰⁶ in 2016. It focused on how citizens could impact social cohesion as well as strive towards a more just approach to citizen participation. Furthermore, it aimed at generating a “collective vision” of citizen participation in collaboration with diverse stakeholders in

¹⁰⁶ The Innovationskommune Sachsen, a title which the city of Brandis was awarded after going through a competition of cities in Saxony, regarding e-participation. Due to its efforts to digitize the community (the mayor's office, administration and public services) and its open and innovative take on participation, the city won the award. The program provided funding for sub-projects which allowed for the exploration of alternative ways of citizen participation.

the city and at creating an overarching system of citizen participation using existing tools and devising new ones in the process. Here the working hypothesis was that participatory tools and methods could spark citizen participation beyond the existing extent.

The scope of this project was more focused on providing the citizens, city council and the mayor of the town of Brandis with the means to approach citizen participation in a more experimental way. The project was set within a framework which specifically focused on the digitization of citizen services. Although a lot has been implemented regarding a digital strategy, participation was still insufficient, and the measures did not have the desired impact.

Participatory design strategies as well as some of the participatory tools and workshop formats were used to spark the discussion on participation in the city, as well as to provide some new means for citizens to engage. In this short chapter, I will focus particularly on the tools developed and their differences to tools developed in the Neighborhood Labs project. Furthermore, one of the core results, a handbook for participatory action, will be portrayed briefly, as it provides an example for putting the results of a series of projects into the hands of citizens.

The project presented an opportunity to iterate on such ideas like a neighborhood platform and app as well as a Hybrid Letterbox neighborhood system. While within the project an overarching system of citizen participation was proposed, I focus on the underlying implications for implementing a socially sustainable approach.

Stakeholders involved.

The project involved stakeholders from the city council of Brandis, as well as the mayor and his staff, local activists and leaders of initiatives who formed the core group of the project. Furthermore, a diverse range of citizens were participating as transitional members of the project, being simply interested in taking part in the shaping of their city.

The role of the research group was focused largely on the development of methods and tools as well as steering workshops and communication activities, being present in the Saxonian city for different events, workshops, observation activities etc.

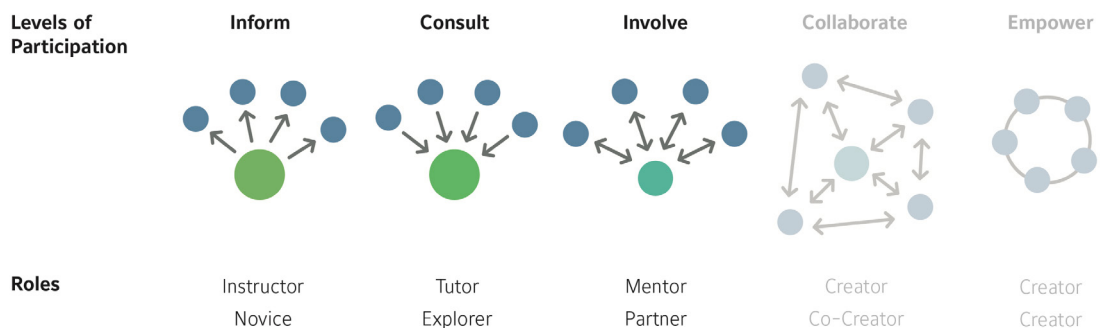


Fig. 37. The levels of participation in this project ranged from “informing” and “consulting” to “involving” throughout the project. “Collaborating” and “empowering” are levels which have to evolve from the project group after our involvement. We provided the infrastructure to assist in

reaching these goals.

Referring back to the categorization proposed in Chapter 2.1.4, the group involved can be separated into the roles of a core group, active, occasional and peripheral participants. In contrast to the Neighborhood Labs project, the range of participants was much broader at peak times, e.g., when sending out Hybrid Letterbox postcards via the local community paper and receiving a large amount back in the summer.

Outcomes and insights.

Within the project, there were different layers of output. On the one hand, there was a rising awareness of taking a designerly approach to citizen participation in the town and with citizens and municipalities, while on the other hand, there was the actual conduction of workshops and other activities such as summer parties, discussion rounds and one-on-one meetings. In addition, the project team produced a number of digital prototypes as well as a handbook for citizen participation summing up the activities of one year on site.

The scope of the project was sharpened after the first three workshops and discussions in Brandis and directed towards three main aspects:

- *Individual and collective narratives spark social cohesion and the identification with Brandis.*
- *Discussions about specific locations and spots shall be sparked (through digital tools and awareness building).*
- *The way the municipality (administration, mayor's office, city council) works and how it offers participation formats should be communicated transparently.*



Fig. 38. The setup of the Hybrid Letterbox, the Litfaßsäule and information banner on the market square in Brandis. Similar to the chalkboard of the Neighborhood Labs project, the Litfaßsäule

was used to gather insights regarding straightforward questions that popped up in interviews and conversations beforehand.

Overall, the project team proposed an overarching participation system. They took into account existing formats such as a Café Communale,¹⁰⁷ a participation portal provided by the Saxonian ministry of the interior, as well as a citizen's app¹⁰⁸ and added the local Litfaßsäule, two hybrid letterboxes as well as the handbook. Furthermore, dedicated citizens continued to steer content and lead monthly meetings following our departure from the project. To involve existing infrastructure has its root in the early phases of the project, where a neighborhood communication platform included such elements as a Litfaßsäule, postboxes as well as billboards.

Potential of the project.

While in CHEST, focus lay on the technological advancement of one of the prototypes of Neighborhood Labs, in Mit-Mach-Stadt, one key and primary focus was to develop and adapt tools which bring municipality and citizens closer together and create a stronger sense of agency and belonging.

- **Self-sufficiency of the project:** *The designed infrastructure (web-platforms, apps, story-corner and story platform as well as templates and a handbook) remains and is looked after by active citizens and members of the municipality. While the tools were introduced in a very rudimentary form, they are designed to be adapted. In contrast to the Neighborhood Labs project, it was made clear from the beginning, that individuals would have to take responsibility in maintaining any digital or analog infrastructure that is developed during the project*
- **Open Source and design for adaption:** *The developed results are all open source and available to anyone who wants to use or adapt them. They can be seen as first iterations towards a Brandis infrastructure which is shaped by its citizens and a team of experts. One of the digital platforms¹⁰⁹ has been adopted by an active core group and is currently being adapted to the citizens needs in self-organized participatory workshops.*

The Brandis project provided a unique difference in setup in contrast to Neighborhood Labs. It was not set in an inner-city-neighborhood but a small town which has already been active in creating an infrastructure for digital participation for its citizens. It became clear that not only is it necessary to steer a participation process from the top-down, but also that the management of expectations and the continuous involvement of bottom-up initiatives are keys to the successful implementation of citizen participation. The infrastructure that was set up by the project team goes beyond simply

¹⁰⁷ The monthly format has been introduced by mayor Arno Jesse in order to spark a conversation regarding communal-political themes in a direct, casual way in a café at the market square in Brandis.

¹⁰⁸ The Brandis App was developed independently by another project group during the time we were in Brandis. A review and analysis we provided lead to a partial adaptation of its structure and content.

¹⁰⁹ <http://www.mitmachen.mit-mach-stadt.de/>

utilizing digital tools and pushing them into the community but incorporates existing ideas and tools that are already pursued by citizens and the municipality alike. The cities objective to involve a larger group of its citizens in its endeavors to re-build and modernize the municipality's participation infrastructure was only achieved through constantly activating initiatives, individuals and members of the municipality throughout the project and beyond.



Fig. 39. The Mit-mach-Plattform, a prototype of a platform for collaboration that, after the project, was taken over by a local project group.

4. An Action Repertoire for Transformation

While the previous chapter gave insights into the phases of the research, including some of the concepts and ideas generated throughout, here an overview of the analytic frame for the design project which is based on a model of research-through-design as well as a framework for transformation is introduced. Three types of actions have been investigated and conducted throughout the projects. They include the three distinct elements of participatory tools, workshop formats and investigative action. These elements were used in a non-linear way and the degree of citizen participation varied. The activities are structured along the following criteria that are adopted from the notion of sustainable design this dissertation stands for. Where workshop methods or interactive tools were re-used, adapted or pushed forward, the cross-links to the relevant sub-projects are described. Furthermore, due to the long-term process, there is some degree of fuzziness and complexity in the interplay of all actions that have been undertaken. As far as questions go, the following ones help with categorizing the empirical systems, practices and purposes of the project.

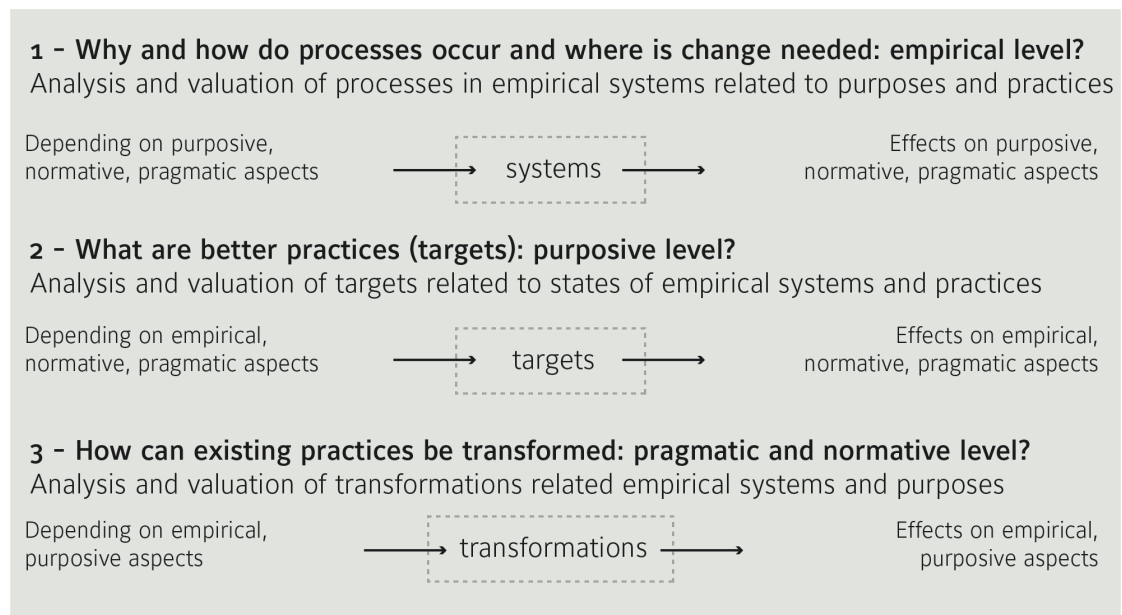


Fig. 40. Hirsch-Hadorn (2006) proposes a loose framework for the analysis of the transformation of empirical systems. Looking at the three levels of effects, it shows promise to be implemented in a sustainability context.

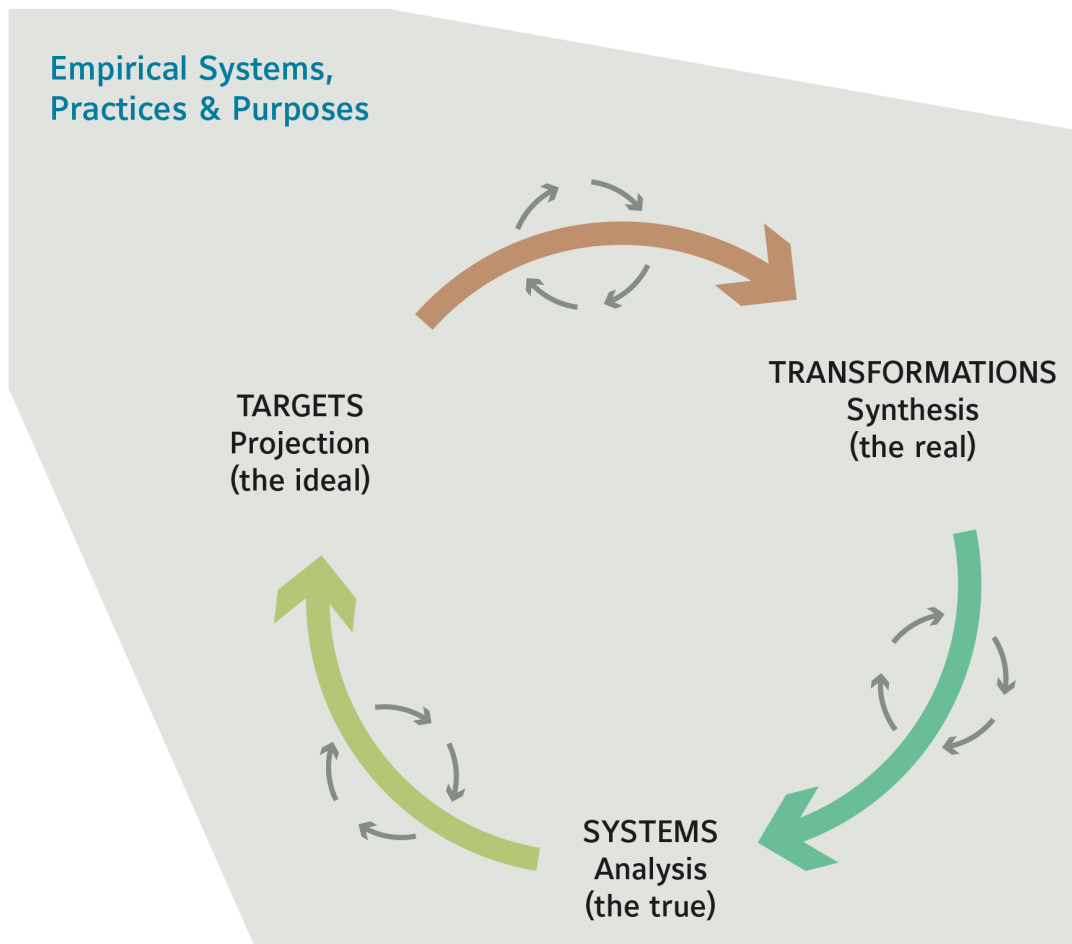


Fig. 41. From the overarching elements in the framework of “Systems, Targets and Transformations”. These elements correspond with Jonas’ process model of Analysis, Projection and Synthesis and provide a framework for analysis with regards to sustainable design.

While on a meta-level the above mentioned frameworks provide guidance for the overall process, a practice framework may prove to be able to categorize and map the tools, methods and techniques used in the process of designing.¹¹⁰ In analyzing the practice elements of my research, I propose a loose framework that supports the categorization and eventually the use of tools, methods and techniques in a sustainable design process. Focused on the design project in this research, this led to identifying and subsequently breaking down the topic of sustainable design regarding the project phases.

Breaking down sustainable design.

As mentioned before, during the project phases, the overarching theme of sustainable design was kept out of the discussions, since it proved to stand in the way of going through a participatory design process. Thus, sustainable design was broken down in several sub-questions and thematic

¹¹⁰ see “A Framework for Organizing the Tools and Techniques of Participatory Design” (Sanders, Brandt & Binder, 2010), which is focused on the practice of participatory design and “A framework for sustainable whole systems design” (Blizzard & Klotz, 2012).

areas, while the core theme of (knowledge) sharing and participation remained as an undertone throughout. It corresponds with the project phases “sharing”, “infrastructuring” and “transferring” in the following way:

In the **sharing phase**, the focus lay on a more technological approach towards sharing. It addressed the apparent gap between the rising digital tools for sharing and analog, community-based ways of sharing:

What kind of design intervention can support knowledge sharing as a means of community building in a meaningful and effective way? How can we bridge the gap between analog and digital, local and global? How can we provide opportunities for access and stimulate interpersonal exchange between generations and create an environment for reciprocal learning experiences? How can the interpersonal transfer of intangible goods (knowledge) be designed and formalized? How can we build a base for an open, self-supported (knowledge transfer) system which can be grown by (the interest of) its participants? How can this system be designed?

In the **infrastructure phase**, the questions were directed more towards an overarching theme of infrastructuring which guided the phase. Here, the focus lay on how to detail and communicate the idea of design infrastructuring and how to shift the understanding of design towards process orientation:

Can design provide an infrastructure for transforming a context and for addressing locally rooted problems? How can this infrastructure engage citizens? What is the relation between bottom-up to top-down in this sense? How can citizens be engaged in the development and dissemination of methods and tools?

In the **transfer phase**, the gathered insights from the sharing and infrastructure phase were analyzed and made transferrable to other projects and contexts. While transfer took place throughout the research, this phase provided a focused effort to transfer participatory tools, investigative action and workshop methods while getting insights on their use by others.

How can a design-infrastructure be transferred to other contexts and projects? How can an action repertoire be developed that caters to the underlying ideals of sustainable design and delivers hands-on guidance for citizens to engage with their own everyday problems? What is an appropriate way of transferring tools and methods to other contexts?

With a focus on a baseline of sustainable aspects, these questions guided the repertoire of action explored during the project. The analysis also caters to the levels of participation as well as the types of stakeholders and their roles throughout the project. The following meta-questions emerged with regards to the practice output of the project:

- **What is the level of participation?** This question refers to the levels of participation regarding the specific method, tool or technique.

- **What are the transformative aspects of the project?** What does it transform? This refers to how a context or situation is transformed.
- **What are the sustainable aspects of the project?** This refers back to the overarching questions which have been broken down through the project phases. It aims at describing sustainable action on a practice level.
- **In which way is it trans- and interdisciplinary?** This provides an overview of how the intervention, tool or method may be inter- or transdisciplinary.

Regarding the practice output of the design phase, and as mentioned in chapter 3, three overarching perspectives can be identified which lead to an action repertoire for sustainable design. In the course of the research numerous methods and tools were used to inform these perspectives:

1. **Opening** – How design can open access to contexts, tools, knowledge and technology through collaborative action.
2. **Making** – How design provides processes to involve stakeholders in critically assessing and making possible futures.
3. **Transforming** – How design is able to transform contexts and situations from one state to a preferred one and asking who frames the negotiation processes tied to this

	SHARING CONCEPT	DESIGN INFRASTRUCTURE	TRANSFER PHASE
OPENING	<ul style="list-style-type: none"> ● Discursive Workshop ● Mapping Workshop ● Break Out Workshop (EIT) ● Semi-Structured Interviews ● Observation ● Context Analysis 	<ul style="list-style-type: none"> ● Discursive Workshop ● Mapping Workshop (Benches) ● Semi-Structured Interviews ● Observation ● Context Analysis 	<ul style="list-style-type: none"> ● Break Out Workshop (MfN)
MAKING	<ul style="list-style-type: none"> ● Design Game Workshop ● Participatory Workshop ● Discursive Intervention 	<ul style="list-style-type: none"> ● Participatory Workshop ● Discursive Intervention ● Interactive Intervention 	<ul style="list-style-type: none"> ● Interactive Intervention
TRANSFORMING	<ul style="list-style-type: none"> ● Future Scenario Building ● Prototyping 	<ul style="list-style-type: none"> ● Future Scenario Building ● Prototyping 	<ul style="list-style-type: none"> ● Handbook

- Dissemination
- Workshop Formats
- Investigative Action
- Interventions and Tools

Fig. 42. Here the types of action carried out are mapped to the phases in my research. It refers to the aforementioned perspectives which guide the process.

I entered the project context when it had already progressed to a point where several methods had been tried and adapted. The initial theme of the project was focused on a sharing community concept up to a point, however, the theme was re-directed during the course of my research toward knowledge sharing and questions of social sustainability.¹¹¹ In the following section, I provide an overview of three strands of practice output, workshop formats, investigative action and participatory tools. These reflect the iterations and step-by-step harmonization that have occurred during the entire research process and lead to a typology of actions for sustainable design. They are mapped according to the previously identified dimensions “transforming”, “opening” and “making”.

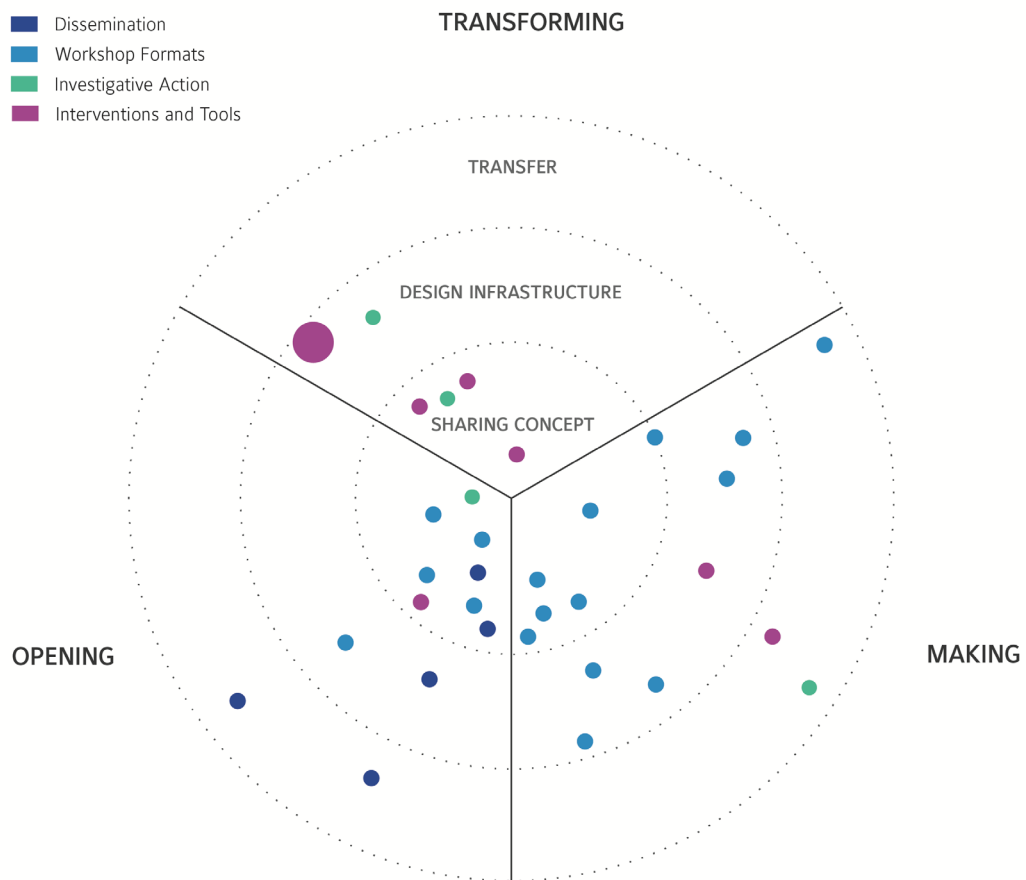


Fig. 43. This matrix is derived from the proposition of a categorization of participatory tools and techniques (Sanders, Brandt, & Binder, 2010). The elements are ordered regarding the phases, the timeline and their respective orientation to the three dimensions.

The overview of the three strands of practice output subsequently lead to the formation of an action repertoire typology, illustrating types of workshops, interventions, tools and actions designed

¹¹¹ I note that the project was not conducted by myself alone, but in an interdisciplinary team. This fact also led to several adaptations in scope as we went along with the process.

to investigate questions of sustainability in urban neighborhoods. For each strand, the scope and output regarding this frame of sustainability is introduced.

Although presented in three different strands, there are instances of this work where the boundaries between workshop, participatory tool and investigative action are blurred.

(Note for the digital version: This page is substituted by an A3 illustration of the action repertoire, added to the data-stick provided as an additional upload)

Towards an Action Repertoire

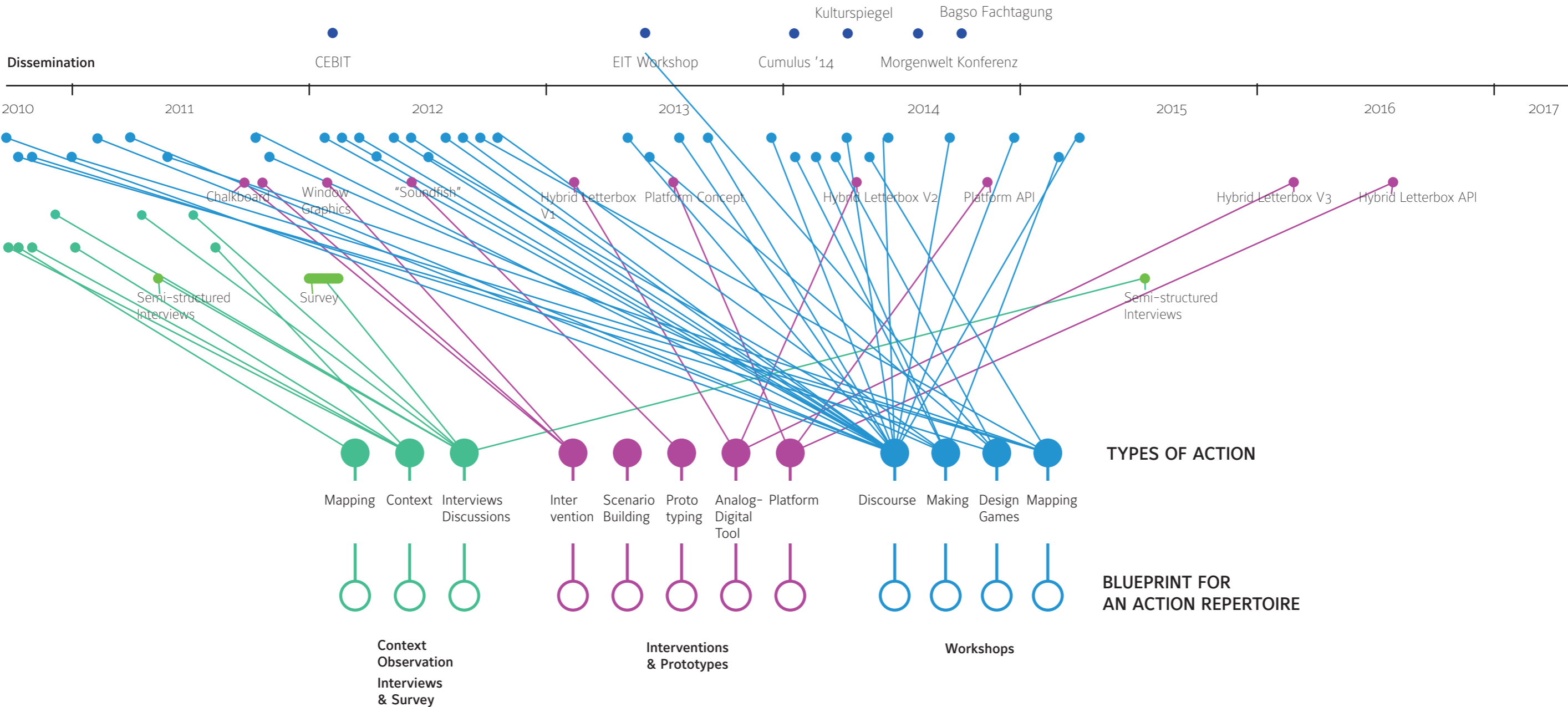


Fig 44. The action repertoire is derived from the individual actions as conducted throughout the research. Distilling them into blueprints for an action repertoire especially regarding research, education and practice is one of the next steps going beyond this dissertation.

4.1. Workshop Formats

During the research projects, which form the basis of this dissertation, numerous tools and research formats were used. They were iteratively adapted, experimented with or simply “put out into the wild”, and these form the basis for a repertoire of action for designers and non-designers alike. I categorized them into three main topics: Workshops, Investigative Action and Participatory Tools which I will go into in the next section.

A part of the formats is based on pre-existing research by others, some are re-appropriated methods used in a different context than originally intended and some are simply multi-medial, experimental tools with which the outcomes vary according to their use. They were complemented by actions based on a social-scientific methodology such as field explorations, observations, interviews and surveys which are subsumed in the chapter 4.2 on investigative action.

As anticipated at the beginning of the research process, various participatory formats did not work well at certain times in the process. For instance, co-designing interactions with the active group on the Fischerinsel did not produce the desired results. Prototyping interventions, however, was a success conceptually as well as in terms of introducing a new method to the group. A major part of the workshop formats originated from a participatory design context. The low-threshold workshops included discussion formats, design games, collaborative mapping exercises and field explorations, which will be presented in this chapter. The formats can be broken down into five different categories, hinging on participatory design workshop methods.

It became evident especially throughout the “Neighborhood Labs” project, that over such a long period of time, there is some need to just meet for a workshop for the sake of being aware that the participants are still involved in the project. There were phases of structured workshops focused on honing-in on the problem, clarifying the research questions and identifying possible interventions. These were followed by phases of unstructured, more discursive workshops, which helped create a bond amongst the participants in the Neighborhood Labs project.

The overarching hypothesis for using a workshop-based approach at times was that it would first of all bind the group together, create arenas for co-developing ideas and subsequently scenarios and prototypes which would then inform the outcome. The core group of the Seniors’ Computer Club as well as the researchers and occasional visitors participated in the workshops. There were some break-out workshops with other stakeholders, such as other initiatives in the surrounding area or research peers at conference workshops.

The criteria of analysis as well as the outcomes varied depending on the format that was delivered, as will become clear in the description of the five different types of workshops which were identified through the analysis of all workshops conducted in the course of the project.

4.1.1. Discursive Workshops

While in the initial investigation, sharing and communication practices were looked at, another graver issue emerged, especially with the group from the Fischerinsel. They were decently organized in their club but embedded in a club-structure of their mother-institution Kreativhaus e.V. which had to report every activity and course to them, making their day-to-day operations chaotic.

Moreover, while their learning activities (such as Skype, photo processing, video editing, etc.) were running smoothly and with much interest by senior citizens from all over Berlin, many group members were indicating that, in addition to the regular club life, they wanted to have an impact on changing the current state of Fischerinsel without first being able to specifically point out the main issues at hand.

In light of these new insights, the research question slightly shifted from matters of improved communication between “locals” towards the empowerment of citizens on the Fischerinsel; it moved towards inducing and fostering change in their local neighborhood while bridging the gap between the analog and the digital, the citizens and local institutions and governing bodies.

What followed was the setup of a living lab for the participatory research of just such dynamics and the impact of designerly practice on them. As a basic format for discussion, we set up monthly or bi-monthly workshop sessions which were mainly discursive. They were supplemented by workshops which were either more collaborative, more directed towards making things or framing problem-areas through design-games.

The prototypical discursive workshop fosters cohesion and strengthens the interpersonal bond within a group. It is meant to lead up to a more outcome-oriented workshop or the use of a specific participatory tool or method for investigative action; here it provided a baseline for the project. One lesson learnt from the process was that although these types of workshops might not produce tangible outputs, the immaterial glue that binds the project group together through conversations, getting to know each other, steering through the problems and questions that arise along the way is invaluable when moving on to collaborative, participatory workshops aimed at actual output.

The workshop format provides a baseline for the project and is in this sense a facilitator for social sustainability, as it moves the project team closer together and helps identify common goals. One of the landmark workshops here produced the idea of having the benches and garden patch in front of the SCC's building renovated. In the following months, an action plan was developed which saw specific individuals dedicated to tasks related to their area of expertise or their connections in the neighborhood.

4.1.2. Collaborative Mapping Workshops

Particularly in an early phase of the research, the participant group conducted various mapping workshops with stakeholders. Here, the aim was to get a sense of place through either work on a 2D map of the Fischerinsel or through walking tour workshops on site. While the 2D-mapping workshops aimed at talking about the needs, constraints and opportunities of the Fischerinsel, the walking tours were more about specifying locations for intervention or action (e.g., where an intervention would be most effective, where benches could potentially be put up or where additional lighting should be placed).

There were three workshops which I will elaborate on for clarification. The first workshop, the “*Ambassador Workshop*”, was communicated as a gathering where everyone on the Fischerinsel was invited. It was framed as an opportunity to open up the project to more active inhabitants and potentially draw more passive ones towards it. Before the workshop, the researchers and the active core group notified the community through emails, posters, flyers and word-of-mouth.

Guiding Topic: Analysis of potential of the Fischerinsel and tentative investigation of knowledge sharing practices. Connecting existing actors and initiatives through a collaborative mapping experience.

The turnout was positive, with 20 people from 4 different initiatives joining the workshop. It was set in the practice theatre of the Kreativhaus which provided the stage for a very vivid discussion. At first, most of the participants were quite nervous and unsure of what to expect.

We loosened the uneasiness of the group through a short introductory game using material cards. Within twenty minutes, each participant was asked to describe their fictitious or real “happy place” using the material cards before them. The materials were foam, metal, glass, plastic, cork, cardboard, colored paper and copper mesh.



Fig. 45. Material cards for an introductory design game.

Now at ease with the setting and the workshop process, we jumped into placing hand-drawn maps on the workshop tables. We put stickers, pens and markers as well as post-it notes before the participants and prompted them to discuss the Fischerinsel regarding its infrastructure, its community and its positive and negative sides.



Fig. 46. Mapping workshop with local stakeholders on the Fischerinsel.

One of the keys of this workshop was that it had a low threshold for participation. By providing a map space for a focused discussion, the personal and inherent quarrels and differences were curbed, although we sensed a lot of tension between the participants, since some of them had never met and brought their own (and their initiative's) agenda to the workshop.

In this workshop, the researcher's role was strictly focused on facilitating and guiding the process, bringing the participants back to the core questions and providing input where needed. In the aftermath of the workshop, a detailed map of the Fischerinsel was produced, based on the workshop interactions and findings.

The overarching topic was kept broad to elicit a broad response, nevertheless, the answers and points of discussion were quite specific. The participants discussed missing lighting, rotten benches, deteriorating walkways, the scenic view of the old harbor, the active initiatives, Kreativhaus and SCC as a hub for new friendship, activities and knowledge sharing, good leisure infrastructure as well as medical care facilities,



Fig. 47. A digitized Fischerinsel map of the ambassador workshop session.

Generally, we learned that most of the participants of the workshops were already active in some initiative or on their own. In the long run, these “activists” were the ones that we identified as multipliers who are able to carry ideas and outcomes from the project to the outside and draw in new participants. The expectations from the group were high, they participated in part because they were aware of the missing communication links and somewhat chaotic structure of the initiative’s actions in the neighborhood, and they sought advice and solutions from us regarding this situation.

Three common goals were identified: strengthening the local community, increasing civility and keeping the Fischerinsel clean and tidy. Some comments recorded during the workshop suggest an ambivalence regarding the Fischerinsel. On the one hand, they are content with the location and cultural offers,

“culturally, we are tied into the city perfectly here, everything is within a couple of blocks”,

on the other hand, they are aware of some issues such as vacancies, missing communication and inactivity by the majority of the inhabitants (which some do not necessarily see as a problem).

“[...] back then there were children everywhere, [...], you were able to get in contact with others through the children.”

“[...] many inhabitants on the Fischerinsel are too cumbersome, how can we get them to be active in our initiatives?”

“Lots of ground floor spaces are empty, there aren’t enough small businesses, so people go to the big supermarkets.”

One major discussion point was that one building had a concierge on the ground floor, a fact which prompted envious comments by some of the participants, but also opened up the question whether or not a concierge might relay information and communication and might be tied into a neighborhood communication and sharing network.

Outcomes of the workshop

The ambassador workshop lead to several next steps which were undertaken over the course of the following month. We were able to cluster the mapping experience into two major themes, infrastructure and community, which were sorted according to positive or negative attributes.

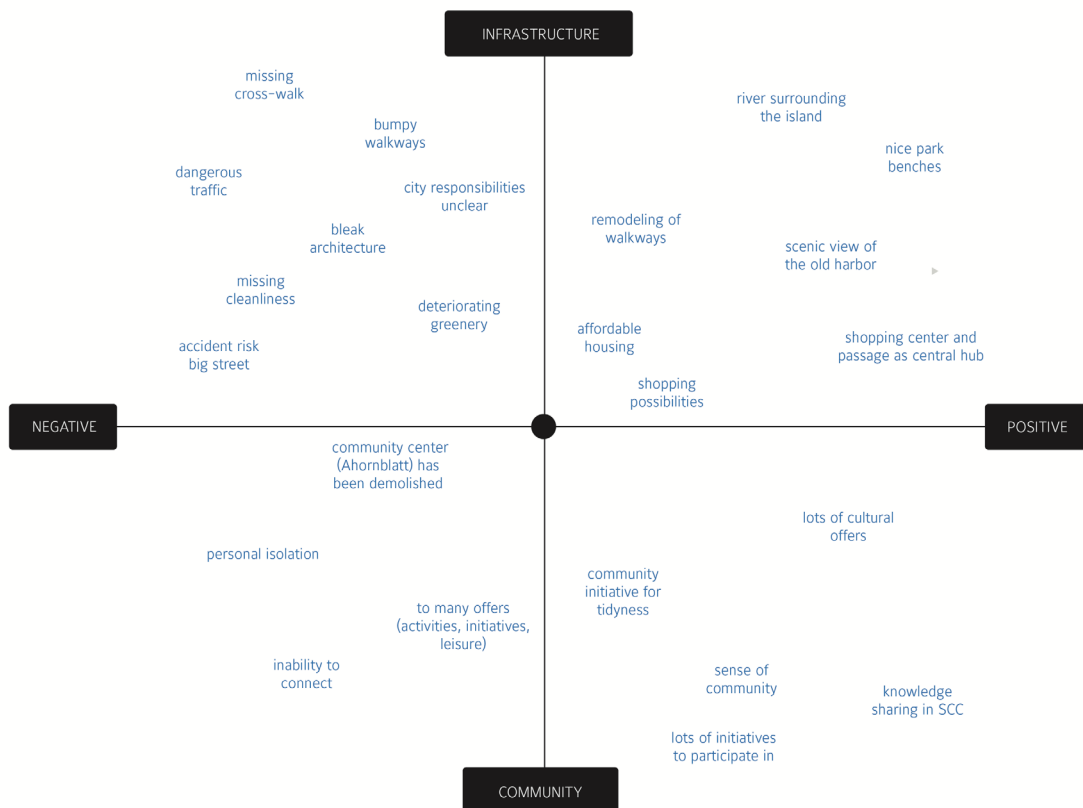


Fig. 48. Ambassador workshop clustering.

As a result of the analysis of the workshop, our group of researchers got together for an ideation phase where concepts, based on the gathered data, were designed. Following the clustering of discussions, notes and input on the maps, we identified crucial touchpoints of the Fischerinsel: there is a sense of being left alone with deteriorating greenery, walkways and overall infrastructure, there is an awareness of the prime position of the island and potential cultural possibilities and activities as well as the numerous initiatives working towards change on the island. Some of the participants voiced their desire for a “village-like” atmosphere on the Fischerinsel, where “people know each other and exchange between young and old happens”. This notion also reverberates in the discussion about the past on the Fischerinsel, which some deem as better than now, especially with regards to

community (although sometimes forced onto the inhabitants) and the maintenance of the Fischerinsel-infrastructure.

In a subsequent follow-up discussion in the next meeting, the core group of the SCC reflected on the workshop as being a potential catalyst for the connection of different (sometimes rivaling) groups on the Fischerinsel who would all benefit from a collaborative effort of improving the communication of their activities and including inactive citizens on the island.

On the part of the researchers, concepts were developed which cater to the clustered results of the workshop and the preceding interviews, observations and discussions.

The other two workshops were concerned with mapping the neighborhood and were especially focused on the deteriorating walkways, greenery and benches. In these workshops, the objective was to translate the physical experience of walking through the neighborhood onto a map and identify specific points of interest where, in this case, benches should be renovated, replaced or demolished. Here, the boundaries between observation and mapping were blurred and overlapped.

4.1.3. Design Game workshops

Neighborhood blocks game

During the initial search for participating groups, it was crucial to drive a conversation along a focused path, in the case of the neighborhood blocks game, it was the path of identifying and discussing interaction with neighbors in one's own neighborhood.

To this end, the neighborhood blocks game served as a generative design toolkit and acted as a boundary object¹¹² in a conversation with participants in the projects. It was specifically designed to cater to a sharing context (in this case tool and service sharing) and helped identify and discuss the participants' living environments and potential starting points for designerly interventions.

The material used for the workshop includes several elements. First of all, a folder with an example and a description of the method was given. It included roughly sketched houses, streets and colored sticker-dots representing neighbors and the participants' relationship to her or him, which can be placed on a cardboard background which is set in front of the participant. The shapes were kept abstract and simple.

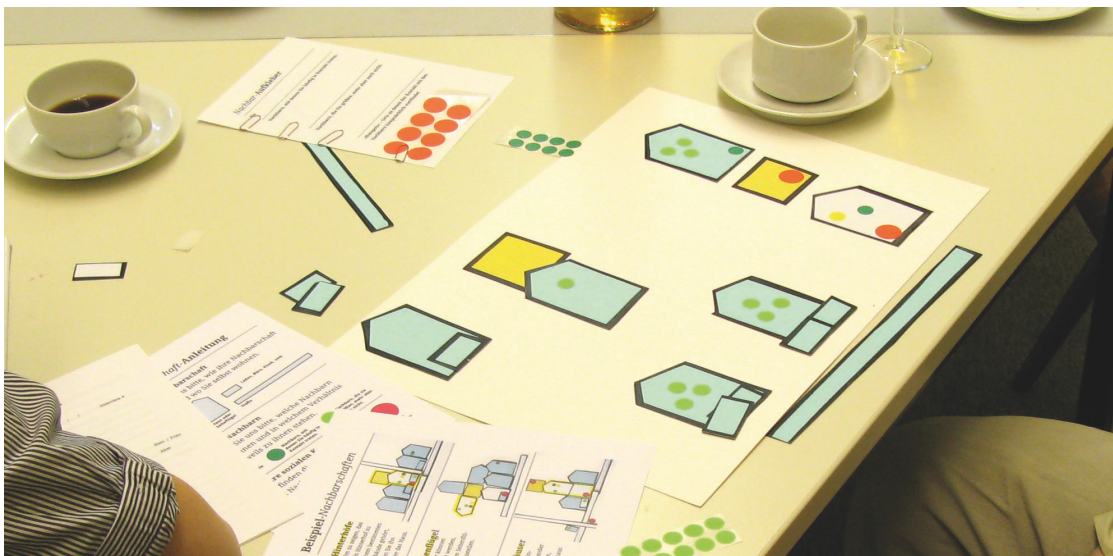


Fig. 49. Neighborhood blocks game in the preliminary project "networked neighborhoods".

During the first uses of the kit, we gathered insights on the context surrounding neighborhood sharing activity and communication which allows for subsequent sharing activities. While suitable for an initial scoping of how participants are embedded in their neighborhood, this blocks game is only one piece of the puzzle. The notion of creatively unlocking a deeper understanding of one's neighborhood pervades all mapping activities during the research phase.

¹¹² A boundary object is something that exists between and bridges two divergent groups of actors because it can be understood by and serve to facilitate communication between the two groups (Star, 1989).

In a second round at a later stage in the process, participants were asked to arrange the neighborhood blocks while being informally interviewed. It became clear that the design game served multiple purposes: First of all, it opened up a situation where participants could be at ease and talk about their living situation in the neighborhood. Secondly, it put their anecdotes in the direct context of their neighborhood, as they were asked to arrange the blocks. This activity prepared us for the next activity which included propositional cards in a card-sorting game focused on neighborhood sharing activities.

While using the two tools, participants expressed a strong desire to share tools, services, time and objects with their neighbors, but made clear that there are certain communicative obstacles that have to be overcome. Some were not integrated in the neighborhood, some identified a lack of one-to-many sharing infrastructure which would aid communicating offers or needs of neighbors, some complained about the landlord or housing company keeping a close eye on the building to make sure that none of the infrastructure is re-appropriated for the purpose of sharing.

Neighborhood cards.

To complement the neighborhood blocks game and as a next step to investigating the willingness to share tools, services, and knowledge, a neighborhood cards game was tested with a group on the Fischerinsel. It consisted of three types of cards based on previous discussions and workshop outcomes include: needs cards, e.g., “I am sick, I need assistance with my shopping” or “I need a drill”; service cards, e.g., “neighborly assistance”; and tools and objects cards, e.g., “drill”, “books” or “car”.

In a one-hour workshop format, participants were asked to put the three types of cards into perspective and discuss their potential. On several occasions, participants felt uncomfortable talking about technology and tools which they were unfamiliar with. Despite the openness of the game and the reminder that everyone can speak freely about it, some participants expressed concern that they would not be able to provide an adequate response either because they felt un-creative or they lacked the understanding of the tool.

Metaphor-card-game.

As a reaction to the aforementioned uneasiness, technological tools were discussed in the group settings, and the research group took a step back from the neighborhood card game and approached the topic of sharing services from a different direction.

In order to base the discussions on real life situations and problems and not on technological artifacts, metaphor cards were used that allowed a more open discussion in a co-design setting with seniors. The benefit of using elastic metaphors is that they are malleable and not confined to real-world, physical constraints; therefore, the metaphors maximize the participants’ cognitive potential in that they can utilize the metaphors as they see fit (Khoury, 2004). The design game combined two extremes: the cognizance and familiarity of everyday life with its existing infrastructures and the unfamiliarity of future technologies.

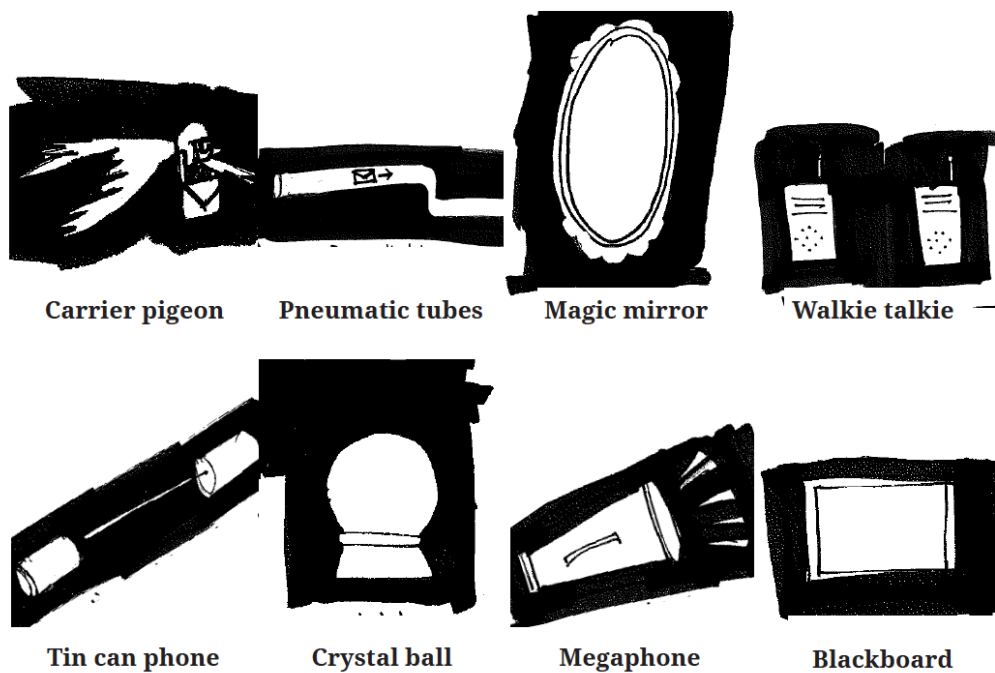


Fig. 50. Metaphor playing cards as used in the networked neighborhoods and Neighborhood Labs project.

As a result of the previous iterations of the design game, “metaphorical tools” were introduced. The opportunities of the application of metaphorical tools include that they are open for interpretation, allowing equal understanding and defamiliarization from existing reservations in the context of technology use. The use of the magical objects concept elicited positive responses from the participants, as these objects have a more playful nature than their technological counterparts.

Metaphorical tools acted as rhetorical devices by establishing a general common understanding about certain meanings among the participants. In the next non-participatory step, these meanings were transformed into designerly concepts which may or may not use a technology.

The set within the design game was separated into three groups:

Strange, displaced objects unfamiliar in a neighborhood setting, e.g., carrier pigeons, pneumatic tubes, walkie talkies

Toy-like, low-tech objects, e.g., tin can telephone, blackboards, megaphones

Magical objects derived from fantasy contexts like fairy tales, legends and fiction literature, e.g., magic mirror, crystal ball, magic hood

In summary, the potential of applying metaphorical tools in a design game include the advantage of providing common understanding and defamiliarization from existing technological solutions. In addition to facilitating appropriation of creative tools, it is fun to use. This game was used on

various occasions. The scope of it was to generate ideas with regards to a certain scenario, in this case, a sharing scenario which required a service or similar tool.

In a group discussion, it was decided which of the focused sharing scenarios had the potential to be enriched by the implementation of one or more of the metaphorical objects. During the process, the consolidation of sharing-cards, opportunities and constraints, and metaphorical objects led to a number of scenarios that the group discussed and summarized.

4.1.4. Making-Workshops

In these workshops, the objective was to build upon earlier meetings and collaboratively design and make interaction artifacts or elements of a wider neighborhood network. During the Neighborhood Labs project, for instance, there were several occasions to that end. Within the making workshops, paper prototyping and quick-and-dirty prototyping exercises were pre-planned by us as researchers and given to the group with lengthy descriptions of the goal that we had. Under the umbrella term of “making-workshops”, I integrated paper-prototyping, quick-and-dirty prototyping as well as functional mock-ups. The workshops were never used as isolated events but embedded in a process which produced scenarios, personas and concept sketches beforehand to inform the prototyping session.

Generally, paper and quick-and-dirty prototyping are used in an interaction design or innovation context, especially in user-centered design, in order to provide a sense of a concept in action. In contrast to using this mode of prototyping in a phase withdrawn from the stakeholders, where the scope and use of the method is quite clear, it was challenging to get the participants of the group to use the method. The aim here was to first of all provide a sense of owner- and authorship for the interaction prototype and communication platform, and to give participants a glimpse into our work, in order to get them to understand the processes behind the research. Furthermore, the objective of getting the project group closer together and improve their sense of impact on the community was an interesting side effect which became clear at a later stage in the project.

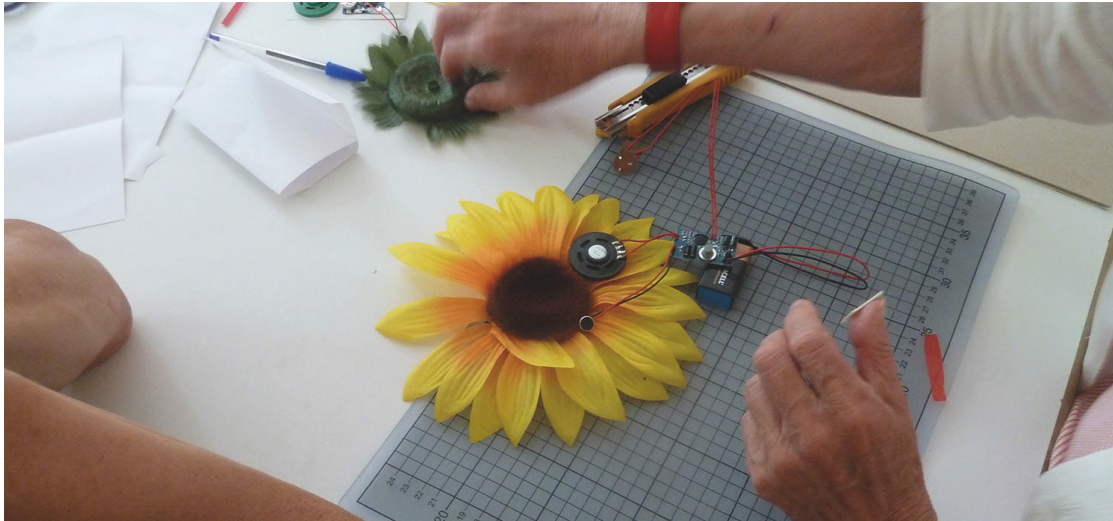


Fig. 51. The making workshops with the core group were gradual ventures into the use of prototyping techniques, usually employing simple materials and technologies.

The method was used for conveying an idea of a knowledge sharing platform as well as for having the participants play with the elements of such a system. Furthermore, in the sharing network phase, a video prototype was produced which narrated the use of a sharing network through video. The three uses differed both in complexity as well as the quality of elements used. While the video prototype focused on the narration of user and use of the network, the paper prototyping method

used in the group workshop focused on a detailed mock-up of an interactive system. Thus, the method of paper prototyping was used over a range of instances, varying in granularity.



Fig. 52. The second iteration of the resulting prototype was taken from the stakeholders and adapted by the research group.

4.2. Investigative Action

A second perspective on the research was “investigative action”, which was oriented towards social scientific methods such as the semi-structured interview, observations and visual mapping.

It aims at both the analysis of the socio-material fabric of the neighborhood as well as the analysis of technological systems within the neighborhood.

While interviews, observations, walks and discussions were important to get a glimpse of the social fabric of the neighborhoods, on the other hand, an analysis of technological systems at the interface between man and machine was crucial in understanding the usability of such technologies within a living lab as the one planned on the Fischerinsel. The analysis focused specifically on sharing approaches on- and offline as well as on the analysis of threshold interfaces. During the process of entering into the neighborhood it quickly became clear, that observations, context analyses and interviews would not suffice in getting a holistic view on the context.

4.2.1. Interviews

Semi-structured interviews following a conversation outline were conducted at a point in the project, where the research group was already well-acquainted with the core group on the Fischerinsel. The interviews were preceded by an online survey¹¹³ that was sent out to the club and completed by 26 SCC members. Six members of the SCC agreed to the filmed interview. The formal part of the interview elicited responses regarding age, organization, support structures and thematic foci.

The outline¹¹⁴ was designed to go from formal to informal questions, so respondents could feel at ease with the format first before chatting more openly.

Regarding the interviews, a qualitative, social scientific approach was taken. The semi-structured interview guide provides a clear set of instructions for interviewers and can provide reliable, comparable qualitative data.

Semi-structured interviews are often preceded by observation, informal and unstructured interviewing in order to allow the researchers to develop a keen understanding of the topic of interest necessary for developing relevant and meaningful semi-structured questions.

The inclusion of open-ended questions and training of interviewers to follow relevant topics that may stray from the interview guide does, however, still provide the opportunity for identifying new ways of seeing and understanding the topic at hand. (Cohen & Crabtree, 2006)

While the outline started with general questions regarding the Seniors' Computer Club, it moved to more associative questions regarding the underlying motivation to participate, ways of learning and individual priorities, requirements and the future outlook of the SCC as well as their relationship regarding technology.

Eight SCC-members were interviewed in two sessions adding to the information gathered in discussions, workshops and interventions.

¹¹³ see Appendix 7.4

¹¹⁴ see Appendix 7.5

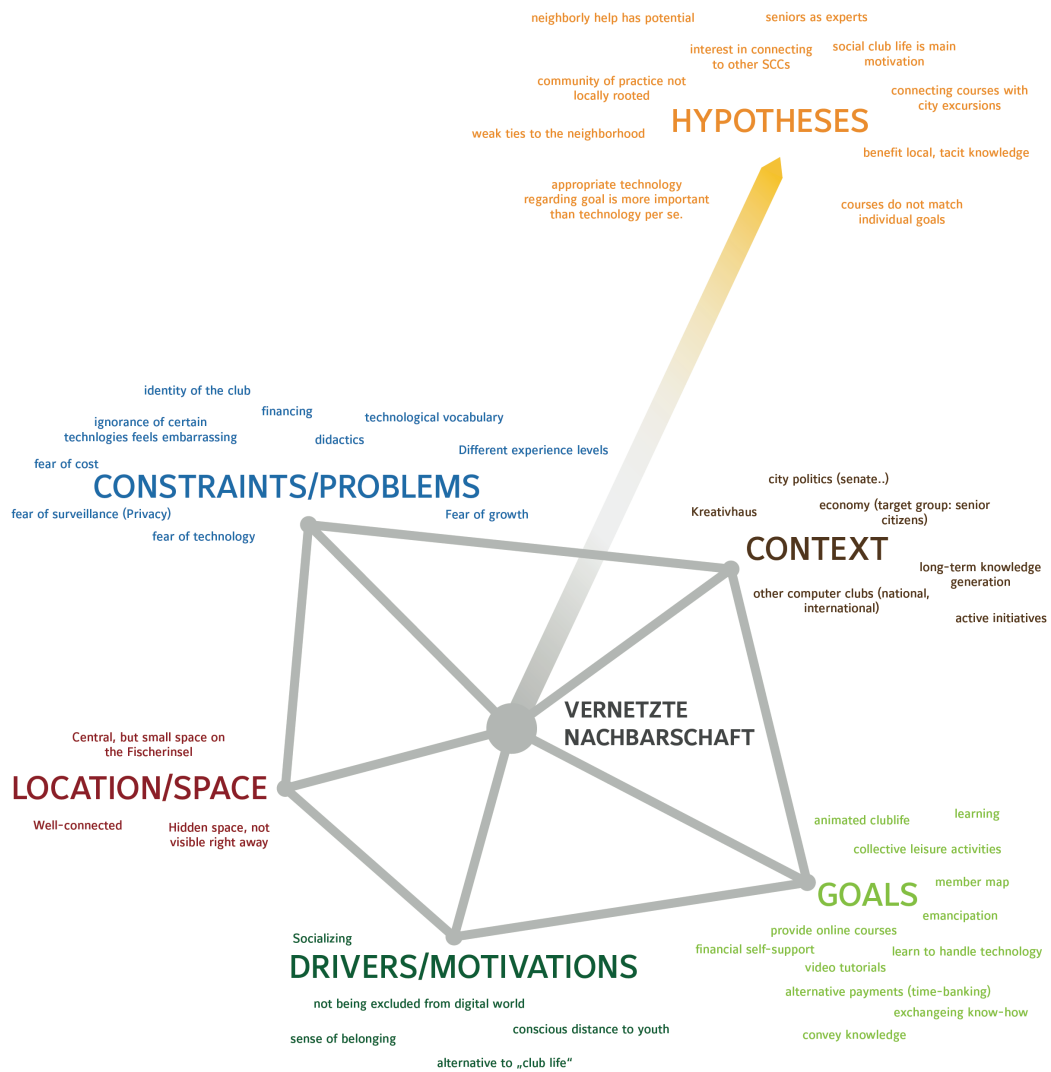


Fig. 53. The first interviews along with observations, initial discussions and interventions brought forth several key boundaries/perspectives for the Vernetzte Nachbarschaft group of the SCC. We identified and clustered the insights into drivers, goals, context, constraints and location and derived hypotheses from these for the SCC.

4.2.2. Context Analysis

Observations: Phase I.

During the process, several observational walks as well as observations of life on the Fischerinsel took place. The main focus here was on the general state of the neighborhood as well as the use of ad-hoc interventions by inhabitants. Furthermore, observing the surroundings provided an initial understanding of the context in which the project would take place. The walks were documented with photo and video and an analysis and clustering took place afterwards. This analysis was done according to parameters of physical constraints, opportunities and needs of the inhabitants against the backdrop of the notion of social sustainability as introduced before. Here, aspects of communication barriers, interaction hubs and opportunities for sharing were predominant as elements of social sustainability. During the walks, interaction thresholds and potential interfaces, their use or re-use and appropriation, were reviewed and catalogued.



Fig. 54. Observations on the Fischerinsel

	PEOPLE	TECHNOLOGY	PLACE
	Different types of users: organizers, trainers, nerds, longterm interested, free-rider, people in need, fearful non-participants, computer-averse people	Important: barrier-free use and approach	The SCC as socio-cultural center, as second home, forced growth, critical size not yet achieved
NEEDS	Clublife: trips, socializing, face to face interaction, meeting people Activities: create memoirs, image processing, communication with family (skype, email, etc.) Inclusion into societal communication, emancipation, independence No redundancies, clear information Exchange regarding computer topics	non-tech or low-tech approach limited, goal-centered offers Easy, noncommittal, secure low-threshold access to activities and offers	Goal: Opening without losing identity, losing the inner core local sanctuary for seniors with different interests "Turning a big city into a small town" In a central location, easy to find
CONSTRAINTS	many passive members limited personnel (administration & education)	reservation, distrust of new technology complexity of content, abstraction of information false notion of scope of club non-existent or inadequate hardware and software	cost of lease limited space questions of money who moderates, who filters club on the verge of being too anonymous increasing complexity of topics, media and interrelations
OPPORTUNITIES	More-generation-exchange More inter-institutional cooperation focus on social ties and network existing strong contacts existing connection between social interaction and knowledge sharing	connection of existing offers technology supports face to face interaction	ambassadors visibility of club offering the club as well as services low-threshold PR, getting more people to join and be active flexibility and openness for participation reciprocal learning offline-channel: PR, SCC as Hub, phone, multipliers, meetUps, Communities of interest

Fig. 55. The sharing phase produced insights regarding needs, constraints and opportunities of inhabitants of the Fischerinsel regarding people, technology and place.

As described before, the Fischerinsel, the location of the first phase of investigation, is dominated by six large high-rise buildings and several smaller structures which house a childcare facility, a swimming facility and the Kreativhaus which is a hub for several active groups in the neighborhood and is an intergenerational meeting place. Each observational walk had a different focus. The first walk focused solely on the infrastructure, the architecture and state of the surroundings; the second focused on sharing practices and the improvisational use of interfaces that bridge a gap between, e.g., public and semi-public space such as hallway billboards; the third one presented here focused on walkways and paths through the Fischerinsel, the time they took and the frequency of use (in a

very limited time). The subsequent image mapping produced patterns and practices which would inform the analysis of communication threshold interfaces.¹¹⁵

Observations: Phase II.

In a second phase of observation, we did observational walks together with the project partners of the Seniors' Computer Club. These walks especially focused on identifying non-places, places with a positive or negative connotation and spaces for potential interventions (improvements). Through physically experiencing the Fischerinsel, as opposed to speaking about it in a workshop setting, provided different insights on the way the participants view their island. While virtually they were quick to point out obvious deficits regarding walkways, greenery, benches, entranceways, guidance systems and, in general, issues regarding the built environment, on the walks, when in a different setting and mindset, their views were more differentiated. This phase of observation was previously introduced in the collaborative mapping workshop section, since the results of the walks were documented physically on a map.



Fig. 56. During a collaborative walk, benches for renovation were identified and mapped.

When the group developed a project regarding the renovation of benches on the Fischerinsel, they ventured out in order to mark potential points of reconstruction, renovation or setting up a new bench.

¹¹⁵ see Chapter 3.6.1

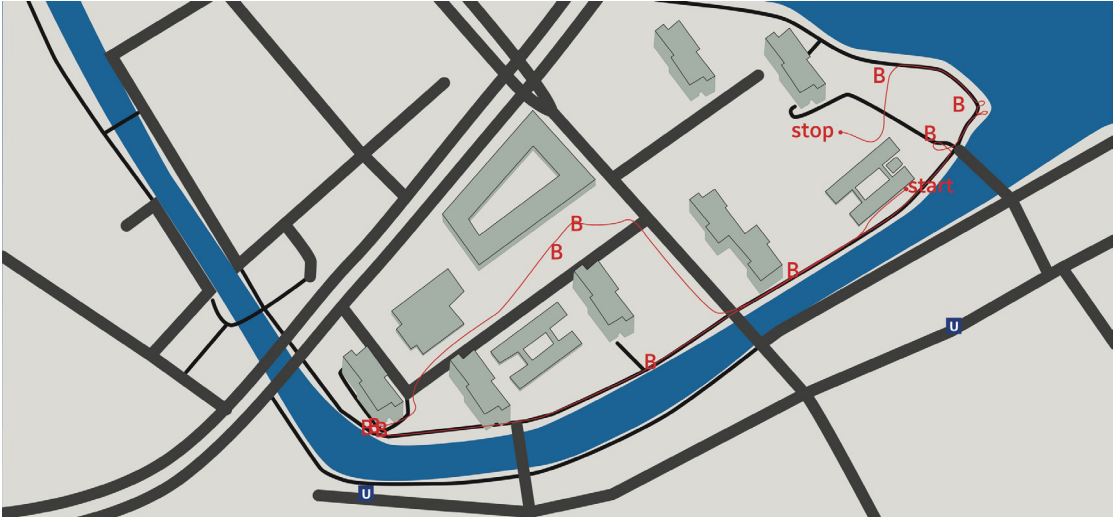


Fig. 57. In a collaborative walk, all places were marked that the stakeholders identified as locations for a new bench or the renovation of an old one.

4.2.3. Mapping Threshold Interfaces

As introduced before, threshold interfaces were starting points for the contextual investigation of the sharing phase. The research group gathered images of threshold interfaces commonly found in the semi-private space of apartment buildings and initially focused on six threshold interfaces in particular: mailboxes, sharing boxes, bulletin boards, bookshelves, doorbell plates, and kiosk fronts.

These interfaces were selected from the observational sessions on thresholds, in which we found these particularly mundane devices to be of interest due to the frequency in which we found these to be creatively misused as communication devices among neighbors.



Fig. 58. Threshold interfaces as collected by the research group.

Each threshold interface was illustrated on a separate sheet of A3 paper. Participants were also provided with tokens with various communication attributes or functions such as call, mail, e-mail, SMS, display, record, video, etc., which are to be used as modifiers to the threshold interface on which they are placed.

We allocated a set amount of time per threshold for the collaborative activity. Participants were asked, as a group, to discuss their experiences with using thresholds as communication devices for sharing with neighbors.

The participants were then encouraged to place attribute token modifiers onto the thresholds to transform them. For example, placing an “SMS” token onto a mailbox could transform it into a mailbox that sends a text message to the owner of the mailbox whenever someone leaves a note on his or her mailbox. Discussion among participants then followed about how the new, evolved threshold interfaces would work and scenarios in which these interfaces would be useful.

Participants struggled to think of sharing solutions for their neighborhoods because their real-world neighborhood constraints limited their creativity. They had a hard time imagining future scenarios in which implementing any solution would reduce their barriers with their neighbors. They also found imagining the idea of applying new technology to their apartment buildings to be too difficult to imagine.

We realized from this experience that we needed to add an element of fantasy into the collaborative sessions so that the participants would not be so concerned about real-world restrictions when designing.

Communication is filtered, and some residents restrict the types of information they wish to receive in their mailboxes. This behaves as a ‘spam filter’ of sorts: similar to what one might have installed on an email client to filter unwanted email. The filter manifests itself in the form of stickers placed on the exterior of mailboxes, semi-private in nature, requesting no advertisements. Noteworthy are also instances of what can be explained as ‘white lists’: requests to, despite the insistence of not receiving advertisements, still receive particular advertisement catalogues.

In a second attempt to create concepts based on threshold interfaces, the research group went into using a Kiviati-diagram to map various interfaces with regards to the notion of how the interface threshold is overcome. Here, the dimensions were co-presence, visibility, audibility, co-temporality, simultaneity, sequentiality, reviewability and lastly, re-visibility.

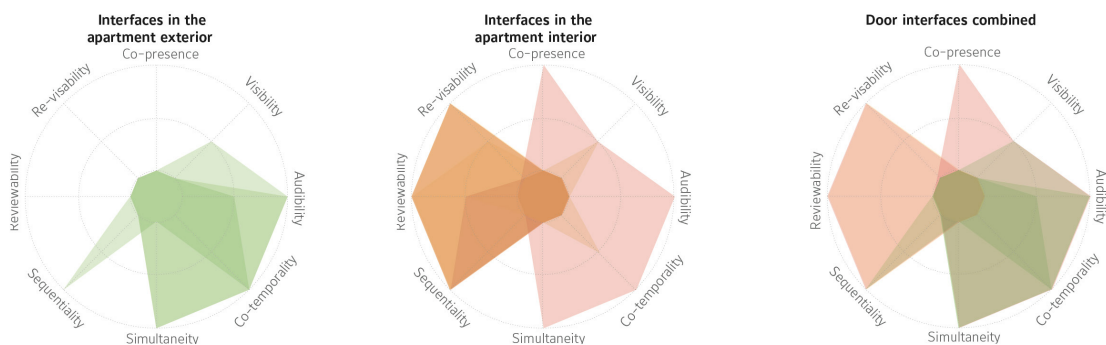


Fig. 59. Selected threshold interfaces mapped on the diagram for comparison.

In the absence of formally-implemented designated communication interfaces in the semi-public or semi-private spheres, inhabitants readily adapt threshold interface surfaces as make-shift communication surfaces, such as in the case mentioned earlier with the frequent occurrence of mailbox surfaces serving informally for one-to-one communication akin to personal bulletin boards. The location of such an interface is also influential in the type of messages communicated and to

whom it is being communicated with. To reiterate, the patterns of behavior observed in the semi-public and semi-private spheres reinforce the importance of locality and security as influential criteria for how and where communication between residents occurs. These transitional spaces can be understood as thresholds that mediate interaction between the public space of the street and the semi-private/semi-public space of the corridor, staircase or courtyard, which finally leads to the private space inside of the single apartments. Many of the thresholds that we observed showed traces of creative misuse and adaption: handwritten notices in corridors, stickers on mail boxes, and post-it notes on doorbell plates and doors, all expressed the need of the neighbors to communicate with each other or outsiders like postmen and other visitors. In contrast to this informal appropriation stood the observed “official” communication interfaces like bulletin boards or the standard labeling of doorbell plates and apartment doors.

Traces of personalization could repeatedly be found overall. On doorbell plates, personalization was much more pragmatic in nature: in cases where landlords were not supplying nameplates, residents crafted their own, often taking the form of handwritten notes or stickers stuck onto the doorbell plate. Stickers stuck on mailboxes also communicate the personalization desire of residents. Some extreme cases contained mailboxes fully covered in graffiti and ornamental stickers. The extent of personalization conveys information about how landlords relate to their residents and how much care is taken of a building.

4.3. Participatory Tools

How the tools evolved over the course of the research is determined greatly by the participants as well as the underlying research question. There were several interaction concepts, scenarios and persona constructions and prototyping exercises along the three phases of the research, which differ in the way they use technology and the notion of sharing. This moved from tool and service-sharing to a more general knowledge sharing approach.

Moving along the process, the layers of investigative action, workshop formats and tools intertwined more and more.

During the research, the whole arsenal of designerly methods were at the disposal of the project members. Depending on their own background, different methods were used for designing interventions, interaction concepts and prototypes.

In this sense, participatory tools refers both to tools used in workshop contexts but also to tools provided for the designers or stakeholders to work in their groups.

4.3.1. Interventions

Interventions were used in this project mainly as tangibles which helped spark a conversation and discussion. They were usually paired with observation and context analysis. At a later stage of the project, interventions were paired with the interactive prototypes that were developed in the project. An intervention is one of the more central elements of an action repertoire and aims, in general and in this project, at disrupting a situation or context and creating an atmosphere of critical debate on a selected subject.¹¹⁶

Chalkboard display.

After being present in the neighborhood for almost six months, we took the opportunity to build a chalkboard-display which we could set up at one of the summer parties on the Fischerinsel. The intention here was to get a feel for the community, to get in contact with them and to initiate a conversation which could be carried on over a longer period of time. Furthermore, the board was to collect, very broadly, initial ideas which could form the basis of a first sharing network on the Fischerinsel.

The two-sided wooden panel, painted with blackboard-varnish, was equipped with two printed stickers which held the following statements:

“This is something I know a lot about”

“This is something I would like to know more about”

¹¹⁶ Landmark interventions either in art or design are, e.g., Candy Chang's “Before I die I want to...” (2011) or Stefan Sagmeister's “Happy Show” (2017). The interventions provide a very simple question which is answered in a creative way.



Fig. 60. The blackboard after the first intervention on the Fischerinsel.

The banner.

A second intervention similar to the blackboard was a large-scale banner with stickers to be filled out and put on it. In a first attempt, we used the banner and stickers as a standalone intervention. Analyzing the scarce results, the project team came to the conclusion that it needed to be combined with the blackboard and a community-oriented setup. In addition to the banner and stickers, we also put up the blackboard combining the broader questions of knowledge sharing with questions regarding the problem scape. We also made waffles in order to attract more people passing by and to involve them in a conversation over food which could then be directed towards the sticker-questions and the blackboard.



Fig. 61. Vernetzte Nachbarschaft banner was used on various occasions, gathering input regarding the problem scape of the neighborhood as well as intrinsic and extrinsic motivations for citizens to be active.

Statements on the stickers included:

What I like....

What I do not like...

Neighborhood is...

The "Fischernetz" is...

My question is...

The statements were kept quite open, however, due to the location and timing of the intervention, they focused on current developments on the Fischerinsel and prompted not only written but also oral responses in subsequent discussions.

The results from both interventions, which we put up several times, were mixed. On the one hand, the written responses were conversation starters, on the other hand, it was unclear at the time how the threads of discussion would be taken up again once the intervention was over. From intervention to intervention the questions were refined, but nevertheless, the rather simple interaction kept the answers within a range that does not extend beyond superficial, mostly visual topics. This shortcoming was alleviated by subsequent workshops which addressed some of the topics mentioned.

4.3.2. Scenarios and Personas

A lot of the design work done in the Neighborhood Labs project was built on the construction of scenarios and personas based on the actual data that was collected. This approach provided a level of abstraction while keeping the actual people behind the data hidden, a fact that can prove to be beneficial or futile depending on the stage of the process.

The hypothesis related to this is that, through the development of scenarios and personas, a problem area may be outlined in a more precise way and may provide a basis for further development of a concept.

Persona development.

The early investigation and analysis of the context on the Fischerinsel produced insights into potential participants and users of the Vernetzte Nachbarschaft projects. As a starting point for the subsequent concept creation phase, personas¹¹⁷ were developed, based on the gathered information, in order to create some separation of the project team from the individuals we were working with.

The personas identified represent a significant group of individuals with common interests. They form a starting point for the development of scenarios in the project.

Scenario development.

Scenarios can take different forms and reflect different phases of the research. While, on the one hand, there was experimentation with narrative forms of scenarios in an early project phase, there were also prescriptive scenarios providing step-by-step use-cases for further development.



Fig. 62. Scenarios may take different forms. They range from narrative to prescriptive and are, in this research, tied closely to the development of video or paper prototypes.

¹¹⁷ Personas are linked very closely with the user-centered design approach, while being adapted to many different contexts, especially in the development of systems and services and in interaction design. There are three types of personas: fictitious personas, which are used to evoke extreme users; personas based on real quantitative data; and personas that are based on qualitative data (Cooper, Reimann, Cronin, & Noessel, 2014).

4.3.3. Prototyping as a Means to Interact

The development of ad-hoc prototypes or mock-ups was an integral part of the research process both in collaborative sessions as well as the ideation and design sessions with just the research team present. It helped illustrate concepts, grasp ideas and discuss future interactions through the means of tangible objects. While in the discursive or design game workshops the setting was quite clear and structured, prototyping sessions were more open and experimental in the sense that they could go in many directions regarding the output. In my work, I distinguish between paper-prototypes, video-prototypes, community-originated prototypes and digital prototypes as a means to convey concepts, investigate processes and design interactions.

Paper prototypes.

Stemming from a human-computer-interaction context, especially user-centered design, the method of paper-prototyping is used primarily in a software development context and the process of creating software. It was developed in the 1980s as a simple tool to cost-effectively prototype interactions. While this method is beneficial for early evaluation of the usability of a digital product, it may also give insights on the elements, scope and target group involved in it. In recent years, the method has been adopted by other design fields. The method plays with the familiar medium of paper and allows for quick adaptation and redirection of a concept and the fast testing of various ideas.

Paper prototypes, as quick ways to prototype user interaction, a scenario or situation, have been beneficial for the joint development of the interventions as well as the digital and analog artifacts that were built during the projects. I will go into the details of three distinct paper prototypes.



Fig. 64. Introducing paper prototyping to the stakeholder group, providing a template and structured instructions for its use.

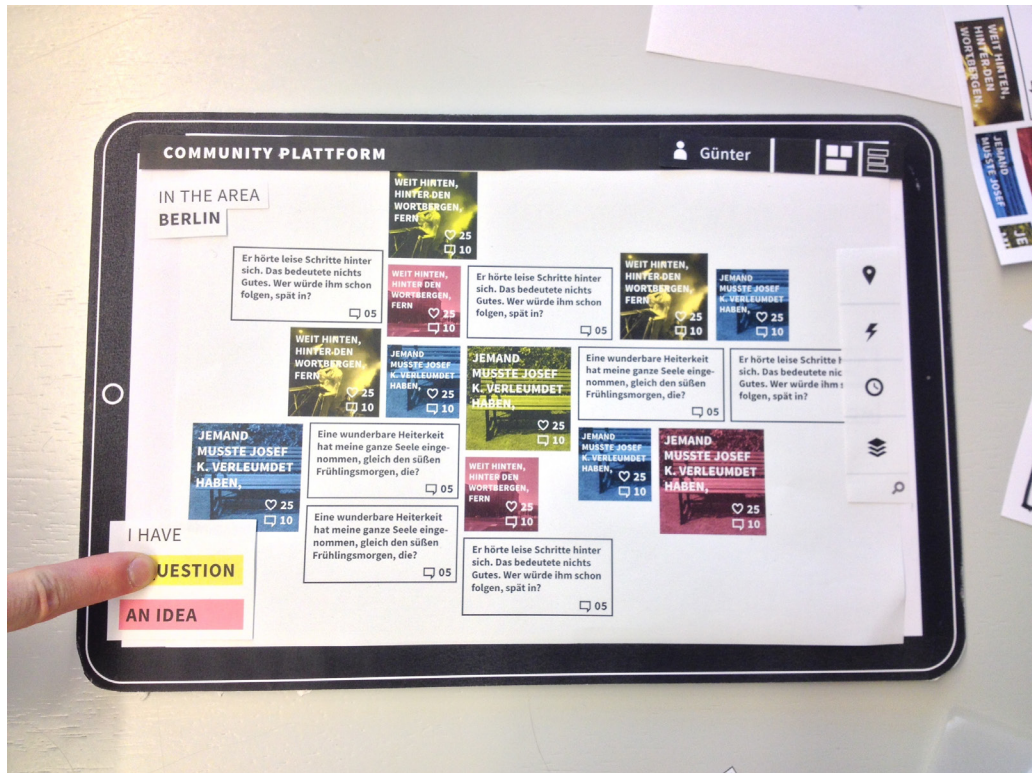


Fig. 65. Paper prototyping a sharing platform for the Fischerinsel project.

Video prototypes.

During the late stages of the sharing phase, and starting from a concept and paper prototyping session, I scripted and developed a video prototype which would give insight into how the concept could work with the use of a mobile device. Here, the concept that was visualized was of a “doorbell history feed”, a concept created in the sharing phase of the research:

A classic, stand-alone doorbell only provides a co-temporal signal when both parties are co-present. Imagine if doorbells had reviewability and didn't require co-presence. The doorbell history feed is a solution that allows residents to review their doorbell usage in timeline format.

With the classic doorbell, the resident doesn't find out who was there, what they wanted, or how to contact the person who rang the doorbell. To alleviate this, the doorbell history feed allows visitors the option to leave a voicemail, which would be assigned to that activity entry in the feed.

Pros: This alleviates the stress of busy residents who feel that they have to wait at home in case of missing a visitor. With the doorbell history feed, they could potentially follow up with the missed visitor.

Cons: Invades the privacy of visitors who might not want to be identified. Same concerns as when caller identification was originally introduced.



Fig. 66. Still from a video prototype that was developed in the sharing phase, following a detailed scenario and script.

The prototype we built was a very low-tech artifact made from thick cardboard, some paint and kapa-boards. In the course of developing this, we always had it in mind to reflect on the use of the concept in the wild, a step which would come after the first test with the video prototype. It built on a detailed storyboard which included iterations and alternative paths.

Community-originated prototypes: The Soundfish.

The Soundfish was an idea coming directly from the community on the Fischerinsel. They wanted to create something lightweight and easy to use that could be passed around at their gatherings in order to record sound snippets to specific questions that would be written on the Soundfish.

The prototype was to yield results on different levels: First off, it should promote the Vernetzte Nachbarschaft project to other inhabitants of the Fischerinsel; secondly, it should provide a learning experience for the senior citizens regarding the use and tinkering with technology; and thirdly, it was to provide insights into how to conduct a prototyping workshop with seniors.

Regarding the shape and setup of the fish, we used very basic materials and technologies, so the first prototyping experience would be positive for everyone involved. Using a greeting card sound module, participants worked on a way to present it to others.

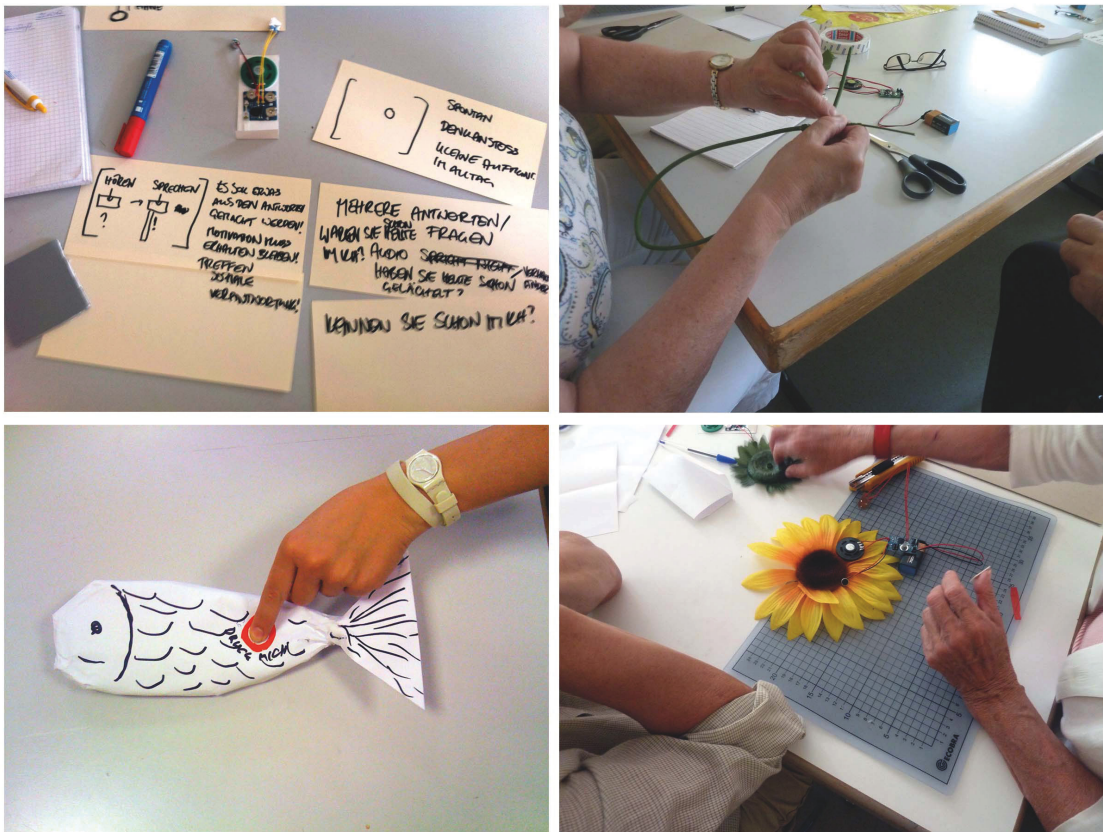


Fig. 67. The workshops and subsequent output sparked a discussion about how people would engage with the Fischerinsel community through this low-threshold medium. Overall, they liked the positive notion of the fish as a symbol for the historic “Fischerinsel” port. Although we would evaluate this idea as quite obvious, it goes back to an earlier concept of the preceding “Networked Neighborhoods” project on which the Vernetzte Nachbarschaft builds and in which the same people are involved. In this preceding project, focused on a sharing community, the research team developed an analog “Fischernetz”, an analog sharing platform including the metaphor of the fish and fishermen in their narration.

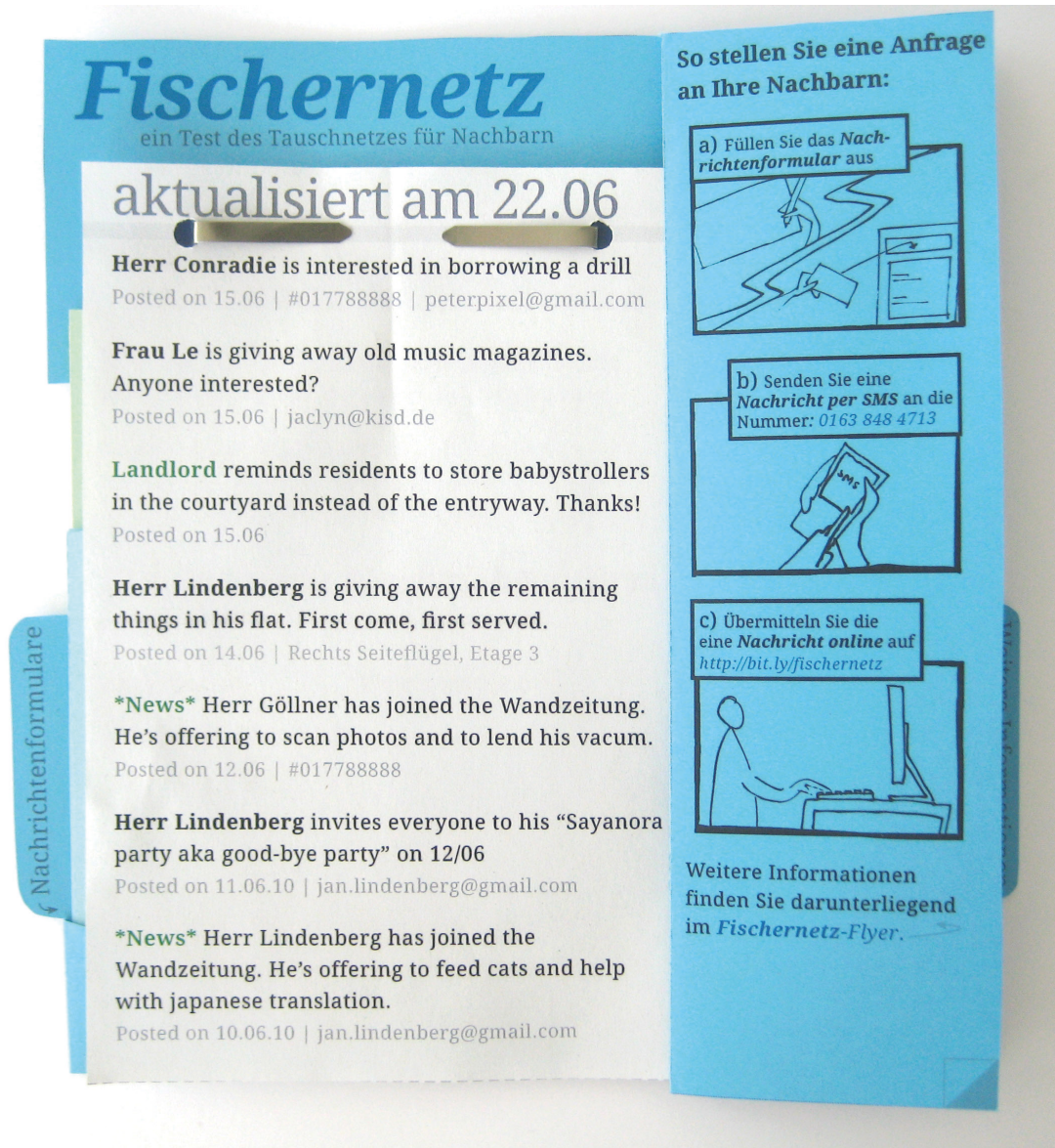


Fig. 68. Early prototype of a house-bulletin in the high-rise buildings on the Fischerinsel.

We ran with the concept, using it as a means to strengthen cohesion in the project and to quickly prototype the idea with participants as well as test a collaborative prototyping approach.

The core group of the Vernetzte Nachbarschaft project were looking for ways to engage the excluded inhabitants of the Fischerinsel through alternative media. They argued that there were so many posters, handouts, flyers, etc. being dumped on the apartment blocks that anything similar would soon disappear or not be taken seriously. In our first observation this was presented as a major problem, while none of the active group had an idea of how to approach this topic differently.

In individual conversations, the need for a more creative way of approaching others was predominant. The core group's fear was that nobody outside the group would feel invited to participate in the project.

Following the first prototyping experience, we developed a second prototype based on the initial ones.

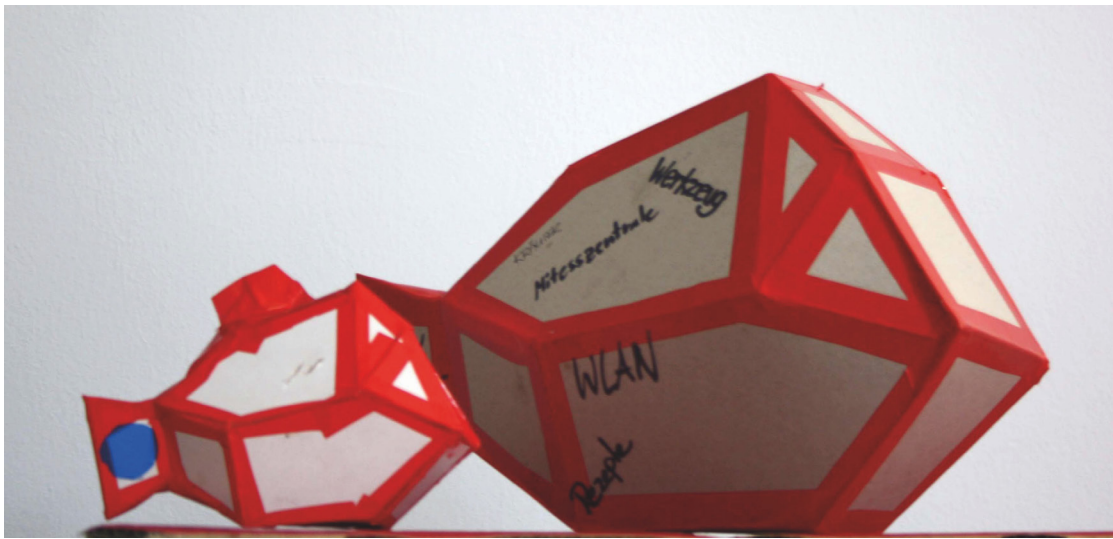


Fig. 69. The iteration of the community developed Soundfish was built with cardboard, tape and a greeting card sound recorder which enabled the playback of a message. The fish was passed around at an event to collect answers to simple questions regarding the neighborhood. The answers were written on its surface and recorded with the built-in sound-device.

Digital prototypes.

While in the sharing phase most of the prototyping was done in analog, there were some initial digital prototypes, which were basically simple click-dummies or digital scenarios, that illustrated the concept of a sharing platform.



Fig. 70. Video-still of an animated scenario and storyboard of the neighborhood sharing platform.

In the “infrastructure phase”, however, several digital mock-ups were built in order to further evaluate the concepts and eventually push them further along towards a working prototype.¹¹⁸

¹¹⁸ The working prototype in question is the Hybrid Letterbox, an analog-digital bridge-device which will be described in the next chapter as one of the landmark outputs of the research.

4.3.4. The Hybrid Letterbox Case

As the first medium-fidelity prototype of the Neighborhood Labs project, the Hybrid Letterbox mimics a very traditional medium of communication which was identified in several workshops and discussions with the stakeholder group.

Digital approaches to citizen participation contrast a longstanding tradition of participation through "traditional" channels. Democratic voting, petitioning and similar practices have been widely accepted in all of the EU countries for decades. While new forms of participation have often claimed to be able to replace such traditional practices, there is significant doubt that a large part of the population will accept this.

As mentioned before, there has also been a rapid rise in digital participation platforms (Adhocracy, Avaaz.org, changify.org, neighborland, etc.) and other forms of political participation, via Facebook or Twitter, over the last 5 years. Although they prove to be successful in certain contexts, they lack analog and multi-modal input and output channels. With the existing solutions, one is dependent on being online and having the skills to use the respective systems. Furthermore, you have to have access to novel technology which might be too expensive or not available in your area.

Assistive technologies providing certain mechanisms to bridge the gap between analog and digital have been developed, but many of those solutions are implemented from one side only, making, for example, the user interface in a way that it mimics analog processes without changing the perception of the actual activity through technology. One finding is that there is a large number of especially tablet-based apps dedicated solely to senior citizens. Furthermore, there are numerous applications that are addressing the security and safety issues that about 9% of the offline-population and an unknown part of the online-population are concerned about

These emerging possibilities of participation are not (or to a very limited extent) available for those who are offline. According to Eurostat (Nov. 2015) these numbers keep decreasing; while in 2009, 30% of Europe's population had no access to the internet, in 2015, statistically it was only a mere 16%. In Germany, 10% of the population has never been online. These very general statistics cloud the actual use of the internet beyond using a search engine or checking e-mail. According to Eurostat (Nov. 2015), 23% of Europe's population states access costs are too high for them to get internet in their homes, 9% are concerned about privacy and security, 41% do not have internet access at home because of lack of skills and 27% do not have access because equipment costs are too high. Due to demographic change, those who are affected are increasingly senior citizens, those who are thus being excluded from the aforementioned participative processes that make use of internet technology. There are only a few bridge technologies that use traditional media and modes of participation.

Regarding ownership of the land and responsibilities for its care and maintenance, the Fischerinsel is quite fragmented. Some parts are privatized, some are in the public hands. Thus,

information about how to participate and be involved in local decision-making processes is scarce or simply not available. The city and governing body are often seen as an opponent rather than a partner in making decisions. When looking at our core group of collaborators at the SCC, the problem of being cut off from digitalization trends is an apparent concern, not because the elderly want to generally be familiar with new technology, but because they want to use it as a supporting element for their everyday life, e.g., for communicating with their grandchildren (Skype), preserving memories (digital photobooks) or staying in contact with other seniors (instant messaging).

The core problem of the gap between digital technologies and the "analog" realities of everyday life create the need for bridge technologies that slowly draw digital strangers towards the digital and provide them with access to, e.g., participation systems.

A tool for bottom-up participation

The concept and the very first prototype of the Hybrid Letterbox was developed in close collaboration with a group of technically-interested senior citizens of the SCC who have been involved in the overall process of the research. The idea for the prototype emerged out of a preliminary project, networked neighborhoods, and was refined in co-design workshops, since some of the predominantly elderly stakeholders in the neighborhood we worked with do not have access to digital media. This was presented as a problem, since we were working on a local social network and were particularly aimed at involving those who had not been active in the shaping of their neighborhood so far. We realized that we needed an interface that would connect the digital and the analog world and hence began working on the development of the early prototype together.



Fig. 71. Hybrid Letterbox: The first prototype (left), and second iteration (right) had different base setups.

Having encountered this hurdle in our own work, we started to become more sensitive towards the generally existing tendencies of exclusion that are inherent in the current digitalization of our social and political lives. The conceptual development of the Hybrid Letterbox was consequently participatory and emphasizes the potential of digital social innovations to make the ever-accelerating technological progress a more just, haptic, humane and rich experience for the vast majority of people.

The Hybrid Letterbox is a ‘bridge technology’ which aims at enabling those who are currently excluded to take part in the described developments. It bridges gaps and overcomes hurdles that obstruct digital participation for a vast and diverse amount of people. It is a digital-analog instrument providing a more inclusive form of (digital) participation than most other existing devices or platforms for participation. Operating in a living lab setting, on the principles of participatory design, we built on recent developments that incorporate concepts like citizen empowerment and participation in the design of technological solutions. In order to generate a significant amount of appropriations of the prototype, we released it open source and collaborated with others in implementing the Hybrid Letterbox in various contexts.¹¹⁹ Initiated contacts include an NGO that enables senior citizens to tweet and a political party that provides novel forms of voter inclusion.

As a network, hybrid letterboxes serve as nodes that are:

- *connected to each other,*
- *are linked to and provide access to existing social networks and*
- *can represent contributions visually in local public space (e.g., projections, city screens).*

Technological setup and iterations.

In stage one, the first working prototype included an Arduino to read the postcard sensor input and control the servo and a Macbook to capture the camera image. A tablet included in the front of the letterbox showed the submissions. The first prototype was not capable of sending the submissions to an internet server and the upload of images to a server was relatively slow, since the Arduino board did not yield sufficient speed. To make the setup more affordable and to also reduce the power consumption of the prototype, in stage two we switched to a setup with a Raspberry Pi B+ in its core, which sped up the upload process significantly. This setup also included a Wi-Fi router and an umts stick, which made it possible to send the submissions to an internet server over mobile internet or Wi-Fi. This prototype is also able to run on battery power for a whole day.

Furthermore, we converted the electronic circuit boards to professionally printed circuit boards which are less error prone, cheaper to produce and, compared to a normal prototyping board, the electronic components can be placed and soldered on it within a few minutes. Providing the sketches for the open source release of the Hybrid Letterbox also makes it easier to reproduce the letterbox.¹²⁰

¹¹⁹ As the basic setup with letterbox and projection, e.g., in the Museum Barberini Potsdam, the Futurium Berlin opening, and others. In adapted setups by others, e.g., Teufel Lautsprecher, University of Göttingen and others.

¹²⁰ The goal of providing open source documentation turned out to be more difficult than the group imagined. Despite slimming the setup down to a minimum, it still required considerable knowledge and skills to put everything together.

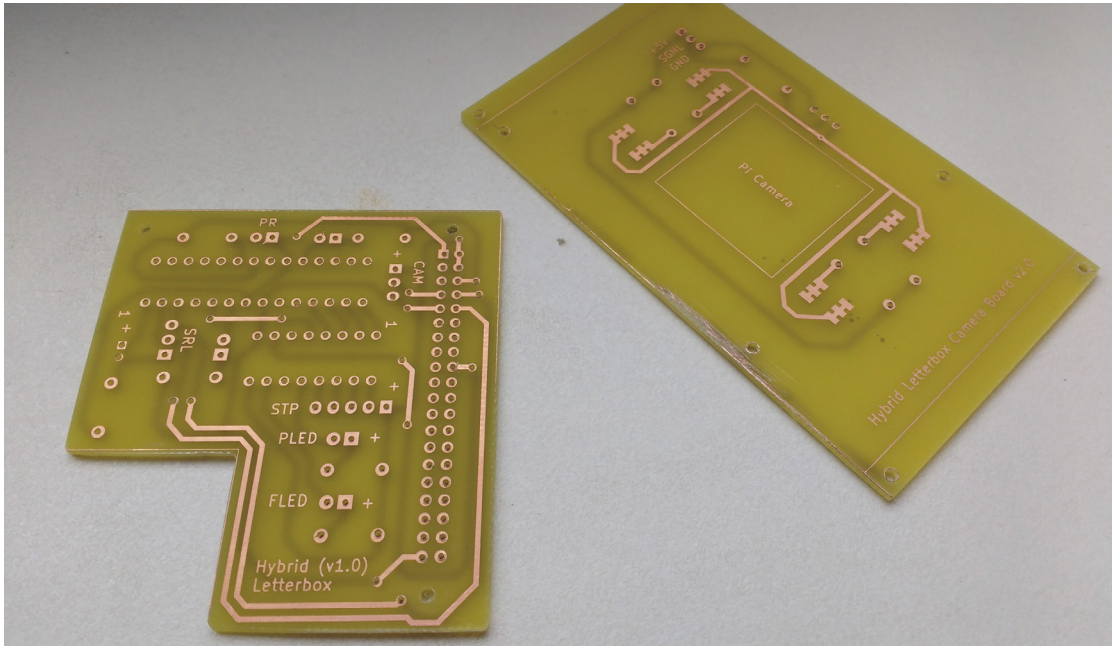


Fig. 72. Camera board and control board.

Two boards have been developed with the release of the Hybrid Letterbox: the camera board, which is shown above and the control board, which will be placed on the Raspberry Pi. One significant problem we noticed in the first user tests was that the letterbox only worked when the postcard was inserted in the correct orientation. The second prototype was able to process the postcards no matter which way it is inserted. In the process of this dissertation, the second functioning prototype has been built and tested in-house, but never released to the public.

Beyond the primary challenge of the participatory and iterative development of the refined prototype and a digital platform, the Hybrid Letterbox provides an example for novel ways of expression in public space. Socio-political engagement in the social network era takes on many forms that go well beyond the involvement in political parties or formal interest groups. On a local level, for example, it is important to help citizens engage spontaneously and project-based within their neighborhoods, to voice and collect ideas, to share opinions and to take on social responsibility.

Further development.

With the release of the second prototype of the Hybrid Letterbox, we implemented a RESTful Web API for the central webserver. The Web API allows the retrieval of the status of all connected letterboxes, the submissions of the letterboxes, combined submissions of multiple letterboxes in one bundled feed and provides basic authorization features for accessing its content. The Web API makes it easy to build customizable interfaces to organize and visualize the content of the letterboxes. In a next step, the API could be further developed to allow commenting on/discuss submissions through a web browser and to connect to social media services like Facebook, Twitter,

etc. The code is available open source on Github.¹²¹ Together with the API, we created a lightweight, easy to use interface that can be adapted depending on the context.¹²²

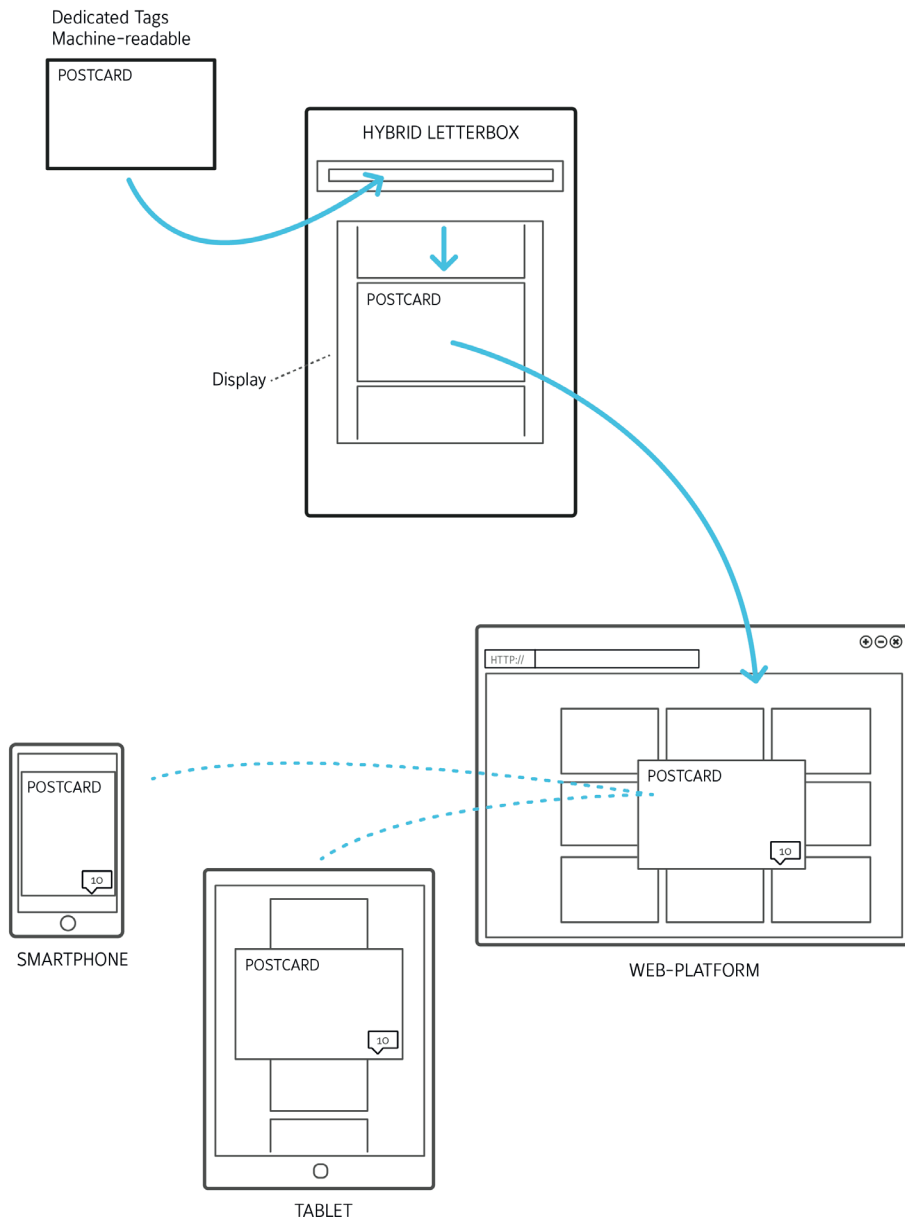


Fig. 73. The Hybrid Letterbox base concept including an analog-digital bridge device tied to a web-platform which allows for analog content to be commented on.

¹²¹ Design Research Lab Berlin (2018). Retrieved from <https://github.com/DRLabBerlin/HybridLetterbox>

¹²² Wireframes, platform images and technical descriptions can be found on Github.

4.3.5. The Fischerinsel Platform and API

The concept of a Fischerinsel web-platform evolved from the sharing network phase through the infrastructure phase, in several directions.

While the first concept saw the integration of numerous in- and output points for the platform, a second and third version opted for the reduction and focusing on of a barebone API as well as on the integration of the Hybrid Letterbox in a neighborhood-specific web-platform which would then be transferred to other contexts.

Fischerinsel web platform.

The web-platform had its origins in the first sharing network concepts of the project and, although it is tied to the Hybrid Letterbox, it has been developed independently. One main focus was on bridging gaps between local neighborly networks and experimental access points to a wider network which can be seen as bridge elements between the physical and the digital world.

The basic assumption and guiding principle for the platform can be summed up as follows:

Neighborly interactions develop usually through a common or shared goal, e.g., the improvement of greenery, support with day-to-day activities, etc. The motivation of this platform, as developed together with the core group on the Fischerinsel, lies in the bridging of analog-digital barriers, which are covered by other elements of the designed infrastructure, such as the Hybrid Letterbox.

The common goal of this platform was to bundle initiatives, information and services in the Fischerinsel neighborhood in a user-friendly, intuitive way and to provide possibilities for actions directed towards impacting one's own living environment. In this way, participation in social and political processes of change in the neighborhood were to be facilitated and fueled. This included the representative documentation of actions, interventions and results and the involvement of press, local policy makers, the city council and an interface to the Berlin Open Data portal.

The concerns, problems and questions that pop up in the neighborhood were to be made available for neighboring districts, in order to facilitate knowledge sharing between neighborhoods.

The web-platform included three key modules to be explored by users.

“Ask & Share”, as a low threshold access point, was to provide the opportunity to quickly post questions to the neighborhood regarding service or tool sharing, which would be made visible and could be commented on by community members. Questions, offers, ideas and proposals could be communicated easily between neighbors.

The second module “Issues”, was aimed at addressing further the specific problems that are shared amongst the members of the community and may not be answered or solved quickly. The platform was to provide a way for people to form interest groups along with tools and methods to organize and tackle problems.

The third module, “Open Source Tools”, was to provide existing bridge devices (such as the Hybrid Letterbox) as blueprints as well as intervention methods in the style of an online handbook.

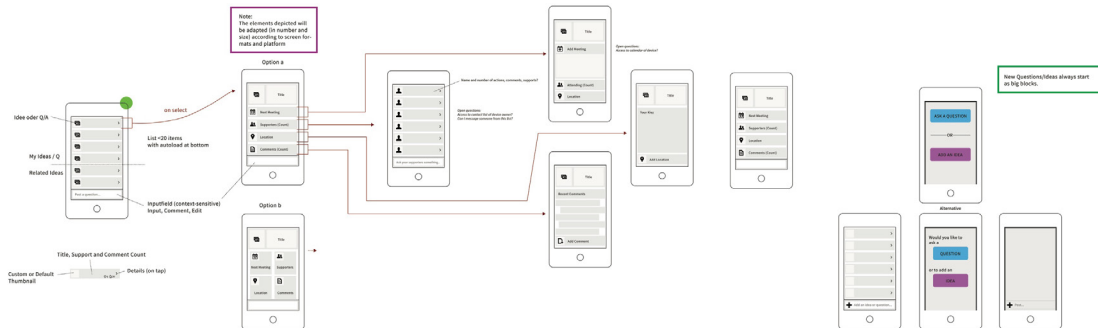


Fig. 74. Wireframes and flows for the Fischerinsel platform as a basis for programming and further testing.

While the Hybrid Letterbox was developed in collaboration with the core group on the Fischerinsel, the Platform and API were largely designed in-house. Nevertheless, at certain points in the process, the core group was informed and consulted and, on rare occasions, included in co-design sessions, e.g., for paper prototyping use scenarios.

The Fischerinsel platform was developed over the course of almost a year, from first ideas to early prototype, but eventually the development was stopped due to programming issues. It became clear that the development of such a large-scale platform, even as a prototype, required larger resources than we were able to provide. Thus, the concept was scaled down and realized as a core API and skeleton platform¹²³ which the group could test over a period of time.

Use scenario.

In this scenario, the Seniors’ Computer Club Berlin-Mitte (SCC) serves as the agent and central hub for running the Hybrid Letterbox network. They are an active part of the neighborhood and are widely acknowledged as carriers of local knowledge as well as technical skills which they are passing on through their club.

Inhabitants of the Fischerinsel are able to collect voices and determine which questions and challenges the neighborhood is facing. The Hybrid Letterbox Interface helps to collect all entries, analog or digital, to create a more diverse image of the neighborhood.

¹²³ An API is short for application programming interface. In the case of the Hybrid Letterbox, it provides an easy to adapt framework for further adaptation on the programming level.

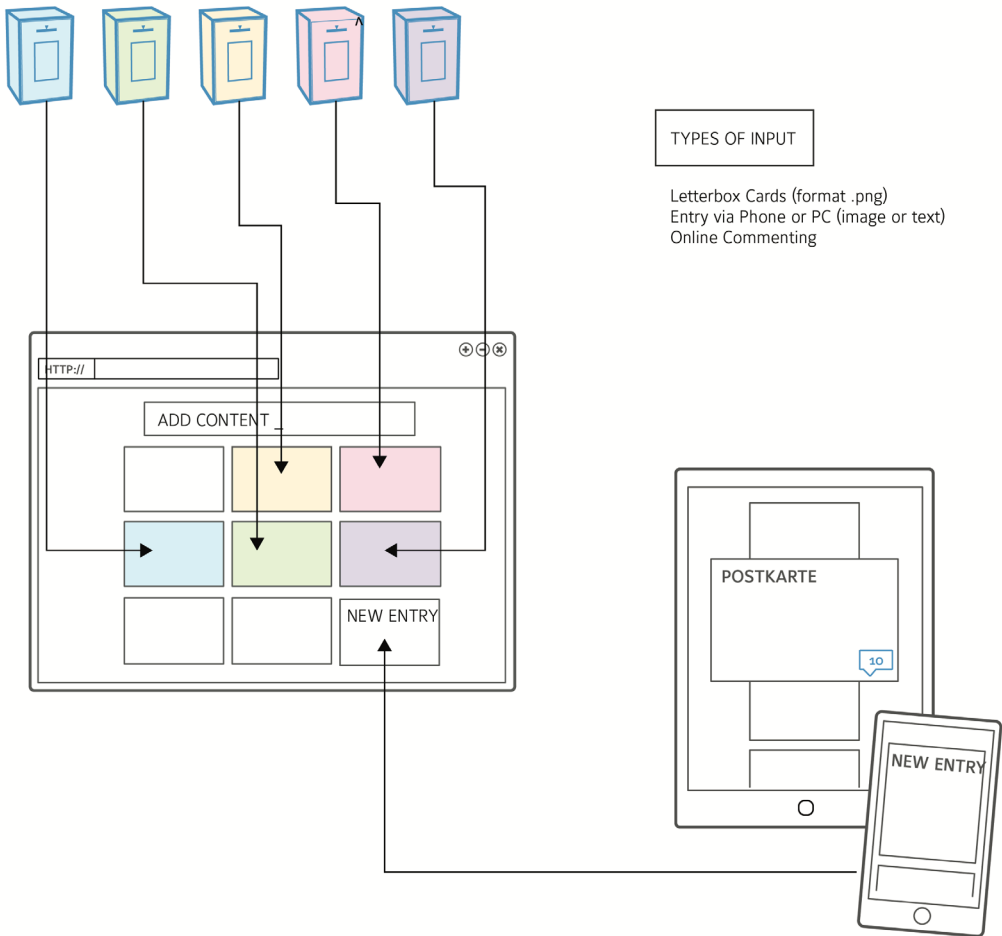


Fig. 75. The structure of the API and flow of content.

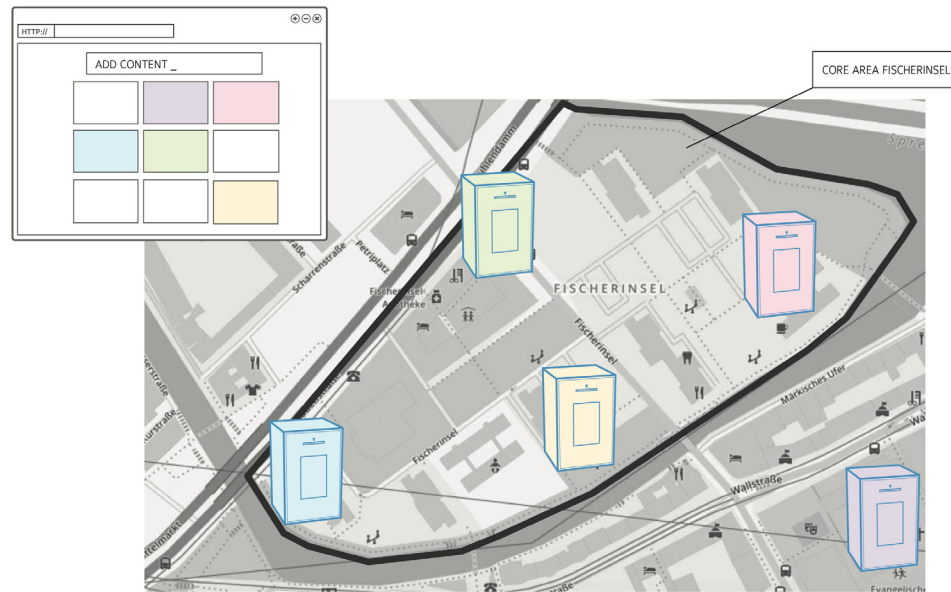


Fig. 76. Setup possibilities on the Fischerinsel (image with map and five letterboxes).

The setup as proposed in Fig. 76 was never fully realized with five letterboxes, but only with two at a time in a field test. It showed the possibilities that such a platform could provide for a small area such as the Fischerinsel.

When mapped to the aforementioned perspectives of “Making”, “Opening” and “Transforming”, the platform and API was mainly situated in the latter two.

Open Source: First of all, the platform and letterbox is developed as an open source framework¹²⁴ which can be adapted and used by anyone anywhere. To make this possible, detailed documentation is provided, which facilitates use by individuals or groups that are not familiar with the project. Nevertheless, setting up the core platform and API requires some expert knowledge in web technology, a fact that could not be circumvented by design.

Transparency and accessibility have been major objectives while working with the core group on this platform. Although they are familiar with some technology, it was important to keep the descriptions and use scenarios as user-friendly as possible. It showed that when going too deep into technological terminology, the participants were uneasy with giving their input. Consequently, the task was to find appropriately graded terminology so that we could collaboratively work on the platform concept.

¹²⁴ The material is available online on a git repository.

5. Discussion and Conclusion

5.1. Towards Sustainable Design by Default

The final chapter provides a summary of the works results as well as the key contributions, open questions and outlook regarding the notion of sustainable design by default.

A framework for sustainable design.

Exploring the diversity of sustainability approaches that are presently discussed presented a diverse, dispersed and fragmented ecosystem. While on the one hand, there is a sustainable practice that keeps inside the scope of problem-solving and market-orientation, there are also practices, leaning on the theory of sufficiency or a post-growth narrative, that go beyond this barrier that most designers seem to be constrained in.

Outside of design, the term of sustainability has been overstretched and mangled into an empty buzzword that has seemingly reached well beyond its expiration date. Sustainability thus “...more often than not represents an effort to ensure the survival of existing social, political and economic forms, in particular that of neoliberal capitalism” (Kossoff, 2011, p. 277).

What resonated in this initial exploration was Papanek’s claim that (industrial) designers are greatly responsible for the failure of mankind to stay within the boundaries of the earthly support systems. In other words, factoring in all design concerned with the production of commercial artifacts, it is difficult for design professionals to move past the boundaries of production and consumption, since they themselves are key assets in such processes.

Designerly artifacts are to be found on every corner, and everywhere we turn, they shape our world and in turn the people that live in it. This is why designers do have an impact and, more importantly, a responsibility to take into account the implications of their designerly outputs. By creating cross-links between holistic sustainability approaches and current movements in design, the basis for a holistic notion of sustainable design, which is informed by theory and rooted in interdisciplinary practice, has been provided.

When reviewing past and current literature on the topic, positive narratives of sustainable design were outweighed by negative ones that emphasize the sheer pressure of globalized, interconnected, environmental, societal and economic problems that we are faced with today. This might be difficult to deal with as a designer, without taking a pragmatic, slightly optimistic stance, acknowledging that sustainability as a concept will remain utopian and that working towards its ideal will, without a doubt, include trade-offs and not necessarily produce solutions. Sustainable design is in this sense a continuous dynamic process. The better it is informed by theory, contextualized in practice, and approached interdisciplinarily, the more appropriate and meaningful its output can be.

The proposed exemplary process and approach supports sustainable designers in their work and provides a positive, constructive way to tackle challenges of sustainability through design, using its capacities of future-focused thinking, interdisciplinary making and the ability to open up access to

new contexts, situations and technologies for others while taking into account neighboring practices.

Conflicting views of sustainable design.

It was vital to establish that the dominant view of sustainable development is but one of a multitude of approaches that exist. After providing an overview of some of the roots of sustainability and referencing other work which has gone deeper into the broad spectrum of sustainability approaches, the concepts of strong sustainability as well as sufficiency were introduced, which are more holistic views on sustainability, that are not tied to abstract dimensions of the social, economic, and environmental sphere and that are suitable as a reference for an inclusive notion of sustainable design. A preliminary framing of sustainable design was attempted, viewed as a practice where designers consider material and immaterial impacts as well as the impact on inter- and intragenerational justice of their designed artifacts. It is this framing that leads to the consideration of a holistic notion of sustainable design, not tied to, for example, a socially or ecologically sustainable perspective, but directed towards a default configuration in design that takes into account all dimensions of sustainability.

As established earlier, there is a noticeable shift in design towards a more conscious, socially-aware practice that, in itself, does not achieve much when the underlying mind- and skillset is not adapted to current needs. In exploring the disparate area of sustainability and design, certain commonalities emerged, which served as a basis for further discussion. It was established that sustainability, in design or otherwise, is a utopian concept which provides the ideal ground for future-focused narratives.

Furthermore, the exploration of selected areas of design that work for social impact have shown commonalities. In an effort to contrast design activism, social design and participatory design, transition and transformation design, their key principles were brought to light. In referencing these overlapping fields of inquiry, a multitude of methods could be integrated in this work, in order to explore their potential for sustainable design. These were then categorized in the three streams of investigative action, collaborative workshops and participatory tools.

The review of literature showed that there is a rising awareness of design as an agent of transformation, not only regarding products and services, but also large-scale systems and processes. Designers working on the backdrop of sustainability are concerned rather with qualitative information which they extract meaning from, involving actual people in real life everyday contexts for and with whom they are designing.

At the same time, sustainability research as well as some areas of design practice, most notably transformation design, transition design, social design, design activism and participatory design, have directed their attention to incorporating some principles and practices of sustainability in their

research or practice, stripping away the historical baggage and overburdening of the term.¹²⁵ Throughout the current work, the objective was to explore these boundaries of practices incorporating principles of sustainability one way or another. In setting the work within research-through-design, I was able to establish tentative links with transdisciplinary research approaches in the social sciences that have a longer tradition in dealing with the topic of sustainability than has design.

Participatory design was introduced as one of the major influences for the Neighborhood Labs project and put it into perspective with the theoretical models of participation, as well as the Scandinavian approach to participatory design; these perspectives are rooted in the workplace democratization movement of the 1960s but have evolved considerably, experimenting with concepts such as "use-before-use" and "design-after-design" and informing the project regarding the implementation of participatory design methods and workshops.

From this backdrop, the hypothesis that a design research project guided by research-through-design and conducted with a participatory mindset could indicate ways and means to incorporate sustainability principles in a way that it is seen as a default configuration, yielded not only the exploration of a diverse set of actions throughout the design project but resulted in a dynamic typology of action that, in reflection, supported the aforementioned hypothesis.

Consequently, the underlying trajectory of this work was to:

- *put sustainable design in perspective regarding sustainability research and provide arguments for a holistic base configuration useable in practice and informed by theory;*
- *explore participation as an underlying requirement and fathom its qualities as well as its limits in use within design;*
- *develop a repertoire of action for stakeholders in an urban neighborhood in Berlin, leading to an assemblage of designerly methods, tools and paths to action to be explored, adapted and contextualized.*

Research-through-design, as a prime example of Mode-2 science, in this case, supported the arguments as well as the baseline for a new understanding and, more importantly, a re-framing of sustainable design towards a holistic, informed practice. In its macro cycles of analysis, projection and synthesis, combined with the micro cycles of research (research/observing - analysis/reflecting - synthesis/planning - realization/acting), lies the path towards situated knowledge which is the basis for transformation to a sustainable society.¹²⁶

¹²⁵ While this shift is not necessarily new, the review of literature suggests that increasingly, design practice as well as design research is influenced or even guided by some goals of sustainability. See chapter 2.1.3.

¹²⁶ see Chapter 1.1.4 for the introduction to research-through-design.

Emerging from the messy junction of sustainability research and sustainable design practice, a key argument was the notion of sustainable design by default which is specifically not meant to be another buzzword to be spread around, but

suggests the implementation of principles and practices of sustainability in design on a micro-level and as a baseline within design education, research and practice.

While this work allows conclusions regarding such incorporation into research and practice, and despite having brought some of the ideas and concepts to design students, targeting a transformation of design education was never the scope of this work.

Working in the field of sustainability, several major issues emerged. The far greatest challenge for its practice, and something that sustainable design has not overcome yet, is the discrepancy between top-down approaches to sustainability, including reports, guidelines, how-tos, global summits and their subsequent policy instruments, and bottom-up initiatives, approaching challenges of sustainability in their everyday life. Somehow designers are caught in-between, scrambling to bring both sides together. In the process, this prompted the tentative proposition that the action repertoire along with the configuration of sustainable design by default would overcome this gap and provide pathways for approaching the wicked problems of sustainability that designers are faced with every day.

The scope as well as the questions regarding this research were partly participatory in a sense that, in some phases, the core stakeholder group was included in meta-workshops discussing the project and its impact on research, allowing conclusions to be drawn to move towards the adaptation of the research question. The assumption that the notion of sustainable design by default is slowly forming, yielded the overarching guiding research question of:

what might be the basic configurations of sustainable design by default and how can a dynamic framework for transformation provide designers with instruments to approach challenges of sustainability on a micro-level?

This provided the grounds for underlying sub-questions, which were explored in different phases of the research and allowed extensive experimentation regarding methods and tools used.

Furthermore, the numerous interventions and actions throughout the project time provided insights into the application of sustainability principles in practice. What was especially beneficial, in this sense, was fragmenting the theme of sustainability into manageable parts which refer to the everyday life, practices and realities of the stakeholders in the project. This meant concretely labelling what sustainability in the context of this specific stakeholder group, of mostly senior citizens on the Fischerinsel, means. Through different phases of the project, the targeted sub-categories of sustainability shifted considerably as a result of the involvement of the stakeholder group as experts of their everyday lives into problem framing and the research process.

The first phase of sharing was dedicated to entering the context and setting up the first iteration of a living lab while using and developing tools and methods which aided in the understanding of the context and the stakeholder group, as well as engage new active citizens in the budding project. This phase produced an exploration of threshold communication interfaces which would provide the basis for numerous concepts that were developed subsequently and that would form the starting point for the iterative development of collaborative tools. In this first phase of "sharing", the categories were strengthening social cohesion in the stakeholder group as well as in the neighborhood, inclusion of a marginalized group (senior citizens with little knowledge of technology), creating an awareness of the impact of active initiatives on the Fischerinsel as well as developing an awareness of the possibilities of designerly methods for non-designers.

The second phase of "infrastructuring" revolved around iterating and refining the concepts that were developed as well as building first working prototypes. Furthermore, the stakeholders were involved in more elaborate designerly methods, such as scenario building and quick-and-dirty prototyping. During this phase, the Hybrid Letterbox, an analog-digital bridge device, one of many concepts that we developed, was taken to early prototype stage and tested together with the stakeholders. "Infrastructuring" was focused on empowering the marginalized group to co-design possible futures (through using, e.g., prototyping) and to provide tools that would enable the stakeholders to eventually use the designerly methods themselves, without the involvement of the design research group.

In the third phase, the focus lay on the adaptation and contextualization of tools and methods to a new context in other projects. In one example, the technology-oriented CHEST project allowed the further development and robust setup of the Hybrid Letterbox including an API. In addition, the citizen-centric project Mit-Mach-Stadt Brandis, in a small town of 10000 inhabitants, implemented the Hybrid Letterbox and an iteration of the digital participation platform and API in a network of citizen participation tools which were complemented by local initiatives and the town administration. In these transfers, the potential and limitations of these elements demonstrated and made clear that considerable collaborative work was needed to adapt and contextualize them, and the initiative and effort of individuals was key to maintaining them in situ.

In detail, three interconnected, entangled dimensions of opening, making and transforming were key to the framing and exploration of the practice part of this work and to the qualitative formation of the action repertoire. The inquiry was guided by the theoretical investigation of sustainable design approaches into how designers might be able to open up access to knowledge, tools and technology, as well as how to involve stakeholders in critically assessing and making possible futures and how they may be able to transform contexts and situations using the proposed action repertoire for transformation, following on principles of intra- and intergenerational justice, social equity and sufficiency.

Opening access to knowledge, tools and technology.

In retrospect, when reviewing the activities that have been undertaken over the course of the project, it became clear that the process of opening access to knowledge, tools and technology was one of countless iterations and constant negotiation and re-negotiation within the stakeholder group.

Firstly, being open as researchers, providing a transparent view on the project process was accompanied by the acknowledgement of failure, which is of course quite common in design, but at first difficult to grasp for non-designers. The stakeholders embraced the idea of trial-and-error phases where they could explore concepts such as an idea-machine, or the development of a web-platform they called Fischernetz, during which they were introduced to scenario building, paper prototyping and card sorting.

Secondly, in this project, opening access to technology was attempted through prototyping and design-game workshops such as a metaphorical tools game that brought stakeholders closer to the idea of communication and sharing knowledge, and kept technological solutions needed for those interactions out of the picture, in order to be able to develop fresh concepts without having restrictions of technological solutions confining the idea process. Furthermore, the research group introduced several technological tools, e.g., an audio-module for prototyping a conversation artifact with which to get in contact with other people on the Fischerinsel, or the Hybrid Letterbox, which was put to different uses over time, with the core group of senior citizens getting accustomed to its inner workings more and more.

The knowledge acquired by the stakeholders and the research group regarding building sketch prototypes and tangible artifacts that embody the ideas generated in the group does not only consider technology but also the process of how to formulate an idea through tangible artifacts and embed them into the living lab context.

Thirdly and on a meta-level, openness within the project meant granting open source access to all prototypes and tools that were generated over time. Following the ideals of open source, all community-generated content is available for remix and adaption, acknowledging that the developed solutions are not final but flexible and potentially evolving into something new. While some of the tools, such as the paper prototyping guidelines or workshop outlines, were easy to handle, the Hybrid Letterbox, as one of the key outcomes, presented a different and, so far, unsolved challenge regarding the open source release. In its current state, it was barely constructable by non-experts and required the bundling of competencies, e.g., in other stakeholder groups.

Making possible futures.

With this work, the argument for the integration of a dimension of making possible futures in sustainable design projects emerged from practice. The phrase of imagining possible futures is deliberately omitted, since in this case making is tied closely to the designerly capacity of producing hands-on artifacts which embody future-focused thinking. In this research, this designerly capacity

was put to the test in a participatory setting, through making haptic, tangible artifacts in collaboration with stakeholders. These elements of "purposeful making", whether in a day-long workshop or a longer sub-project, allowed stakeholders to ideate, negotiate and visualize such possible futures whether they are for a global or local scale.

The dimension of making was framed as an integral part of the project and argued for as, especially in a living lab context, an integral part of a social learning process. It proved valuable to go in this direction since the project group was able to convey some of the more advanced ideas regarding a knowledge sharing system and the subsequent steps that would have to follow, through making and prototyping. Eventually, the idea of prototyping and making took hold in the stakeholder group and they proposed a making-session of their own, to develop quick-and-dirty prototypes such as the soundfish that allowed them to tinker with digital sound modules and workshop material. The prototype would eventually end up as a recording and playback device which would allow them to playfully engage with other neighbors on the Fischerinsel, trying to interest them in the project. This instance is representative of the idea of equipping stakeholders with designerly tools to assess and make possible futures. In this case, the trajectory was not as future-focused as the group might have wished, but the impulse came from the stakeholders.

Consequently, the project Neighborhood Labs showed that through making and collaborative prototyping the stakeholder group was able to make sense of the problem space, the process as well as the artifacts created within. Taken in conjunction with other methods and tools, making provided the spark for the stakeholders to embed themselves in a narrative that allows the building of possible futures.

Transforming contexts and situations.

The third dimension is the one that challenges the existing practice of design the most. Firstly, in order to be able to identify and transform un-sustainable practices and their contexts, designers must work in inter- and transdisciplinary ways, and agreeing with Jonas (2015), they shall challenge their existing practice. This requires an informed position, which has to be developed over time. The call for designers to transform a practice of "un-sustainability" into one that allows "futuring" has never been accepted, nor undertaken. However, it is not only the processes and practices it seeks to transform, but also user behavior and market incentives. In short and in tune with research on transformation processes, throughout the process of designing, on this level, designers have to explore the processes behind unsustainable practices, provide informed arguments for re-directing the practice and most importantly, a pathway and the means to do so.

Secondly, within the design project, this dimension refers to the underlying idea that design may produce products, services or systems that embody an impulse to transform the status quo. In their early stages, sharing systems might have been an example thereof, although the transformation from, e.g., individual car ownership to shared use of mobility is a slow one and faces adversity.

Thirdly, throughout the project, it was shown that there is considerable struggle amongst stakeholders regarding who initially identifies the challenge or problem ahead and which path to take to approach it. Transferring owner- as well as authorship to the stakeholder group proved to be vital in establishing that these processes are not out of their hands but can be actively steered by them. This work sought to support this by slowly approaching the problem area and iteratively moving towards co-framing the problem through hands-on workshops, observations, walks and other activities with different stakeholders such as senior citizens, city officials, company owners and initiatives. While it was attempted to provide some access points to decision-making, specifically regarding the theme of social cohesion, knowledge sharing and empowerment to use analog-digital communication tools, the negotiation processes of what a preferred future state thereof might be have, until the end of the project, been ongoing between members of the team, peripheral project participants and the core group of stakeholders. Nevertheless, the so-to-speak emancipated stakeholder group actively engaged in this negotiation over time. Here, the importance of tacit knowledge in these decision-making processes has been explored and emphasized by the changes that the core group of stakeholders went through: from peripheral participants to decisive actors in the project, who are prepared to push forward based on the knowledge that has been acquired over project time. In this sense, it became clear that the basis for decision-making in terms of possible futures lies not only in being informed from the top-down (sustainability theory through the project) but also from the bottom-up (everyday practices and their implications in the stakeholder group). Who decides the preferred state lies in these perspectives and the negotiations within. This work sought to provide tools and access points to approach this struggle.

Evolving research from Neighborhood Labs to Civic Infrastructures.

As reference points for practice, the concept of social practices and the everyday life was introduced, which are supposed starting points for the inquiry into un-sustainability and transformation through design. Furthermore, they might provide insights into how those practices form and finally how designers might be able to deal with them. Secondly, an overview of sharing practices and their relation to sustainability was provided, especially referring to theories of sufficiency and the notion of using instead of owning, while assessing its impact on the re-direction of certain practices. These considerations played a role, especially in the first two project phases, when sharing practices were central to the process. Thirdly, the research framework of living laboratories for sustainability was introduced which served as a basis for the evolution of the neighborhood lab as a core to the project and provided an argument for taking the research to the streets, moving outside of the lab.

The Neighborhood Labs project provided an anchor for all explorations regarding theory or practice. The rationale for selecting the Fischerinsel neighborhood in central Berlin was introduced, along with the Seniors' Computer Club core group of participants, who were involved in the project from the beginning to the end of the official project, drawing in other initiatives and individuals.

While it began as a smaller scale, workshop-based project, questions of self-sufficiency and sustainability quickly emerged as a common goal among the researchers and project partners alike. Based on a Scandinavian participatory design methodology, the research group framed the work as providing civic infrastructures for the engagement in and transformation of the everyday life of citizens in urban neighborhoods and the inclusion in urban change processes.

In an iterative approach, the project was set up and adapted over the course of six years. Its community-originated thematic baseline was consistently concerned with sharing practices, whether the sharing of goods and services, or the sharing of knowledge, which became the focus of the infrastructure and transfer phase.

These practices relate to four perspectives of sustainability, namely economic relief in terms of sharing goods and services with others, reducing ecological impact through the sharing of goods and improving the social fabric through collaboration, skill and knowledge sharing as well as the empowerment to participate in local transformation processes, which was an emphasis in the last two phases. One of the outcomes of the process was becoming part of a community through collaboration in a shared interest which itself formed collaboratively. Through this, the project itself endured even without the research group present, while establishing a sense of authorship by as well as transfer of ownership to the core group of the Vernetzte Nachbarschaft on the Fischerinsel.

As researchers/designers, the group going into the Fischerinsel had to overcome some issues regarding trust and commitment. The way the neighborhood lab was set up, it allowed the researchers to slowly ease into the context, get to know the stakeholders and create a basis for interest for the project that we were proposing. However, the initial openness of the project was unusual for many of the stakeholders, and they had to regularly be reminded that the openness is not due to a missing direction but to the nature of the participatory project itself, which allowed all stakeholders to take part in building the research process, co-framing the problem and the design activities. This, of course, did not happen constantly, but rather in waves, which allowed the research to focus in on the process and take on a research perspective from the outside looking in and be able to transfer some of the insights towards the research community.

The project produced several tools which served different purposes, the Hybrid Letterbox and neighborhood platform were prime examples of such tools. As an analog-digital bridge device the Hybrid Letterbox had numerous uses over time. In its development within the neighborhood lab, the notion of use-before-use and design-after-design, at various stages of the project, was explored through design games workshops and test-runs. In the process, stakeholders with no background in design were involved in predominantly design-specific activities such as paper prototyping, card sorting or making. The Hybrid Letterbox was subsequently used in different contexts outside of design, providing the research group with an outside influence and critique which was included in further iterations.

Implications for sustainable design.

With regards to the field of design research, this work contributes to a re-thinking of sustainability in the context of design, approached from a research perspective. In the process, shortcomings of sustainable design in dealing with the challenges of sustainability in a holistic way have been identified. By opening up sustainable design to new cross-links of current sustainability research approaches, while grounding it in a participatory, research-oriented practice, a starting point for designers to implement a sustainable mindset into their practice was suggested, along with an open, dynamic set of actions to explore. In line with Jonas (2015), who introduced possible implications of research-through-design for sustainability and social transformation on a theoretical level, this work argues for RtD as a basis for framing a design project and sub-projects to inform a future practice of sustainable design.

The continuous work in the Neighborhood Labs project and the subsequent output consequently informed the adaptation and re-framing of sustainable design. Through practice, in terms of sustainability principles and catering to the capabilities of design, three vital perspectives for the work of a sustainable designer which are described above as opening access, transforming contexts and making possible futures were extracted. These perspectives were referenced to current streams in design with partly similar objectives (transformation design, transition design, design activism and participatory design) and put into context regarding the Neighborhood Labs project output. The overall practice output, with its different research and design activities, made it possible to extract and exemplify the aforementioned typology of action that, in turn, helped frame the notion of sustainable design by default, which is the proposed trajectory of a future version of sustainable design, engaged in practice and informed by research.

Another communicable result of this research is the adaptation and contextualization of a living lab approach towards a neighborhood lab. In contrast to most other living-lab-type setups, the characteristics of the neighborhood lab was its openness to non-technological solutions, its distributed configuration, using existing infrastructure instead of setting up a separate lab in a separate space (which would be the usual way to go) and its gradual formation. It is thus rather a living lab process than a technological setup in a fixed space. The process of adapting to the stakeholders and becoming somewhat part of their ecosystem allowed the research group to, e.g., be included in the course program of the Seniors' Computer Club and to use their spaces for our workshops, interventions and actions. With this comes the realization that to set up a living lab which does not emphasize technological solutions, very little equipment and resources are needed.

The neighborhood lab setup facilitated the implementation of an iterative research-through-design approach through its flexible and distributed setup in practice. The approach of research-through-design in turn allowed a reflection on the epistemological qualities of designerly outputs within this neighborhood lab in context and the contribution to the theory of sustainable design.

The iterative approach to designing within the research process provided some indication of the value that research-through-design could bring to a sustainable design practice.

Towards an action repertoire.

In analyzing the activities that have been conducted over the course of five years within the Neighborhood Labs project and beyond, a pattern regarding certain types of activities emerged which were presented as an 'action repertoire'. This action repertoire is a loose collection of mixed methods and tools, which lends its tag from design activism, describing it as a "framework for action" allowing, in this case, diverse stakeholders to explore, adapt and follow through on actions regarding their everyday living environment. The action repertoire is constructed to provide a spark for others to create meaningful change in their surroundings. However, it should open a debate rather than provide set rules which are proclaimed to induce change. Although this might provide a basis for a handbook or some sort of how-to document, it is not meant as such.

Quite frequently, especially in the context of socially-oriented practices of design, research results and recommendations are put in such a format¹²⁷ and arguably provides an entry point for non-designers and non-researchers to utilize the tools, methods and ideas hands-on. However, my work allows the conclusion that in order for the proposed formats to be implemented, a handbook as a fixed, paper- or web-based, non-flexible medium, does not live up to its dynamic, adaptable content. It might provide a starting point, but seeing that every project comes with a different context and challenges, different stakeholders and dynamics, this action repertoire requires careful adaptation in collaboration with stakeholders. To conclude, the action repertoire provides starting points, but is rather to be viewed as a growing database of expertise, that anyone should be able to access.

¹²⁷ Examples include the the *Collective Action Toolkit* by Frog Design, *Design for Social Impact Handbook* by Ideo, or the *Freiraumfibel* by the Federal Institute for Research on Building, Urban Affairs and Spatial Development, to name a few.

5.2. Open Questions and Further Research

The proposed notion of sustainable design by default reflects some of the ideas and trajectories of other fields in design, such as transition or transformation design, but also design activism and participatory design. Nevertheless, sustainable design by default aims at its inclusion in design practice, theory and education in a way that it is not framed as a new buzzword but as a guiding baseline for design. These are high pretenses, and the path towards their implementation is long and requires practice orientation of research in this field as well as a re-thinking of design curricula. To this end, this work would serve as the perfect basis to construct such a curriculum, consolidating the overarching notion of sustainable design by default by negotiation through the dynamic action repertoire.

This work gave rise to some questions regarding how challenges of sustainability are brought into a design discourse. While the proposed action repertoire might provide some starting points, there is a need for further exploration of both the inclusion of stakeholders in such processes as well as the role design researchers and (sustainable) design practitioners take.

Participation and its limits.

While the group was open to the evolving participatory approach in the project, there were clear constraints at times regarding resource limits. Early on in the project, the research group fell into the so-called participation fallacy trap, as discussed in transdisciplinary research, conducting participatory workshops for the sake of participation and continuity in a manner that views participants as equal partners which shape the process. This was identified as a necessary part in a long-lasting project, which helped keep the participants involved and interested in it. Although over the period of the entire project the participatory design activities were balanced with expert designer or research activities, there were phases when the equilibrium shifted.

Furthermore, collaborative making as well as prototyping activities proved to be of vital importance for the cohesion of the project group, the mutual understanding of processes of design and the empowerment of stakeholders in a process that they were having shared control over. In the process, however, this democratic approach gave rise to power struggles and long constrained animosities in the stakeholder group, which brought the project to a near collapse.

Going further, this work suggests a clearer definition and shaping of the respective roles, taking into account each participants experiences and skills, including the designers/researchers.

Targeting everyday practices.

Everyday practices were introduced as a byline to the project, providing anchor points for sustainability principles and practices to take hold. While the framing of sharing practices was useful in the project, the impact on a sustainable way of life proved limited. With regards to designing sustainable futures, it becomes crucial to explore, to a greater extent, the implications and

directions of social practices as well as the relationship of everyday practices and their impact on decision making regarding those sustainable futures.¹²⁸

To this end, future research holds the potential to approach such practices with the proposed framework, further defining it and evaluating it against practices more central to sustainability than the practices of sharing, targeted in this work.

¹²⁸ Recently, Leneke Kuijer and others were exploring practices and the everyday life in conjunction with sustainable choices by users and provided an interesting view into design and social practices (Kuijer, 2014; Kuijer, Jong & Eijk, 2013).

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6.2. Literature

- Archer, B. (1979). Design as a discipline. *Design Studies*, 1(1), 17–20. [http://dx.doi.org/10.1016/0142-694X\(79\)90023-1](http://dx.doi.org/10.1016/0142-694X(79)90023-1)
- Archer, B. (1981). A view of the nature of design research. *Design: Science: Method*, 1, 30–47.
- Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, 35(4), 216–224.
- Baedeker, C., Greiff, K., Grinewitschus, V., Hasselkuß, M., Knutsson, J., Liedtke, C., ... Virdee, L. (2014). Transition through sustainable Product and Service Innovations in Sustainable Living Labs : application of user-centered research methodology within four Living Labs in Northern Europe 1–21.
- Bajgier, S. M., Maragah, H. D., Saccucci, M. S., Verzilli, A., & Prybutok, V. R. (1991). Introducing Students to Community Operations Research by Using a City Neighborhood As A Living Laboratory. *Operations Research*, 39(5), 701–709. <https://doi.org/10.1287/opre.39.5.701>
- Bayazit, N. (2004). Investigating Design: A Review of Forty Years of Design Research. *Design Issues*, 20(1), 16–29. <https://doi.org/10.1162/074793604772933739>
- Ben-Eli, M. (2004). Sustainability: The Five Core Principles–A New Framework. *Buckminster Fuller Institute*. <<Http://Bfi-Internal.Org/Sustainability/Principles>>(2004, 2006).
- Ben-Eli, M. (2012). The cybernetics of sustainability: definition and underlying principles. *Enough for All Forever: A Handbook for Learning about Sustainability*, Murray J, Cawthorne G, Dey C and Andrew C (Eds.). Champaign, IL, Common Ground Publishing: University of Illinois, 14.
- Bergvall-Kareborn, B., Hoist, M., & Stahlbrost, A. (2009). Concept design with a living lab approach. In *System Sciences, 2009. HICSS'09. 42nd Hawaii International Conference on* (pp. 1–10). IEEE. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=4755508
- Bieling, T., Sametinger, F., & Joost, G. (2014). Die soziale Dimension des Designs. *The Social Dimension of Design* In *Die Geschichte Des Nachhaltigen Designs*, 218–229.
- Biggs, M. A. R., & Büchler, D. (2007). Rigor and Practice-based Research. *Design Issues*, 23(3), 62–69. <https://doi.org/10.1162/desi.2007.23.3.62>
- Binder, T. (2007). Why design: labs. In *Proceedings of Design Inquiries, the 2nd Nordic Design Research Conference*, Available at: <http://www.nordes.org>. CiteSeer. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.87.6838&rep=rep1&type=pdf>
- Binder, T, De Michelis, G., Ehn, P., Jacucci, G., Linde, P., & Wagner, I. (2011). *Design Things*, A. Telier. The MIT Press, Cambridge, Massachusetts.
- Binder, T., Brandt, E., Halse, J., Foverskov, M., Olander, S., & Yndigegn, S. (2011). Living the (co-design) Lab. *Nordes*, (4). Retrieved from <http://www.nordes.org/opj/index.php/n13/article/view/108>
- Bjögvinsson, E., Ehn, P., & Hillgren, P.-A. (2012). Design Things and Design Thinking: Contemporary Participatory Design Challenges. *Design Issues*, 28(3), 101–116. https://doi.org/10.1162/DESI_a_00165

- Björgvinsson, E., Ehn, P., & Hillgren, P.-A. (2010). Participatory design and democratizing innovation. In *Proceedings of the 11th Biennial Participatory Design Conference* (pp. 41–50). ACM. Retrieved from <http://dl.acm.org/citation.cfm?id=1900448>
- Björgvinsson, E., Ehn, P., & Hillgren, P.-A. (2012). Agonistic participatory design: working with marginalised social movements. *CoDesign*, 8(2–3), 127–144. <https://doi.org/10.1080/15710882.2012.672577>
- Blevis, E. (2006). Advancing sustainable interaction design: two perspectives on material effects. *Design Philosophy Papers*, 4(4), 209–230.
- Blizzard, J. L., & Klotz, L. E. (2012). A framework for sustainable whole systems design. *Design Studies*, 33(5), 456–479.
- Blomberg, J. L., & Henderson, A. (1990). Reflections on participatory design: lessons from the trillium experience. In *Proceedings of the SIGCHI conference on Human Factors in Computing Systems* (pp. 353–360). ACM.
- Bødker, S., & Kyng, M. (2018). Participatory Design That Matters - Facing the Big Issues. *ACM Trans. Comput.-Hum. Interact.*, 25(1), 4:1–4:31. <https://doi.org/10.1145/3152421>
- Boehnert, J. (2018). *Design, Ecology, Politics: towards the Ecocene*. Bloomsbury Publishing.
- Bonsiepe, G. (2007). The uneasy relationship between design and design research. *Design Research Now*, 25–39.
- Brandes, U., Erlhoff, M., & Schemmann, N. (2009). *Designtheorie und Designforschung*. UTB GmbH. Retrieved from https://books.google.de/books?id=mt3ZB_mZsYcC
- Brocchi, D. (2013). Das (nicht) Nachhaltige Design. *Die Geschichte Des Nachhaltigen Designs*. VAS-Verlag Für Akademische Schriften, Bad Homburg, 54–80.
- Brodie, E., Cowling, E., Nissen, N., Paine, A. E., & Warburton, D. (2009). Understanding participation : A literature review. *Pathways through Participation*, (December), 50.
- Brown, L. R. (1982). Building a sustainable society. *Society*, 19(2), 75–85.
- Brundtland, G., & others. (1987). Our common future: Report of the 1987 World Commission on Environment and Development. *United Nations, Oslo*, 1–59.
- Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues*, 8(2), 5–21.
- Buchanan, R. (2001). Design research and the new learning. *Design Issues*, 17(4), 3–23.
- Burns, C., Cottam, H., Vanstone, C., & Winhall, J. (2006). Transformation design. *RED Paper*, 2.
- Buur, J., & Matthews, B. (2008). Participatory innovation: a research agenda. *Proceedings of the Tenth Anniversary Conference on Participatory Design Conference*, 189–192.
- Caradonna, J. L. (2016). *Sustainability: A history*. New York, NY: Oxford University Press.
- Carson, R., Darling, L., & Darling, L. (1962). *Silent spring*. Boston; Cambridge, Mass.: Houghton Mifflin ; Riverside Press.
- Cetin, O. D. (2016). Design activism from the past to present: A critical analysis of the discourse. *Blucher Design Proceedings*, 8(2), 388–393. http://dx.doi.org/10.5151/despro-icdhs2016-04_016

- Chapman, J. (2005). Emotionally durable design objects, experiences and empathy. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=130526>
- Chapman, J. (2009). Design for (emotional) durability. *Design Issues*, 25(4), 29–35. <https://doi.org/10.1162/desi.2009.25.4.29>
- Chapman, J., & Gant, N. (2007). *Designers, visionaries and other stories : a collection of sustainable design essays*. London; Sterling, VA: Earthscan.
- Chick, A., & Micklethwaite, P. (2011). *Design for sustainable change how design and designers can drive the sustainability agenda*. Lausanne: Ava Pub Sa. Retrieved from <http://site.ebrary.com/id/10469445>
- Chow, R. (2010). What should be done with the different versions of Research Through Design. *Entwerfen. Wissen. Produzieren. Designforschung Im Anwendungskontext*, 145–158.
- Mauch, C. (2014). *The Growth of Trees: A Historical Perspective on Sustainability* (Vol. 3). German Council for Sustainable Development. Retrieved from http://www.carsoncenter.uni-muenchen.de/download/press/rcc-news/140805_mauch.pdf
- Cipolla, C., & Peruccio, P. P. (Eds.). (2008). Changing the change proceedings. Allemandi Conference Press.
- Clark, H. H., Brennan, S. E., & others. (1991). Grounding in communication. *Perspectives on Socially Shared Cognition*, 13(1991), 127–149.
- Clark, W. C., & Munn, R. E. (1986). *Sustainable development of the biosphere*. Cambridge University Press.
- Clausen, J., Bowry, J., & Bienge, K. (2017). Five Shades of Sharing Eine Szenariogeschichte rund um die Haken und Ösen der Sharing Economy.
- Cooper, A., Reimann, R., Cronin, D., & Noessel, C. (2014). About face : the essentials of interaction design. Retrieved from <http://www.books24x7.com/marc.asp?bookid=63431>
- Cornwall, A., & Jewkes, R. (1995). What is participatory research? *Social Science and Medicine*, 41(12), 1667–1676. [https://doi.org/10.1016/0277-9536\(95\)00127-S](https://doi.org/10.1016/0277-9536(95)00127-S)
- Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.
- Cross, N. (1999). Design Research: A Disciplined Conversation. *Design Issues*, 15(2), 5. <https://doi.org/10.2307/1511837>
- Cross, N. (2001a). Design / Science / Research : Developing a Discipline. *Proceedings of the Fifth Asian Design Conference: International Symposium on Design Science*. Retrieved from <http://web.science.mq.edu.au/isvr/Documents/pdf files/presence-design-philosophy/DesignScienceResearch.pdf>
- Cross, N. (2001b). Designerly ways of knowing: Design discipline versus design science. *Design Issues*, 17(3), 49–55.
- Curran, M. A. (1996). *Environmental life-cycle assessment*. London: McGraw-Hill.
- Dilnot. (1984). Design as a Socially Significant Activity. *Design & Society*, 101–105.
- Dilnot, C. (1982). Design as a socially significant activity: an introduction. *Design Studies*, 3(3), 139–146.

- Dilnot, C. (1998). The science of uncertainty: the potential contribution of design to knowledge. *Doctoral Education in Design*, 65–97.
- DiSalvo, C., Louw, M., Holstius, D., Nourbakhsh, I., & Akin, A. (2012). Toward a Public Rhetoric Through Participatory Design: Critical Engagements and Creative Expression in the Neighborhood Networks Project. *Design Issues*, 28(3), 48–61. https://doi.org/10.1162/DESI_a_00161
- Dixon, T., Colantonio, A., Ganser, R., Carpenter, J., Ngombe, A., & Glasson, J. (2009). Measuring socially sustainable urban regeneration in Europe. *Oxford Institute for Sustainable Development (OISD) and European Investment Bank (EIB)*.
- Döring, R., & Ott, K. (2001). Nachhaltigkeitskonzepte. *Zeitschrift Für Wirtschafts-Und Unternehmensethik*, 2(3), 315–342.
- Dutilleul, B., Birrer, F. a J., & Mensink, W. (2010). Unpacking European Living Labs : Analysing Innovation ' s Social Dimensions. *Central European Journal of Public Policy*, 4(June), 60–85.
- Dykstra, E. a., Blomberg, J. L., Greenbaum, J., Carter, K. a., Madsen, K. H., & Muller, M. J. (1991). Participatory design in Britain and North America: responses to the Scandinavian Challenge. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems Reaching through Technology - CHI '91*, 389–392. <https://doi.org/10.1145/108844.108962>
- Eckardt, F. (2005). In Search for Meaning: Berlin as National Capital and Global City. *Journal of Contemporary European Studies*, 13(2), 189–201. <https://doi.org/10.1080/14782800500212426>
- Ehn, P. (1988a). Playing the language-games of design and use-on skill and participation. *ACM SIGOIS Bulletin*, 9(2–3), 142–157. <https://doi.org/10.1145/966861.45426>
- Ehn, P. (1988b). *Work-oriented design of computer artifacts* (PhD Thesis). Arbetslivscentrum.
- Ehn, P. (2008). Participation in design things. In *Proceedings of the tenth anniversary conference on participatory design 2008* (pp. 92–101). Indiana University.
- Ehn, P. (2009). *Design Things and Living Labs*.
- Ekardt, F. (2011). *Theorie der Nachhaltigkeit : rechtliche, ethische und politische Zugänge - am Beispiel von Klimawandel, Ressourcenknappheit und Welthandel*. Nomos, Baden-Baden. Retrieved from /z-wcorg/.
- Erlhoff, M. (1995). *Nutzen statt besitzen*. Göttingen: Steidl.
- Erlhoff, M. (2006). *Michael Erhoff and Friends: Text and Image*. Birkhauser.
- Erlhoff, M. (2015). Owls to athens, or: the discrete charm of transformation design. In W. Jonas, S. Zerwas, & K. Von Anshelm (Eds.), *Transformation Design: Perspectives on a New Design Attitude* (pp. 75–82). Birkhäuser Verlag GmbH.
- Fahy, F., & Rau, H. (2013). *Methods of Sustainability Research in the Social Sciences*. Retrieved from <http://grail.eblib.com.au/patron/FullRecord.aspx?p=1138480>
- Fallman, D. (2008). The Interaction Design Research Triangle of Design Practice, Design Studies, and Design Exploration. *Design Issues*, 24(3), 4–18. <https://doi.org/10.1162/desi.2008.24.3.4>
- Fallman, D., & Stolterman, E. (2010). Establishing criteria of rigour and relevance in interaction design research. *Digital Creativity*, 21(4), 265–272. <https://doi.org/10.1080/14626268.2010.548869>

- Felton, E., Zelenko, O., & Vaughan, S. (2013). *Design and ethics: Reflections on practice*. Routledge.
- Findeli, A. (1994). Ethics, Aesthetics, and Design. *Design Issues*, 10(2), 49–68.
- Findeli, A., Brouillet, D., Martin, S., Moineau, C., & Tarrago, R. (2008). Research Through Design and Transdisciplinarity: A Tentative Contribution to the Methodology of Design Research. In «FOCUSED» — *Current Design Research Projects and Methods Swiss Design Network Symposium* (pp. 67–91). Bern: Swiss Design Network.
- Fischer, C., Grieshammer, R., Barth, R., Brohmann, B., Brunn, C., Heyen, D. A., ... Wolff, F. (2013). Mehr als nur weniger. *Suffizienz: Begriff, Begründung Und Potenziale. Freiburg: Öko-Institut Working Paper, 2, 2013*.
- Frayling, C. (1993). Research in Art and Design. *Royal College of Art Research Papers*, 1(1), 1–5.
- Fry, T. (1999). *A new design philosophy: an introduction to defuturing*. UNSW Press.
- Fry, T. (2009). *Design futuring : sustainability, ethics, and new practice*. Oxford; New York: Berg.
- Fry, T. (2017a). *Design after design*. Taylor & Francis.
- Fry, T. (2017b). *Remaking Cities: An introduction to urban metrofitting. London: Bloomsbury*.
- Fuad-Luke, a. (2002). Slow Design, a paradigm shift in design philosophy. *Development by Design, Bangalore, India*, (0), 01–02.
- Fuad-Luke, A. (2007). Re-defining the purpose of (sustainable) design: enter the design enablers, catalysts in co-design. *Designers, Visionaries and Other Stories. London, Earthscan*, 18–52.
- Fuad-Luke, A. (2009). *Design activism: beautiful strangeness for a sustainable world*. Routledge.
- Fuhs, K.-S. (2013). *Die Geschichte des Nachhaltigen Designs*. Bad Homburg: VAS Verl.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. Sage.
- Godin, D., & Zahedi, M. (2014). Aspects of research through design: a literature review. *Proceedings of DRS*, 281.
- Goldsmith, E., Allen, R., Allaby, M., Davoll, J., Lawrence, S., & others. (1972). *A blueprint for survival*. Houghton Mifflin Boston.
- Grand, S., & Jonas, W. (2012). *Mapping Design Research, Positions and Perspectives*. Berlin, Basel: Birkhäuser. Retrieved from //www.degruyter.com/view/product/202693
- Gsell, M., Dehoust, G., & Hülsmann, F. (2015). Nutzen statt Besitzen: Neue Ansätze für eine Collaborative Economy. *Vom Umweltbundesamt (Umwelt, Innovation, Beschäftigung, 03/15)*.
- Hammarskjöld, D. (1975). What now. Another Development. Dag Hammarskjöld Report. *Development Dialogue*.
- Heinrichs, H. (2013). Sharing economy: a potential new pathway to sustainability. *GAIA-Ecological Perspectives for Science and Society*, 22(4), 228–231.
- Hirsch Hadorn, G. (Ed.). (2008). *Handbook of transdisciplinary research*. Dordrecht ; London: Springer.
- Hirsch Hadorn, G., Bradley, D., Pohl, C., Rist, S., & Wiesmann, U. (2006). Implications of transdisciplinarity for sustainability research. *Ecological Economics*, 60(1), 119–128. <https://doi.org/10.1016/j.ecolecon.2005.12.002>

- Huber, J. (2000). Industrielle Ökologie: Konsistenz, Effizienz und Suffizienz in zyklusanalytischer Betrachtung.
- International Union for Conservation of Nature and Natural Resources., United Nations Environment Programme., World Wildlife Fund., Food and Agriculture Organization of the United Nations., & Unesco. (1980). *World conservation strategy : living resource conservation for sustainable development*. Gland, Switzerland: IUCN.
- Irwin, T. (2015). Transition design: A proposal for a new area of design practice, study, and research. *Design and Culture*, 7(2), 229–246.
- Irwin, T., Kossoff, G., & Tonkinwise, C. (2015). Transition design provocation. *Design Philosophy Papers*, 13(1), 3–11.
- Jackson, T. (2009). *Prosperity without growth: Economics for a finite planet*. Routledge.
- Jegou, F., & Manzini, E. (2008). Collaborative services: Social innovation and design for sustainability.
- John, N. A. (2012). Sharing and Web 2.0: The emergence of a keyword. *New Media & Society*, 15(2), 167–182.
- Jonas, W. (2001). A scenario for design. *Design Issues*, 17(2), 64–80.
- Jonas, W. (2007). Design Research and its Meaning to the Methodological Development of the Discipline. In R. Michel (Ed.), *Design Research Now: Essays and Selected Projects* (pp. 187–206). Basel: Birkhäuser Basel. https://doi.org/10.1007/978-3-7643-8472-2_11
- Jonas, W. (2012). Exploring the swampy ground. *Mapping Design Research*, 11–42.
- Jonas, W. (2015). Social Transformation Design as a form of Research Through Design (RTD). In W. Jonas, S. Zerwas, & K. Von Anshelm (Eds.), *Transformation Design: Perspectives on a New Design Attitude* (pp. 114–133). Birkhäuser Verlag GmbH.
- Jonas, W., Zerwas, S., & Von Anshelm, K. (2015). *Transformation Design: Perspectives on a New Design Attitude*. Birkhäuser.
- Julier, G. (2008). Design activism as a tool for creating new urban narratives. In *Changing the Change, Allemandi Conference Press, Turin* (pp. 813–822).
- Karasti, H. (2014). Infrastructuring in participatory design. In *Proceedings of the 13th Participatory Design Conference: Research Papers-Volume 1* (pp. 141–150). ACM.
- Katzeff, C., Broms, L., Jönsson, L., Westholm, U., & Räsänen, M. (2013). Exploring sustainable practices in workplace settings through visualizing electricity consumption. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 20(5), 31.
- Kidd, C. V. (1992). The evolution of sustainability. *Journal of Agricultural and Environmental Ethics*, 5(1), 1–26.
- Kossoff, G. (2011). Holism and the reconstitution of everyday life: a framework for transition to a sustainable society. *Grow Small, Think Beautiful: Ideas for a Sustainable World from Schumacher College*, 122–42.
- Krippendorff, K. (1995). Redesigning Design; An Invitation to a Responsible Future. *Design Pleasure or Responsibility*, 138–162.
- Kuijer, L. (2014). *Implications of Social Practice Theory for Sustainable Design*.

- Kuijer, L., & De Jong, A. M. (2011). Practice theory and human-centered design: A sustainable bathing example. *Nordes*, (4). Retrieved from <http://www.nordes.org/opj/index.php/n13/article/view/134>
- Kuijer, L., Jong, A. de, & Eijk, D. van. (2013). Practices as a unit of design: An exploration of theoretical guidelines in a study on bathing. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 20(4), 21.
- Kviselius, N. Z., Ozan, H., Edenius, M., & Andersson, P. (2008). The Evolution of Living Labs—Propositions for Improved Design and Further Research. In *Proceedings of the 5th International Conference on Innovation and Management (ICIM 2008)* (pp. 842–856). Retrieved from http://www.pucsp.br/icim/portugues/downloads/pdf_proceedings_2008/77.pdf
- Leismann K., Rohn H., Schmitt M., Rohn H., & Baedeker C. (2013). Collaborative consumption: Towards a resource-saving consumption culture. *Resources Resources*, 2(3), 184–203.
- Lele, S. M. (1991). Sustainable development: a critical review. *World Development*, 19(6), 607–621.
- Linz, M. (2004). *Weder Mangel noch Übermaß: über Suffizienz und Suffizienzforschung*. Wuppertal papers.
- Linz, M., Bartelmus, P., Hennicke, P., Jungkeit, R., Sachs, W., Scherhorn, G., ... von Winterfeld, U. (2002). Von nichts zu viel. *Suffizienz Gehört Zur Zukunftsfähigkeit, Wuppertal Papers*, 125.
- Madge, P. (1993). Design, Ecology, Technology: A Historiographical Review. *Journal of Design History*, 6(3), 149–166. <https://doi.org/10.2307/1316005>
- Madge, P. (1997). Ecological Design: A New Critique. *Design Issues*, 13(2), 44. <https://doi.org/10.2307/1511730>
- Manzini, E. (2005a). A cosmopolitan localism: Prospects for a sustainable local development and the possible role of design. *Dis-Indaco, Politecnico Di Milano*, 1–5.
- Manzini, E. (2005b). Enabling solutions, 1–8.
- Manzini, E. (2006a). Design, ethics and sustainability Guidelines for a transition phase. *Nantes - Cumulus Working Papers*, 9–15.
- Manzini, E. (2006b). Design for sustainability. How to design sustainable solutions. *Sustainable Everyday Project*, (2004), 1–11.
- Manzini, E. (2007). Design Research for Sustainable Social Innovation. In R. Michel (Ed.), *Design Research Now: Essays and Selected Projects* (pp. 233–245). Basel: Birkhäuser Basel. https://doi.org/10.1007/978-3-7643-8472-2_14
- Manzini, E. (2009). New design knowledge. *Design Studies*, 30(1), 4–12. <https://doi.org/10.1016/j.destud.2008.10.001>
- Manzini, E. (2016). Design culture and dialogic design. *Design Issues*, 32(1), 52–59.
- Margolin, V. (1996). Global expansion or global equilibrium? Design and the world situation. *Design Issues*, 12(2), 22–32.
- Margolin, V. (1998). Design for a Sustainable World. *Design Issues*, 14(2), 83. <https://doi.org/10.2307/1511853>
- Margolin, V. (2007). Design, the future and the human spirit. *Design Issues*, 23(3), 4–15.

- Margolin, V., & Margolin, S. (2002). A "Social Model" of Design: Issues of Practice and Research. *Design Issues*, 18(4), 24–30. <https://doi.org/10.1162/074793602320827406>
- Markussen, T. (2013). The disruptive aesthetics of design activism: Enacting design between art and politics. *Design Issues*, 29(1), 38–50. https://doi.org/10.1162/DESI_a_00195
- Matofska, B. (2015). What we know about the Global Sharing Economy. *Compare and Share*.
- Mazé, R., Gregory, J., & Redström, J. (2011). Social Sustainability: A design research approach to sustainable development. Retrieved from <http://soda.swedish-ict.se/4179/>
- Mazé, R., Olausson, L., Plöjel, M., Redström, J., & Zetterlund, C. (2013). *Share this book - Critical perspectives and dialogues about design and sustainability*. Retrieved from <http://www.diva-portal.org/smash/record.jsf?pid=diva2:646702>
- McConville, J. R., & Mihelcic, J. R. (2007). Adapting Life-Cycle Thinking Tools to Evaluate Project Sustainability in International Water and Sanitation Development Work. *Environmental Engineering Science Environmental Engineering Science*, 24(7), 937–948.
- McDonough, W., & Braungart, M. (2002). *Cradle to cradle : remaking the way we make things*. New York: North Point Press.
- McMahon, M., & Bhamra, T. (2015). Social Sustainability in Design: Moving the Discussions Forward. *The Design Journal*, 18(3), 367–391. <https://doi.org/10.1080/14606925.2015.1059604>
- Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). *The limits to growth*. New York, 102.
- Mebratu, D. (1998). Sustainability and sustainable development: historical and conceptual review. *Environmental Impact Assessment Review*, 18(6), 493–520.
- Meroni, A. (2007). *Creative communities*. Milano: Polidesign.
- Mulder, I., Fahy, C., Hribernik, K., Velthausz, D., Feurstein, K., Garcia, M., ... Stahlbröst, A. (2007). Towards harmonized methods and tools for Living Labs. *EChallenges 2007*
- Mulgan, G., Wilkie, N., Tucker, S., Ali, R., Davis, F., & Liptrot, T. (2006). *Social Silicon Valleys—a manifesto for social innovation*. The Young Foundation. The Basingstoke Press.
- Nowotny, H., Scott, P., & Gibbons, M. (2003). Introduction: Mode 2' Revisited: The New Production of Knowledge. *Minerva*, 41(3), 179–194.
- Nowotny, H., Scott, P., Gibbons, M., & Scott, P. B. (2001). *Re-thinking science: Knowledge and the public in an age of uncertainty*. SciELO Argentina.
- Ott, K. (2003). The case for strong sustainability. *Greifswald's Environmental Ethics*, 59–64.
- Ott, K. (2004). Essential components of future ethics. *Ökonomische Rationalität Und Praktische Vernunft, Würzburg*, 83–108.
- Ott, K. (2014). Institutionalizing strong sustainability: A Rawlsian perspective. *Sustainability*, 6(2), 894–912.
- Ott, K., & Döring, R. (2008). *Theorie und Praxis starker Nachhaltigkeit*. (Beiträge zur Theorie und Praxis starker Nachhaltigkeit.) Marburg: Metropolis-Verl.
- Owen, C. L. (1998). Design research: Building the knowledge base. *Design Studies*, 19(1), 9–20.

- Paech, N. (2009). The economy in the aftermath of growth. *Carl von Ossietzky Universität, Oldenburg*, 24–30.
- Paech, N. (2012). *Liberation from excess: The road to a post-growth economy*. Oekom-Verlag.
- Pallot, M., Trouse, B., Senach, B., & Scapin, D. (2010). Living Lab Research Landscape : From User Centred Design and User Experience towards User Cocreation. *Technology Innovation Management Review*, 1, 19–25.
- Papanek, V. J. (1985). *Design for the real world; human ecology and social change*. Chicago: Academy Chicago Publishers.
- Polanyi, M. (2009). *The Tacit Dimension*. University of Chicago Press.
- Rammert, W. (2010). Die Innovationen der Gesellschaft. In *Soziale Innovation* (pp. 21–51). Springer. Retrieved from http://link.springer.com/chapter/10.1007/978-3-531-92469-4_2
- Reckwitz, A. (2002). Toward a Theory of Social Practices: A Development in Culturalist Theorizing. *European Journal of Social Theory*, 5(2), 243–263. <https://doi.org/10.1177/13684310222225432>
- Reckwitz, A. (2003). Grundelemente einer Theorie sozialer Praktiken: Eine sozialtheoretische Perspektive/Basic Elements of a Theory of Social Practices: A Perspective in Social Theory. *Zeitschrift Für Soziologie*, 282–301.
- Redclift, M. (2005). Sustainable development (1987-2005): an oxymoron comes of age. *Sustainable Development*, 13(4), 212–227. <https://doi.org/10.1002/sd.281>
- Redström, J. (2008). RE: Definitions of use. *Design Studies*, 29(4), 410–423.
- Regger, B., & Bunders, J. (2009). Knowledge co-creation: interaction between science and society: a transdisciplinary approach to complex societal issues. *VU University Amsterdam–Athena Institute*, Available at: [Www. Falw. vu. Nl/Nl/Onderzoek/Athena-Institute/](http://www.falw.vu.nl/NL/Onderzoek/Athena-Institute/)(Accessed May 2011).
- Reich, Y. (1992). *Participation and design : an extended view*. Pittsburgh, Pa.: Carnegie Mellon University, Engineering Design Research Center.
- Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a General Theory of Planning Dilemmas in a General Theory of Planning *. *Policy Sciences*, 4, 155–169.
- Robertson, M. (2017). *Sustainability Principles and Practice*. Florence: Taylor and Francis.
- Robinson, J. (2004). Squaring the circle? Some thoughts on the idea of sustainable development. *Ecological Economics*, 48(4), 369–384. <https://doi.org/10.1016/j.ecolecon.2003.10.017>
- Ryle, G. (1945). Knowing how and knowing that: The presidential address. In *Proceedings of the Aristotelian society* (Vol. 46, pp. 1–16).
- Sachs, W. (1993). Die vier E's. *Politische Ökologie*, Sept./Okt, 1993, 69–72.
- Sanders, E. B-N, Brandt, E., & Binder, T. (2010). A framework for organizing the tools and techniques of participatory design. In *Proceedings of the 11th biennial participatory design conference* (pp. 195–198). ACM.
- Sanders, E. B.-N., & Chan, P. K. (2007). Emerging trends in design research: changes over time in the landscape of design research. *Iasdro7*, 2007.
- Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-Design*, 4(1), 5–18.

- Schatzki, T. R. (2002). *The site of the social : a philosophical account of the constitution of social life and change*. University park (PA): The Pennsylvania State University.
- Schatzki, T. R. (2009). Social practices a Wittgensteinian approach to human activity and the social.
- Schatzki, T. R., Knorr-Cetina, K., & Savigny, E. von. (2001). *The practice turn in contemporary theory*. London; New York: Routledge. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=134021>
- Schneidewind, U., Zahrnt, A., Zahrnt, V., & Cunningham, R. (2014). *The politics of sufficiency: making it easier to live the good life*.
- Schumacher, E. F. (1973). *Small is beautiful* (Vol. 90). New York: Harper & Row.
- Schumacher, J., & Feurstein, K. (2007). Living Labs–The User as Co-Creator. Results from Corelabs: Co-Creative Living Labs. In *13th International Conference on Concurrent Enterprising (ICE)*. Sophia Antipolis, France.
- Scupelli, P. (2015). Designed transitions and what kind of design is transition design? *Design Philosophy Papers*, 13(1), 75–84.
- Seghezzi, L. (2009). The five dimensions of sustainability. *Environmental Politics*, 18(4), 539–556. <https://doi.org/10.1080/09644010903063669>
- Shove, E. (2007). *The design of everyday life*. Berg.
- Shove, E., Pantzar, M., & Watson, M. (2012). The Dynamics of Social Practice. *The Dynamics of Social Practice: Everyday Life and How It Changes*, 1–19. <https://doi.org/10.4135/9781446250655.n1>
- Simon, H. A. (1996). *The sciences of the artificial*. MIT press.
- Simon, N. (2010). *The participatory museum*. Museum 2.0.
- Simonsen, J., & Robertson, T. (2012). *Routledge international handbook of participatory design*. Routledge.
- Sneddon, C., Howarth, R. B., & Norgaard, R. B. (2006). Sustainable development in a post-Brundtland world. *Ecological Economics*, 57(2), 253–268. <https://doi.org/10.1016/j.ecolecon.2005.04.013>
- Spinuzzi, C. (2002). A Scandinavian challenge, a US response: methodological assumptions in Scandinavian and US prototyping approaches. *Proceedings of the 20th Annual International Conference on Computer Documentation*, 208–215. <https://doi.org/10.1145/584955.584986>
- Spinuzzi, C. (2005). The methodology of participatory design. *Technical Communication*, 52(2), 163–174.
- Spitz, R. (2015). “Design is not a Science”: Otl Aicher’s Constitutional Putsch at the HfG Ulm and His Credo for the Social Responsibility of Designers. *Design Issues*, 31(1), 7–17. https://doi.org/10.1162/DESI_a_00304
- Star, S. L. (1989). The Structure of Ill-Structured Solutions: Boundary Objects and Heterogeneous Distributed Problem Solving, 37–54.
- Stengel, O. (2011). Suffizienz-die Konsumgesellschaft in der oekologischen Krise.
- Thorpe, A. (2011). Defining Design as Activism. *Journal of Architectural Education*, 1–16.
- Thorpe, A. (2012). *Architecture and design versus consumerism: how design activism confronts growth*. Routledge.

- Tonkinwise, C. (2015). Design for Transitions—from and to what? *Design Philosophy Papers*, 13(1), 85–92.
- Tritter, J., & McCallum, A. (2006). The Snakes and Ladders of User Involvement: Moving beyond Arnstein. *Health Policy (Amsterdam, Netherlands)*, 76, 156–168.
- Van Laer, J., & Van Aelst, P. (2010). Internet and social movement action repertoires: Opportunities and limitations. *Information, Communication & Society*, 13(8), 1146–1171.
- Vezzoli, C. (2006). Design for sustainability: the new research frontiers. In *7th Brazilian Conference on Design, P & D, Curitiba* (pp. 09–11).
- Vezzoli, C., Ceschin, F., & Kemp, R. (2008). Designing transition paths for the diffusion of sustainable system innovations. A new potential role for design in transition management?, 1–14.
- Vezzoli, C., & Manzini, E. (2006). Design for Sustainable Consumption. *Changes to Sustainable Consumption*, 167–197.
- von Geibler, J., Erdmann, L., Liedtke, C., Rohn, H., Stabe, M., Berner, S., & Jordan, N. D. (2013). *Living Labs für nachhaltige Entwicklung: Potentiale einer Forschungsinfrastruktur zur Nutzerintegration in der Entwicklung von Produkten und Services*.
- Wahl, D. C., & Baxter, S. (2008). The Designer's Role in Facilitating Sustainable Solutions. *Design Issues*, 24(2), 72–83.
- Walker, S. (2011). Form beyond function: practice-based research in objects, environment and meaning. *International Journal of Sustainable Design*, 1(4), 335–347.
- Walker, S., Dogan, C., & Marchand, A. (2009). Research Through Design—The Development of Sustainable Material Cultures. In *8th European Academy of Design Conference Proceedings*.
- Walker, S., Manzini, E., & Wylant, B. (2007). *Enabling Solutions for Sustainable Living*.
- Warde, A. (2005). Consumption and Theories of Practice. *Journal of Consumer Culture*, 5(2), 131–153. <https://doi.org/10.1177/1469540505053090>
- Warde, A. (2010). *Consumption*. London: SAGE.
- Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge university press.
- White, S. C. (1996). Depoliticising development: the uses and abuses of participation. *Development in Practice*, 6(1), 6–15.
- Willis, A.-M. (2006). Ontological designing. *Design Philosophy Papers*, 4(2), 69–92.
- Zapf, W. (1989). Über soziale innovationen. *Soziale Welt*, 40(H. 1/2), 170–183.
- Zimmerman, J., Stolterman, E., & Forlizzi, J. (2010). An analysis and critique of Research through Design. In *Proceedings of the 8th ACM Conference on Designing Interactive Systems - DIS '10* (p. 310). ACM. <https://doi.org/10.1145/1858171.1858228>

7. Annex

7.1. Video prototype storyboard variations

These storyboards were collaboratively developed with stakeholders, therefore in German language.

Szene	Summary	Varianten	Setting / Einstellung	Kommentar e
Päckchen annehmen				
1	Postbote Klingelt an der Tür von Familie K.		Treppenhaus, Haustür	
	Es ist niemand zu Hause.			
2	Das ... teilt ihm mit, wer in der Nachbarschaft bevorzugt das Päckchen annehmen möchte.			
		Schnitt auf Frau K: Sie freut sich sehr auf die Sendung, ist an diesem Tag aber erst spät zu Hause, die Nachbarn sind im Urlaub. Sie gibt deshalb den Spätkauf gegenüber als Abgabeadresse ein, um nach der Arbeit noch vorbei schauen zu können.		

1	Notification:/SMS auf Herr Ks Handy:Mehrere Besuche haben geklingelt	Herr K ruft App Doorbell History auf	Gehweg, unterwegs	Timeline wird angezeigt, Notifications (evtl mit Icons (Post, nur Klingel, Nachricht, etc)
2	Öffnen der App			
3	Auswahl des Eintrags "Post"		Großaufnahme Smartphone	
4	Für Sie wurde ein Paket beim Spätkauf gegenüber abgegeben. Sie können es während der Öffnungszeiten abholen		Großaufnahme Smartphone, Evtl. Sprachnachricht?	
5	Herr K läuft in Richtung Spätkauf		Gehweg, Herr K läuft auf Kamera zu	
6	Szene im Spätkauf. Entgegennehmen des Pakets. Evtl. Authentifizierung durch Handy.			
Bohrmaschine anschaffen				
1	Herr K braucht eine Bohrmaschine		Halbtotale oder halbnaher Einstellung	
2	Er überprüft die zentrale Tauschstelle im Haus danach, ob jemand eine verleihen würde.			

3	Es ist keine im Haus,	Ein Nachbar bietet eine an		
4	also schlägt er allen vor, eine gemeinsame Bohrmaschine zu kaufen.			Nachricht im Haus wird verschickt, zentrales Messageboard, Votingssystem?
5	Zeitanzeige...1 Tag später (?)	Nachricht, wenn das Ziel erreicht ist und viele dafür gestimmt haben....		
6	Herr K bekommt eine Nachricht/Notification über den Status bzw. die Rückmeldungen			
7	Herr K schaut sich die Rückmeldungen an (5 Bewohner haben dafür gestimmt, 2 dagegen)			
8		Microfinancing
Bohrmaschine ausleihen				
1	Herr K benötigt eine Bohrmaschine.		in der Wohnung	Problem mit einem Bild skizzieren: Herr K mit Dübel in der Hand zeigen
2	Er geht zum Hauseingang, wo sich die Klingeln befinden		Hauseingang	
3	Es existiert ein zusätzlicher		Hauseingang	Klingelbrett zeigen

	Knopf, über den Nachrichten an alle Mieter hinterlassen werden können			
4	Herr K. Klingelt und hinterlässt seine Anfrage nach einer Ansage mit wenigen Sätzen.	Er ruft eine "Hausnummer" an. / er verwendet einen Screen	Hauseingang	
5	Alle Nachbarn, die diesen Dienst abonniert haben erhalten die Nachricht auf ihre Mailbox	Festnetz, Handy	in der Wohnung	unterschiedliche Nachbarn zeigen, die eine Nachricht erhalten (wie?)
6	Am nächsten Tag klingelt es bei Herr K.	Eine Nachbarin hinterlässt einen Zettel an seine Tür: sie können die Bohrmaschine bei mir abholen	in der Wohnung	
7	Frau L. aus Etage 9 bringt ihm die Bohrmaschine vorbei.	Frau L. ist immer erst spät zu Hause. Sie gibt die Maschine bei einem anderen Nachbarn ab und sendet diese Information an Herr K.	Vor der Haustür	
Bohrmaschine verleihen				
1	Frau K hat eine Bohrmaschine, die sie nur sehr selten benutzt.		In der Wohnung	

	Sie geht zum Klingelbrett und drückt die Taste: »verleihen«		Hauseingang	
	Es öffnet sich ein Menü			
	Sie wählt »Angebot sprechen«	Eine Angebrachte Kamera ermöglicht ihr das Objekt zu fotografieren		
	(Sie wählt »Angebot schreiben)			
	(Sie wählt »Objekt fotografieren«)			
Ein Loch bohren lassen				
	Frau K möchte ein neues Regal installieren. Sie ist Handwerklich nicht sehr geschickt und benötigt deshalb nicht nur die Maschine, sondern jemanden, der sie bedienen kann.			
	Sie wählt aus der Mieterliste einige Mieter aus, von denen sie denkt, dass sie eventuell helfen könnten			
	Herr L. und Herr U. haben sich für diesen Dienst angemeldet.			

	Beide erhalten die Anfrage auf ihre Handys.			
	Beide schicken einen Terminvorschlag an Frau K			
	Bei Frau K klingelt es: sie nimmt ab und der Terminvorschlag wird ihr vorgelesen			
	Sie lehnt den Terminvorschlag von Herr K ab			
	Sie nimmt den Terminvorschlag von Herr U an.			
	Herr U. kommt vorbei und übernimmt die Aufgabe.			Datum wird eingeblendet
	Frau K lädt Herr U als Dankeschön zum essen ein.			
Ein Hausfest organisieren				
	Herr U möchte ein Hausfest organisieren			
	Er richtet eine Message an alle.			
Klingel umleiten				
	Herr K fährt in den Urlaub.			
	Sie legt er seine Klingel auf den Nachbarn Herr B um, der während			

	der Zeit zu Hause ist.			
	Wenn jemand klingelt erhalten er eine Nachricht (SMS, Mail).			
	Es klingelt bei Herr B.			
Schlüssel hinterlassen				
	Herr K fährt in den Urlaub. Für dringende Fälle möchte er den Schlüssen hinterlassen.			
Kuchen backen				
(Micropayments per "Neighbor-Hug-Button")	Frau Gruber backt gerne Kuchen. Da ein ganzer Kuchen immer zuviel ist, möchte sie ihn mit anderen teilen			
	Sie macht ein Bild von dem Kuchen und "veröffentlicht" es im Hausnetz			
	Als Wünsche gibt sie an, dass jemand ihr mit dem Aufhängen von einem Bild hilft, einen kleinen Betrag zahlt, etc.			

7.2. Threshold Interface Concepts

Collection of threshold concepts

- QR Windows: Curtains, shutters or blinds can have a personalized QR code projected onto them. People passing by can scan the QR codes from the sidewalk to see the resident's sharing status announcements. The sharing status is easily updated by the resident to announce sharing requests and offers. The resident could potentially set different access levels depending on if the receiver lives within the building, nearby or is a random passerby.
- Dance Dance Revolution doormat: The doormat could be a weight-sensitive, durable display. When it is activated by being stepped on, the person standing on the doormat can interact with it. To communicate with the doormat, the person navigates/answers simple multiple choice questions. It's a low-fidelity communication tool.
- Give & take doormat: Doormat divided up into different areas: one part used especially for offering items and a second part dedicated to receiving items.
- Sheepdog Doormat: A doormat that is equipped with sensors to record and transfer information about activity at a front door. Residents exchange the doormat for instance when going on a holiday in order to allow neighbours to take care of their homes.
- Spy on inventory: Metaphor of a spy camera in order to offer various items. Such item could be categorised according to whom they are available for: friends on one level, neighbours on a different and general public on a third. The camera is a metaphor and does not necessarily relate to a physical camera hanging and filming objects: rather, it can be translated as remotely being able to see certain sharable items.
- Glass-encased bulletin board: The bulletin board could be a display that allows residents to see what other neighbors are offering to share. Additionally the bulletin boards could be connected so that residents could search the database of bulletin boards to potentially find someone who is offering what they are requesting. This could also be a mix between analog and digital bulletin board, when you approach it there are certain levels of access, public announcements are visible to everyone in analog form, when you have to give back something that has been shared with you, there is a personal notice on the virtual board.
- Mobile spyglass (sharing) application: On entering the building you get a digital map of it that shows where certain items are located and who wants to share it. You would be able -

depending on your access rights - to see the items that you can borrow. Maybe there is an incentive to also share items/give something back.

- Mobile spyglass application: Whenever someone rings your doorbell, you will receive an SMS/ (a videofeed of the door-camera is opened (should work similar to getting a phonecall). The option of opening the door is added and a smart-phone app allows you to access the current view through your spyglass where ever you are. Move the camera angle via the app, open the door by the app.
- Look inside spyglass: A spyglass that allows the visitor to see certain things that are shared by the resident inside an apartment.
- Shared spyglass: provide access to your spyglass when you are not able to take care for the house, etc. Access to virtual/real storage space (Tauschbörse), access depending on rights within the network, depending on location of the spyglass (public, semi-public, private)
- Opaque / Transparent Door: Make sharing objects visible by changing the door transparency. Could also be in semi-public space, like a neighborhood sharing base. Use a community currency to take things out. Maybe there are different categories of sharing (free, community-related, open to everyone)
- Message Recorder: Record a video message for a recipient, add an asynchronous communication, record and send video messages to groups / individuals based on special interests (e.g. a video message that contains an offer / a need for sharing, an announcement for the communal chess club,...)
- Shared Mailbox: Provide access to your mailbox for the purpose of sharing. Specify groups or individuals that will gain a key and leave objects and documents for these people. Use >> keys and rights management to provide access to other parties.
- Opaque / transparent mailbox: the mailbox changes surface from opaque to transparent, relating to the ongoing sharing activity. Only people with access can see the content (when they are close to the object).
- Networked Mailbox: Use the mailbox as a node in a broader network of mailboxes. Add an availability / mood status on the mailbox: The status shifts to a personalized mode when somebody is approaching for whom a more detailed status should be visible.
- Printing Mailbox: People can electronically address a mail to a recipient, the mail will be printed out in the mailbox and will though be received in a physical form.
- Scanning Mailbox: A letter that is posted in a mailbox is scanned when posted and transferred to an electronic format. Any other owner of a >> printing mailbox can receive a printout (c: not a very sustainable solution)

- **Sharing Box:** Combination of real and virtual sharing space. (Compartment or booth where you can check the virtual house directory for things shared) The idea is to create an environment where users feel as comfortable as in their own private space. Using a personal access key people can post sharing objects and services. Transportation of personal into public space. Network and community activity is visualized (sharing traces and connections) - think multitouch, big screen, etc
- **Tracing bell:** Provide a use-history of the bell in form of a timeline. Who rang the bell at what time? > create visual representations of sequences, use it like a virtual timemachine, zoom in and out of the network. You can get information of the traces you have left in the community.
- **Color coded bells by proximity:** Add a dynamic color system that provides information about sharing activities to neighbours when approaching a door bell board: e.g. a green color is activated when a member approaches the bell board – which shows him that this neighbour wants to deliver some sharing objects.
- **-Distributed Doorbells:** Ring one bell but target a group of neighbours due to a special topic or for a special purpose.
- **Sharing Bell:** One dedicated doorbell provides access to the sharing network: ring it and announce / leave your sharing offer, react on an existing sharing offer.
- **Bell control center:** use the bells for displaying relations based on sharing scenarios (where is the object? display the route of an object within the neighbourhood)

7.3. Sharing phase persona example

Friendly neighbour

Herr Rosenthal

Family ties

Lives with spouse and children.

Occupation

Works as a shopkeeper on the same block as his home.

Computer literacy and Communication

He has an email address, but doesn't use it often. Has a high preference for immediate communication. Face to face contact is important to him.

"I would rather just call, that is quicker. I don't have time to email. Perhaps if I tried and they didn't answer, I'd mail."

Neighbourhood network

Knows all the neighbours, since he introduces himself to them whenever they move in. Engages in sharing activity with his neighbours and organizes the neighbourhood gatherings. Even though he enjoys the community aspect of having a close neighbourhood, he still maintains that some degree of privacy is important to him.

"Neighbours should set and respect borders. The couples in our neighbourhood have less contact to other neighbours (like for example the single neighbours) Neighbours within the same age group have more contact with each other, since they have more in common."

Life Goals

Have and maintain relationships.

Experience Goals

Feeling satisfaction from helping others

End-Goal

Seeing others benefit

Having access to things he can't afford

Lives with her spouse and 3 year old daughter.



Age: 53

Gender: Male

Duration of residence: 12 years

7.4. Survey on Fischerinsel

The survey document that was sent out online and distributed as a printed survey.

Vernetzte Nachbarschaft

Guten Tag und vielen Dank fuer Ihre Bereitschaft, an unserer Umfrage teilzunehmen.
Das Projekt Vernetzte Nachbarschaft ist eine Zusammenarbeit des Senioren Computer Club Berlin-Mitte und dem Design Research Lab der UdK Berlin.

Über Sie

1. Wie alt sind Sie?

In Jahren

Mark only one oval.

50-60

60-70

70-80

2. Was ist Ihr Geschlecht?

Mark only one oval.

Weiblich

Männlich

3. Welche Nationalität besitzen Sie?

4. In welchem Bezirk in Berlin wohnen Sie?

5. Wie lange sind Sie schon Mitglied im SCC?

z.B. zwei Jahre

6. Welchen beruflichen Hintergrund haben Sie?

7. Wie schätzen Sie Ihre Computerkenntnisse ein?

Mark only one oval.

Ich bin Anfänger

Ich habe Grundkenntnisse, brauche aber noch öfter Hilfe

Ich komme ganz gut zurecht

Ich bin Profi

8. Seit wann sind Sie im Internet?

z.B. 2 Jahre

9. Wie sind Sie auf die Idee gekommen, sich am PC fit zu machen?

10. Was sind Ihre stärksten Interessen im Umgang mit Computern?

Tick all that apply.

- Kommunikation mit Freunden und Familie: eMail, Chatten, ...
- Digitale Bilder
- Schreiben
- Informationen suchen
- Other: _____

11. Was gefällt Ihnen beim Surfen im Internet am Besten?

Der Senioren Computer Club Berlin-Mitte

12. Sind Sie ehrenamtlich im Club tätig?

Mark only one oval.

- Ja, ich bringe mich ehrenamtlich ein
- Ich packe ab und zu mal an, wenn es sich anbietet
- Ich würde mich gerne einbringen, weiß aber nicht so recht, wie
- Nein, ich bin ein Besucher/eine Besucherin des Clubs
- Other: _____

13. Was ist Ihnen das Wichtigste am SCC?

Mark only one oval.

- Etwas über Computer zu lernen
- Kontakt zu Gleichgesinnten zu pflegen und Freunde zu finden bzw. zu treffen
- Mich auch nach dem Arbeitsleben einbringen zu können
- Other: _____

14. Wie wichtig ist der Fischerinsel-Kiez für den Club?

Mark only one oval.

- Gar nicht wichtig, rein zufällig
- Wichtig
- Essentiell

15. Würden Sie einen Austausch mit jüngeren Menschen wünschen?

Mark only one oval.

- Ja, wir könnten viel von einander lernen
- Nein, mir ist es lieber, wenn wir Senioren unter uns bleiben
- Other: _____

16. Was erwarten Sie von einem Wissensaustausch mit Jüngeren?

17. Finden Sie, dass der Club wachsen sollte?

Mark only one oval.

	1	2	3	4	
Nein, er sollte klein und intim bleiben	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Ja, der Club könnte ruhig größer werden und sich öffnen

18. Finden Sie, dass der Club professioneller werden sollte?

Mark only one oval.

	1	2	3	4	
Nein, der Club sollte ein Hobby sein	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Ja, der Club sollte sich professionalisieren

19. Wodurch sollte der Club sich in Zukunft finanzieren?

Tick all that apply.

- Mitgliedsbeiträge
- Kurse ("Sommerakademie")
- Öffentliche Fördergelder
- Sponsoren
- Other: _____

20. Welche Themen würden Sie sich zusätzlich zum angebotenen Kursprogramm wünschen?

21. Was ist das Beste/das Schönste am Club?

22. Was stört Sie am meisten am Club?

Nachbarschaft/Treffs

23. Wie oft sind sie im SCC auf der Fischerinsel?

24. Sind Sie auch in anderen Treffs aktiv?

Mark only one oval.

- nein
- ja

25. Falls ja, in welchen Treffs sind sie aktiv?

Entweder im Internet oder "Offline"

26. Pflegen Sie viele Kontakte in Ihrer Nachbarschaft?

Mark only one oval.

- Ja
- Geht so
- Nein

27. Haben Sie Kenntnisse und Fertigkeiten, die Sie gerne an andere Menschen weitergeben würden?

Wenn ja, welche?

28. Über welche Themen/Interessensgebiete würden Sie sich gerne mehr mit anderen Menschen austauschen?

7.5. Videointerviews Guideline

This videointerview guideline has been followed through with the german-speaking stakeholder group and was structured to inform the interviewers and provide them with questions to lead into the interview.

Unstructured Interview:

Characteristics of Unstructured Interviews

- *The interviewer and respondents engage in a formal interview in that they have a scheduled time to sit and speak with each other and both parties recognize this to be an interview.*
- *The interviewer has a clear plan in mind regarding the focus and goal of the interview. This guides the discussion.*
- *There is not a structured interview guide. Instead, the interviewer builds rapport with respondents, getting respondents to open-up and express themselves in their own way.*
- *Questions tend to be open-ended and express little control over informants' responses.*

Semi-Structured Interview:

Characteristics of Semi-structured interviews

- *The interviewer and respondents engage in a formal interview.*
- *The interviewer develops and uses an 'interview guide.' This is a list of questions and topics that need to be covered during the conversation, usually in a particular order.*
- *The interviewer follows the guide, but is able to follow topical trajectories in the conversation that may stray from the guide when he or she feels this is appropriate.*
- *The semi-structured interview guide provides a clear set of instructions for interviewers and can provide reliable, comparable qualitative data.*
- *Semi-structured interviews are often preceded by observation, informal and unstructured interviewing in order to allow the researchers to develop a keen understanding of the topic of interest necessary for developing relevant and meaningful semi-structured questions.*
- *The inclusion of open-ended questions and training of interviewers to follow relevant topics that may stray from the interview guide does, however, still provides the opportunity for identifying new ways of seeing and understanding the topic at hand.*

Fragebogen

Allgemeine Fragen zum Club

- Wer hat den SCC gegründet und warum?
- Wie ist die Altersstruktur?
- Wie groß ist der organisatorische Aufwand (Stunden / Woche)?
- Wer unterstützt den Club? (öffentliche Träger?)
- Wie ist die Geschlechterverteilung bzgl. Beteiligung am Clubgeschehen/den Kursen?
(- Was unterscheidet einen Seniorencomputerclub von einem Computerclub ohne Altersbeschränkung?)

Interviewteilnehmer: Persönliche Angaben

Geschlecht

Alter? (50-60, 60-70, 70-80, ...)

Wohnort? Bezirk

Herkunft? Berliner, Langzeitberliner (<20 Jahre), Zugezogen (<5 Jahre)

Ausbildung? (Studiert, etc.)

Unstrukturierte/ Halb-Strukturierte Interviews:

Strukturierter Teil geht über in unstrukturierten.

An Teilnehmer

1. Wie sind Sie zum SCC gekommen?
2. Was macht den SCC aus? Beschreiben Sie den SCC in einem Satz.
3. Warum nehmen Sie teil?
4. Was ist das Schönste/Wichtigste am Club?
5. Wie hat sich der SCC im Laufe der Jahre entwickelt/verändert?
6. Welche Angebote schätzen Sie besonders, welche würden Sie sich wünschen?
7. Welche anderen Interessensschwerpunkte/Hobbies/etc. verfolgen Sie?
8. Was könnte Ihrer Meinung dazu beitragen, dass man dem SCC nicht beitreten möchte?

Projektspezifische Fragen

- Würden Sie gerne / wären Sie bereit gelerntes Wissen an andere weiterzugeben?

- Wünschen Sie sich manchmal gerne fremde Hilfe zu Hause am PC?
- Wo erhalten Sie dann Hilfe?
- Kontaktieren Sie auch andere Clubmitglieder? Wie kontaktieren Sie sie?
- Würden Sie sich einen stärkeren intergenerationalen Dialog wünschen?
- Besteht Kontakt zu anderen Clubs (z.B. SCC)?

An Organisatoren/Kursleiter

(- Was unterscheidet einen Seniorencomputerclub von einem Computerclub ohne Altersbeschränkung?)

(- Wie würden Sie die Motivation der Kursteilnehmer beschreiben?)

- Wie würden Sie den Kenntnisstand ihrer Kursteilnehmer beschreiben?

- Welche Themen sind beliebt, welche unbeliebt?

- Wie wird das Kursprogramm gemacht?

- Was vermissen Sie im Club?

- Was sind die Stärken / Schwächen des Clubs?

- Haben Sie Einfluss auf die Gestaltung des Kursprogramms?

- Würden Sie gerne selbst Weiterbildungen erhalten?

- Wie ist das Geschlechterverhältnis in den Kursen?

(- Gibt es Geschlechtsspezifische Unterschiede im Umgang mit Computern / Technologie

- Was sind Auffälligkeiten in der Herangehensweise / den Berührungspunkten /den Interessen von Männern und Frauen?)

Welches Verhältnis/ Kooperation besteht zum/mit dem Kreativhaus?

Neueinsteiger/innen

- Wie haben Sie den Club gefunden?
- Was erhoffen Sie sich von einer Teilnahme im Club?
- Wie würden Sie ihre Computerkenntnisse beschreiben?
- Was würden Sie sich nach einer Kursteilnahme wünschen?
- Wollen Sie regelmäßig im Club Mitglied werden?

ORIENTIERUNGSPUNKTE IM DIALOG

Motivation der Kursteilnehmer, Leiter, Organisatoren, Teilnehmer/innen

- Rolle von Technologie: Mittel zum Zweck? Faszination für Technologie? ...

Vorteile der Clubmitgliedschaft (Was "gibt" ihnen der Club?)

Motivationen/Ziele der Mitglieder

- Mit-der-Zeit-gehen?

- Zweckorientierung: Zwecke?

- Soz. Umfeld/soz. Austausch/Aufbau neuer soz. Kontakte?

- Teilhabe an Informationsgesellschaft/Anpassung an eine sich verändernde Umwelt?

- Bessere Kommunikation mit Familie (Enkel, Kinder im Ausland, etc.)?

- Neues-lernen, Neugierde?

- Neue Leute Kennenlernen

Prioritäten / Wünsche in der Programmgestaltung

Was sind Seniorenspezifische Themen?

Herkunft der Mitglieder/Lokalbezug zur Fischerinsel

- Wohnen Sie auf der Fischerinsel?

- Kennen Sie Menschen, die auf der Fischerinsel wohnen?

- Spielt der Ort des Clubs für Sie eine Rolle?

Bevorzugte Hilfestellungen/Lehr- bzw. Lernmethoden

(Welche könnten Sie sich für sich oder Andere vorstellen?)

- Welche Dienste nutzen Sie bereits? (- Face 2 Face, Internet, Telefon, ...)

- Welche Dienste würden Sie gerne kennenlernen?

7.6. CHEST Letterbox Event Submissions

Gibt es aktuelle Sorgen auf der Fischerinsel?	Wie Wollen wir Blumenoasen schaffen?	Wie stellen sie Sich eine belebte Fischerinsel vor?
<p>Die Bebauung auf der Fischerinsel (Mühlendamm) sollte auf keinen Fall ein Hochhaus sein! Ohne die Mitbewohner zu befragen, wurden über "Nacht+Nebel" die Bäume gefällt, Sträucher vernichtet. Eine Baugenehmigung ist noch nicht erteilt; nur weil die WBH das Geld hat, will sie ohne Beteiligung der Bewohner der "Insel" einfach bauen. Das ist die sogenannte "Demokratie". Der Senat ist offensichtlich auch überfragt.</p>	<p>Kann man auch an Fassaden schaffen (Blauregen)</p>	<p>Bürger auch Ausserhalb der Arbeitszeiten ansprechen und beteiligen</p>
<p>Mehr Grün fürs Stadtklima</p>		<p>Schleusenkanal mit sauberem Wasser - aber keine Mücken zucht.</p>
<p>Gerüde und Bebauung</p>	<p>z.B. Blumenkästen entlang des Spesskanals (Kästen am Geländer oder Boden). Eimer mit Seilen zum Giessen</p>	<p>Schön wäre eine Seniorengruppe, die gemeinsam etwas unternimmt (Wandern, Kaffeetrinken, reden oder einfach bummeln; abends vielleicht Karten spielen oder im Notfall auch gegenseitig helfen)</p>

Kein neues Hochhaus	Die Gartenfreunde auf der Fischerinsel werden hier bestimmt mithelfen, versuchen die jungen Bewohner mit einzubeziehen	Bitte melden [?] ! Wir brauchen Anwohner, die mitmachen !!! (Giessen, [?]pflanzen, etc)
Hundehinterlassenschaften werden nicht entsorgt!	Blumenoasen sind toll, erfordern aber kontinuierliche Pflege (*Bürgerpatenschaften können das). Aufwertung der Grünstreifen und Neupflanzung von Bäumen können schon viel.	Mit viel grün - Bäume, Sträucher, Blumenrabatten. Bänke, Sitzinseln besonders für ältere und gehbehinderte Bewohner. Treffpunkte für Gespräche und auch mal ein Kartenspiel u.s.w.
Unebene Wege und ungepflegte Grünflächen	Wechselnde Bepflanzungen nach Jahreszeit. U.U. mit Patenschaften durch Anwohner. Die Blumenbeete müssten natürlich zunächst angelegt werden.	Mit attraktiven Treffpunkten für Jung und Alt, die zum Verweilen und zum Gespräch anregen. Auch für Kinder sollte etwas geboten werden.
Aufstockung des Gebäudes vor der Fischerinsel 1	Grüne Rasenflächen sind ja sehr schön + vor allem mit Mäh-Technik "pflegeleicht". Grün ist in der Tat sehr schön. Aber man sollte bei den "Umweltsorgen" endlich mal mit dem Gejammer (Bedrohte Schmetterlinge, Hummeln, Bienen, etc) aufhören. Bei allen Grünflächen ein 2m breiter Streifen mit Blumen-Mischung-Ansaat, eben für die genannten Bedrohten.	öffentliche Toiletten fehlen entlang der Touristenwege, Dampferanlegestellen, Hist. Hafen.
Gerüste am WBM-Gebäude	Entlang der Wege, Ufer die allerdings von Stolperfallen befreit werden müssten. Hinter / Vor FI 4/5 gibt es leere Beete.	- Mehr kleinere Geschäfte, wie Fleischerei, Blumenladen, Drogerie (wie DM oder Roßmann) Schuhgeschäft o.a. mehr. - Mehr Parkplätze für die

		Bewohner der Fischerinsel (bezahlbar) - KITA - Einrichtung - gesellschaftliches Zentrum, wie z.B. "Das Kreativhaus"
Defekte Bänke und kaputte Wege	Die bisherige Parkanlagenpflege ist nicht ausreichend. Geschützte Grünanlagen müssen besser in Ordnung gehalten werden. Früher haben die Bürger selbst Hand angelegt und auf Ordnung geachtet, fehlende Kontrollen! Deshalb die Bepflanzung durchführen, damit auch auf der Fischerinsel wieder eine "grüne Oase" zu finden ist.	1000 Sonnenblumen am Ufer der Friederichsgracht
Wenn schon gebaut wird, sollte der Innenhof mit hoher Aufenthaltsqualität angelegt werden. z.B. Wiedererrichtung der Stele, die auf der FI stand.		
Ja, die vor uns stehenden Baumaßnahmen und die dazugehörige konkrete Information.		
- Riesen - dauerhafte - Pfützen am Uferweg Spreekanal - Taubenfütterer - Behindertengerechte Zu+Abgänge an Gehwegen, vor allem zum Uferweg im Bereich der FI 9 + 10		

Vermüllung... wilde Feiern auf der Inselbrücke mit jeder Menge Scherben!		

