

Value-sensitive digital social innovation  
for marginalized people:  
Designing, shaping, and reflecting on a concept to  
support humans experiencing homelessness

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## Danksagung

„Die Welt und das Leben zu lieben, auch unter Qualen zu lieben, jedem Sonnenstrahl dankbar offenzustehen und auch im Leid das Lächeln nicht ganz zu verlieren.“

—Hermann Hesse

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## Abstract

Life in our current society has a multitude of challenges—among them poverty, inequality, and homelessness. Many organizations and individuals are working on addressing these challenges—from small local groups to the United Nations. In an attempt to outline the most significant and impactful challenges, the latter formulated the sustainable development goals (SDGs).

A recent research field that addresses societal challenges through information and communication technologies (ICT) is digital social innovation (DSI). The designs of DSI applications vary according to their contexts and objectives, and their goals are often oriented toward the SDGs. While DSIs can assist in addressing societal challenges, they cannot provide a complete solution.

The design and development of DSIs are associated with great responsibility because they can have a profound impact on the living conditions of individuals and their environments. This responsibility is especially important when working with marginalized individuals because they are often subjected to societal prejudices, and their needs receive little attention. However, while DSI researchers are increasingly becoming aware of the responsibility of their work, little research has been conducted on ethical issues associated with working with marginalized people. To close this research gap, it is necessary to account more strongly for ethical issues—such as ethical dilemmas or value conflicts—that may arise among stakeholders during the development or use of such technologies. The consideration of values contributes to the necessity of co-created active inscription of values<sup>1</sup> in technology (i.e., in DSIs).

In this dissertation, which is grounded in the fields of DSI and information systems (IS)<sup>2</sup>, I suggest that the research field of value sensitive design (VSD) offers suitable methods to adequately address such ethical issues in a way that DSI does not currently do on its own. In pursuit of my aim, I recognize that VSD provides methods for taking into account the values

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<sup>1</sup> Here, my understanding of value follows Friedman and Hendry (2019, p. 24) in understanding a value as something that “is important to people in their lives, with focus on ethics and morality.” Examples of values are human welfare or freedom from bias.

<sup>2</sup> My research on DSI applications has its origins in IS research and has been expanded to include additional aspects of the multidisciplinary DSI research field. For this reason, I use DSI as an umbrella term for the research field that encompasses IS research for DSI. At certain points, IS research will be explicitly mentioned (e.g., when referring to specific extensions of IS research methods).



of different direct and indirect stakeholders. These methods range across empirical, conceptual, and technological investigations. VSD proposes that existing entanglements between stakeholders and values need to be addressed through the methods so that ethical issues can be detected, addressed, and hopefully even resolved through value inscription.

Despite its potential, the connection between the multidisciplinary fields of DSI and VSD has not yet been explored extensively. In this dissertation, this research gap is addressed by applying a proactive, design-oriented IS approach called action design research (ADR) based on a specific DSI project called *OpenStreetPay*. Furthermore, phenomenon-driven research (PDR) is also utilized and complements the overall ADR approach.

The OpenStreetPay project is a grassroots volunteer project accompanied and shaped by research. Its aim is to enable digital donations to and payments for people who experience homelessness and to ensure that they do not face additional difficulties in an increasingly cashless society. The project seeks to step in where institutional solidarity seems to fail in Germany. It strives to help people who feel little heard in society and who lack the digital means to receive donations and make payments. During the development of the project's digital application concept, ethical issues were discovered within the DSI ecosystem, for example, when it came to deciding who should receive aid. These are the ethical issues to which this dissertation devotes particular attention through its approach of connecting DSI and VSD.

Based on the ADR research and work in this project, I extend DSI research and design by employing results from VSD together with insights from participatory and ethically responsible work with marginalized people. This extension is developed and illustrated by answering five central research questions (RQs) that address the design, implementation, and evaluation of value-sensitive DSI applications, as well as shaping the newly coined research field of value-sensitive DSI proposed in this dissertation. In the following section, I summarize the results in relation to the respective RQs.

*(1) Why should DSI for marginalized individuals be designed in a value-sensitive way?*

In this dissertation, I develop argumentation for the need for value sensitivity in DSI design and implementation and clarify and define the newly coined term of value-sensitive DSI applications.

*(2) How can value-sensitive DSI for marginalized individuals (using the example of humans experiencing homelessness) be designed?*

This dissertation derives design principles for the design of a value-sensitive DSI application for marginalized people, especially those experiencing homelessness. They were developed by reflecting on design decisions in the OpenStreetPay ADR project and were iteratively generalized by knowledge gained from a meta-study identifying and analyzing 118 DSI applications in the field of digital homelessness support from different countries worldwide.

*(3) How can research and design methods (be extended to) support the development of value-sensitive DSI?*

The results of this thesis comprise design principles for selecting and adapting design methods from DSI and VSD, thus supporting the combination of contributions from both fields in the development of value-sensitive DSI applications. At the same time, insights for enhancing IS research methods by value sensitivity (especially ADR) were gained and the first steps elaborated, paving the way for further ADR or researchers to be involved in providing value-sensitive DSI applications.

*(4) How can the societal impact of a value-sensitive DSI in accordance with its pursued values be reflected and evaluated?*

For answering this question, a multilevel framework for human-value-oriented DSI ecosystems was developed supporting the reflections of value inscriptions on different and interrelated layers of the DSI ecosystem. On this basis, evaluation of different factors and their possible intertwinement can be guided transparent. Furthermore, the evaluation with marginalized people carried out in the OpenStreetPay project led to complementing evaluation approaches by insights from additional research fields (see below).

*(5) Why and how should DSI for marginalized individuals be designed in a value-sensitive way?*

Revision and extension of the first RQ led to the development and postulation of a research agenda for the newly coined research field, shaping four dimensions for further research: (i) reflective value-sensitive goal-setting, (ii) an extended research method and shaping of research conditions, (iii) consideration of stakeholder values and possible discrimination, and (iv) value-sensitive DSI development.

With these findings, this dissertation simultaneously contributes to the DSI and VSD fields as well as to research on working with marginalized people.

First, the thesis extends DSI research with a novel approach to responsible design and research, especially value orientation and value inscription. With my research, I demonstrate how a significant and urgent societal challenge can be addressed in practice and research.

Second, this dissertation improves on the proactive technical investigation of VSD through performing empirical, conceptual, and technical investigations in the context of OpenStreetPay and by leveraging insights from DSI and IS research, particularly ADR, for such technical investigations.

Third, specific characteristics of DSI research with marginalized individuals were identified, particularly research with those experiencing homelessness. These aspects comprise the necessity for multidisciplinary research to ensure that the voices of marginalized people are heard in the research process and the design. In my thesis, I therefore align my DSI research with responsibility toward the target group, for example, by considering the challenges and prejudices that arise from people's living and housing situations.

Since this research was shaped by various impulses from both the OpenStreetPay project and the topics and results from different research, there was a need to create transparency about the research journey. To do so, the origins of the research ideas, questions, and contributions had to be clarified. Hence, a reflection on the research journey, which (a) highlights where the respective impulses for the individual papers came from, (b) illustrates the influence of multidisciplinary research, and (c) clarifies how I sharpened my value-sensitive DSI approach throughout the research progress, is developed. This research journey can also be viewed as an additional contribution of this dissertation. It guides the reflection on the research process and can serve as a model and enrichment for further ADR approaches and projects. Additionally, a tool supporting collaboration among different research teams throughout the evolving research journey and for transferring insights from the OpenStreetPay progress was developed and applied.

This dissertation is one of numerous attempts in the fields of DSI and VSD aiming to contribute to shaping the world sustainably. However, further proactive and design-oriented research is still needed to meet arising societal challenges with appropriate and informed strategies for solutions. I close the dissertation by making suggestions for what such future research could look like.

**Keywords:** digital social innovation; value sensitive design; action design research; marginalization; humans experiencing homelessness; sustainable development goals

## Zusammenfassung

Das Leben in unserer heutigen Gesellschaft ist mit einer Vielzahl von Herausforderungen verbunden. Darunter fallen beispielsweise Armut, Ungleichheit und Obdachlosigkeit. Viele Organisationen und Einzelpersonen — von kleinen lokalen Gruppen bis hin zu den Vereinten Nationen — arbeiten daran, diesen Herausforderungen zu begegnen. Die Vereinten Nationen haben hierzu die Ziele für nachhaltige Entwicklung (Sustainable Development Goals, SDGs) formuliert, um die wichtigsten und folgenreichsten Herausforderungen zu umreißen.

Ein neu aufkommendes Forschungsgebiet, das sich mit der Adressierung der gesellschaftlichen Herausforderungen mittels Informations- und Kommunikationstechnologien (IKT) befasst, ist das Forschungsgebiet der digitalen sozialen Innovation (DSI). DSI-Anwendungen sind je nach Kontext und Zielsetzung unterschiedlich gestaltet und orientieren sich häufig an den SDGs. DSI können bei der Bewältigung gesellschaftlicher Herausforderungen helfen, aber keine vollständige Lösung für sie bieten.

Die Gestaltung und Entwicklung von DSIs ist mit großer Verantwortung verbunden. DSIs können tiefgreifende Auswirkungen auf die Lebensbedingungen von Menschen und ihre Umwelt haben. Die Verantwortung ist besonders relevant, wenn mit marginalisierten Menschen gearbeitet wird. Diese Menschen sind oft mit gesellschaftlichen Vorurteilen konfrontiert und ihre Bedürfnisse werden weniger beachtet. Obwohl sich DSI-Forschende zunehmend der Verantwortung ihrer Arbeit bewusst sind, gibt es bisher wenig Forschung zu ethischen Herausforderungen in der Arbeit mit marginalisierten Personen. Um diese Forschungslücke zu schließen ist es notwendig ethische Herausforderungen, die bei der Entwicklung oder Anwendung solcher Technologien auftreten können, stärker zu berücksichtigen. Ethische Herausforderungen sind dabei beispielsweise ethische Dilemmata oder Wertkonflikte. Die Berücksichtigung von Werten<sup>3</sup> trägt dazu bei, dass Werte aktiv in Technologien (d.h. in die DSI) eingeschrieben werden.

In dieser Dissertation, die in den Bereichen DSI und Information Systems (IS)<sup>4</sup> angesiedelt ist, wird daher das Forschungsfeld des Value Sensitive Design (VSD) als geeigneter Ansatz

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<sup>3</sup> Das Verständnis von Werten dieser Dissertation folgt Friedman und Hendry (2019, S. 24), die einen Wert als etwas verstehen, das „für Menschen in ihrem Leben wichtig ist, mit Schwerpunkt auf Ethik und Moral“. Beispiele für Werte sind das menschliche Wohlergehen oder die Freiheit von Vorurteilen.

<sup>4</sup> Meine Forschung zu DSI-Anwendungen hat ihren Ursprung in der IS-Forschung und wurde um zusätzliche Aspekte des multidisziplinären DSI-Forschungsfeldes erweitert. Aus diesem Grund verwende ich DSI als

identifiziert, um diese ethischen Herausforderungen auf eine Weise zu behandeln, die die DSI-Forschung allein derzeit nicht leisten kann. Bei der Verfolgung dieses Ziels wurde herausgearbeitet, dass VSD Methoden zur Verfügung stellt, die Werte verschiedener direkter und indirekter Interessengruppen berücksichtigen. Diese Methoden umfassen empirische, konzeptionelle und technologische Untersuchungen. VSD-Forschende stellen dabei heraus, dass bestehende Verbindungen zwischen Stakeholdern und Werten mit Hilfe der Methoden berücksichtigt werden müssen, damit ethische Herausforderungen erkannt, angegangen und hoffentlich durch die Einbeziehung von Werten gelöst werden können.

Trotz seines Potenzials ist die Verbindung zwischen den multidisziplinären Bereichen DSI und VSD noch nicht umfassend erforscht worden. In dieser Dissertation wird diese Forschungslücke geschlossen, indem die proaktive, designorientierte IS-Forschungsmethode Action Design Research (ADR) in einem spezifischen DSI-Projekt namens OpenStreetPay angewendet wird. Darüber hinaus wird Phenomenon-Driven Research (PDR) verwendet, um den ADR-Ansatz zu ergänzen.

Das OpenStreetPay-Projekt ist ein ehrenamtliches sowie wissenschaftlich begleitetes und mit gestaltetes Grassroots-Projekt. Das Projektziel besteht darin digitales Spenden und Bezahlen für Menschen, die von Obdachlosigkeit betroffen sind, zu ermöglichen. Dabei möchte das Team sicherstellen, dass obdachlose Mitmenschen in einer zunehmend bargeldlosen Gesellschaft nicht mit zusätzlichen Schwierigkeiten konfrontiert werden. Das Projektteam setzt dort an, wo die institutionelle Solidarität in Deutschland zu versagen scheint. Es will Menschen helfen, die sich in der Gesellschaft wenig gehört fühlen und denen die digitalen Möglichkeiten fehlen, Spenden zu empfangen und Zahlungen zu leisten. Während der Projektentwicklung des digitalen Konzeptes wurden innerhalb des DSI-Ökosystems ethische Fragen aufgeworfen, z.B. wem geholfen werden soll. Diese ethischen Fragen werden in der vorliegenden Dissertation durch die Verbindung von DSI und VSD besonders berücksichtigt.

Auf der Grundlage der ADR-Forschung und der Arbeit in diesem Projekt wird die DSI-Forschung und -Gestaltung erweitert, indem die Ergebnisse aus dem VSD zusammen mit Erkenntnissen aus der partizipativen und ethisch verantwortlichen Arbeit mit marginalisierten Menschen verwendet und integriert werden. Diese Erweiterung wird durch die Beantwortung von fünf zentralen Forschungsfragen entwickelt und illustriert, die sich auf das Design, die

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Oberbegriff für das Forschungsfeld, das die IS-Forschung für DSI umfasst. An bestimmten Stellen wird die IS-Forschung explizit erwähnt (z. B. wenn es um spezifische Erweiterungen von IS-Forschungsmethoden geht).

Gestaltung sowie die Evaluation von wertebasierten DSI-Anwendungen beziehen und den neuen Forschungsbereich der wertebasierten DSI postulieren, welcher in dieser Dissertation vorgeschlagen wird. Im folgenden Abschnitt werden die Ergebnisse in Bezug auf die einzelnen Forschungsfragen zusammengefasst.

*(1) Warum sollte eine DSI für marginalisierte Personen wertesensibel gestaltet werden?*

In dieser Dissertation wird eine Argumentation für die Notwendigkeit von Wertesensitivität bei der Gestaltung und Umsetzung von DSI entwickelt sowie der neu geprägte Begriff der wertesensitiven DSI-Anwendungen definiert.

*(2) Wie kann eine wertesensible DSI für marginalisierte Personen (am Beispiel von Menschen, die von Obdachlosigkeit betroffen sind) gestaltet werden?*

In dieser Dissertation werden Designprinzipien für die Gestaltung einer wertesensiblen DSI-Anwendung für marginalisierte Menschen abgeleitet, insbesondere für Menschen, die von Obdachlosigkeit betroffen sind. Sie wurden durch die Reflexion von Designentscheidungen im OpenStreetPay ADR-Projekt entwickelt und iterativ durch Erkenntnisse aus einer Metastudie generalisiert. Die Metastudie beinhaltet dabei die Identifizierung und Analyse von 118 DSI-Anwendungen im Bereich der digitalen Obdachlosenhilfe aus verschiedenen Ländern weltweit.

*(3) Wie können Forschungs- und Designmethoden erweitert werden, um die Entwicklung von wertensensitiven DSI zu unterstützen?*

Die Ergebnisse dieser Arbeit beinhalten Designprinzipien für die Auswahl und Anpassung von Gestaltungsmethoden aus DSI und VSD mit dem Ziel, die Kombination von Beiträgen aus beiden Bereichen bei der Entwicklung von wertesensiblen DSI-Anwendungen zu unterstützen. Gleichzeitig werden Erkenntnisse für die Erweiterung von IS-Forschungsmethoden um Wertesensitivität (insbesondere ADR) gewonnen und erste Schritte erarbeitet, die den Weg für weitere ADR-Forschung und -Forschende für die Bereitstellung von wertensensitiven DSI-Anwendungen ebnen sollen.

*(4) Wie kann die gesellschaftliche Wirkung einer werteesensiblen DSI entsprechend der verfolgten Werte reflektiert und bewertet werden?*

Zur Beantwortung dieser Frage wurde ein Multilevel Framework für wertorientierte DSI-Ökosysteme entwickelt, welches die Reflexion von Werteinschreibungen auf verschiedenen und miteinander verknüpften Ebenen des DSI-Ökosystems unterstützt. Auf dieser Grundlage soll die Bewertung der verschiedenen Faktoren und ihrer möglichen Verflechtung transparent gemacht werden. Darüber hinaus wurden durch die im OpenStreetPay-Projekt durchgeführte Evaluation mit marginalisierten Menschen Evaluationsansätze durch Erkenntnisse aus weiteren Forschungsfeldern ergänzt (siehe unten).

*(5) Warum und wie sollte eine DSI für marginalisierte Personen werteesensibel gestaltet werden?*

Die Überarbeitung und Erweiterung der ersten Forschungsfrage führte zur Entwicklung und Postulierung einer Forschungsagenda für das neu geprägte Forschungsfeld, die vier Dimensionen für die weitere Forschung beinhaltet: (i) Zu reflektierende werteesensible Zielsetzung, (ii) Erweiterung bestehender Forschungsmethoden und Gestaltung der Forschungsbedingungen, (iii) Berücksichtigung von Stakeholder-Werten und möglicher Diskriminierung und (iv) Werteesensible DSI-Entwicklung.

Mit diesen Erkenntnissen leistet diese Dissertation gleichzeitig einen Beitrag zur DSI- und VSD-Forschung sowie zur Forschung mit marginalisierten Menschen.

Erstens wird in dieser Dissertation die DSI-Forschung um einen neuartigen Ansatz zur verantwortungsvollen Gestaltung und Forschung, insbesondere zur Wertorientierung und Werteinschreibung, erweitert. Dabei zeigt diese Forschungsarbeit, wie eine bedeutende und dringende gesellschaftliche Herausforderung in Praxis und Forschung adressiert werden kann.

Zweitens wird mit dieser Dissertation die proaktive technische Untersuchung von VSD durch Erkenntnisse aus der DSI- und IS-Forschung substanziell ergänzt, insbesondere durch den Einsatz von ADR für die technische Untersuchung. Weitere Ergänzungen sind für die empirische, konzeptionelle und technische Untersuchungen im Kontext von OpenStreetPay erprobt worden.

Drittens wurden spezifische Charakteristiken der DSI-Forschung mit marginalisierten Personen identifiziert, insbesondere für die Forschung mit Menschen, die von



Obdachlosigkeit betroffen sind. Diese Aspekte umfassen insbesondere die Notwendigkeit der multidisziplinären Forschung, um sicherzustellen, dass die Stimmen marginalisierter Menschen im Forschungsprozess und im Design von DSI-Anwendungen gehört werden. In dieser Dissertation wird daher die DSI-Forschung an der Verantwortung gegenüber der Zielgruppe ausgerichtet, indem zum Beispiel die Herausforderungen und Vorurteile berücksichtigt werden, die sich aus der Lebens- und Wohnsituation der Menschen ergeben.

Da diese Forschung durch verschiedene Impulse sowohl aus dem OpenStreetPay-Projekt als auch durch Themen und Ergebnisse aus anderen Forschungsarbeiten geprägt wurde, war es notwendig, Transparenz über den Forschungsweg zu schaffen. Dazu wurden die Ursprünge der Forschungsideen, -fragen und -beiträge reflektiert. Die Reflektion über den Forschungsweg umfasst dabei (a), woher die jeweiligen Impulse für die einzelnen Paper kamen, (b) die Verdeutlichung des Einflusses multidisziplinärer Forschung und (c) die Schärfung des wertesensiblen DSI-Ansatzes im Laufe des Forschungsprozesses. Die Reflektion des Forschungsweges kann als zusätzlicher Beitrag dieser Dissertation betrachtet werden. Sie unterstützt die Reflektion über den Forschungsprozess und kann als Anleitung und Bereicherung für weitere ADR-Ansätze und -Projekte dienen. Darüber hinaus wurde ein Tool entwickelt und angewendet, das die Zusammenarbeit zwischen verschiedenen Forschungsteams während des gesamten Forschungsprozesses und den Transfer von Erkenntnissen aus dem OpenStreetPay-Fortschritt unterstützt.

Diese Dissertation ist einer von zahlreichen Versuchen in den Bereichen DSI und VSD, die darauf abzielen, einen Beitrag zur nachhaltigen Gestaltung der Welt zu leisten. Es bedarf jedoch noch weiterer proaktiver und designorientierter Forschung, um den bestehenden gesellschaftlichen Herausforderungen mit angemessenen und fundierten Lösungsstrategien zu begegnen. Die Dissertation wird mit Vorschlägen, wie eine solche zukünftige Forschung aussehen könnte, abgeschlossen.

**Stichworte:** Digitale Soziale Innovationen; Value Sensitive Design; Action Design Research; Marginalisierung, Mitmenschen, die von Obdachlosigkeit betroffen sind; Sustainable Development Goals

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## List of Abbreviations

ADR	Action design research
AR	Action research
BIE	Build, Intervene, and Evaluate
DSI	Digital social innovation
ICT	Information and communication technology
IS	Information systems
KT	Knowledge type
P	Paper
PDR	Phenomenon-driven research
RQ	Research question
SDG	Sustainable development goals
VSD	Value sensitive design

# 1 Introduction

## 1.1 Motivation

The world and its population are facing a multitude of societal challenges. The United Nations is seeking to address these with its sustainable development goals (SDGs) (United Nations, n.d.). One societal challenge that relates to several of the SDGs is homelessness. Although the statistics vary<sup>5</sup> on how many humans are experiencing homelessness, the UN reported that in 2020, 1.8 billion people worldwide—about 20% of the world’s population—faced the challenge of insufficient housing (Guterres, 2020, April 23).

Living in unstable conditions can have a negative impact on one or more of the social, physical, and security domains (Busch-Geertsema et al., 2016; Casey and Stazen, 2021). It has also been shown that inadequate housing and poverty can lead to increased stress and mental health issues<sup>6</sup> (Lima et al., 2020). In many countries, these constraints and difficult living conditions are compounded by the social stigma surrounding humans experiencing homelessness (Belcher and DeForge, 2012; Eisenmann and Origanti, 2021). This makes people experiencing homelessness a particularly marginalized group (European Commission, 2020).

Combating homelessness is a complex, multifaceted societal challenge that can only be tackled only through a concerted social and political effort (Brown et al., 2009; Caulier-Grice et al., 2012). The EU has already recognized the need to act, and many countries have set targets to end homelessness by 2030 (Yakimova, 2020). In addition to efforts at the political level, several aid organizations and institutions support people in this difficult situation. The assistance offered is diverse, spanning from Housing First approaches to acute emergency assistance and digital support (Kempfert et al., 2022; Ly and Latimer, 2015; Mackie et al., 2019).

An emerging field of research that deals with addressing societal challenges through information and communication technologies (ICT) is the field of digital social innovation

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<sup>5</sup> Different statistics are currently used to show how many people experience homelessness. This is due to a range of factors, such as different definitions of who is considered homeless and also the fact that people may be hidden homeless (Busch-Geertsema et al., 2016; Pleace, 2016).

<sup>6</sup> It should be noted that the relationship between homelessness and health should be viewed as complex (Ranmal et al., 2021).

(DSI) (Bria et al., 2015; Qureshi et al., 2021). DSI researchers continue the tradition of pursuing the goal of making the “world a better place”, which is also mentioned in social-informatics (Rohde et al., 2022). In the DSI field, DSI applications are either viewed analytically from the outside or proactively shaped by researchers and their project teams. Researchers tend to conduct analytical studies rather than proactive ones. This observation was ascertained through an analysis of the research perspectives applied in the referenced studies of the DSI overview study of Qureshi et al. (2021).

The design of DSIs varies according to the contexts and objectives (Eckhardt et al., 2021; Terstriep et al., 2020), and DSI goals are often oriented toward the SDGs e.g. the reduction of inequalities (Qureshi et al., 2021). It is important to emphasize that DSI should be seen as a contribution to addressing societal challenges but not an overall solution (Morozov, 2014; Tracey and Stott, 2017).

The design and development of DSIs are associated with great responsibility, as they can have a profound impact on the living conditions of individuals and their environments. This is especially important when working with marginalized individuals (German Informatics Society, 2018; Hota et al., 2023; World Medical Association, 2022). However, while researchers in the DSI field are increasingly becoming aware of the social responsibility that comes with their work, Qureshi et al. (2021, p. 647) still find that “research on ethical dilemmas inherent in engaging with marginali[z]ed communities [...] has been lacking.” To close this research gap, it is consequently necessary to account more strongly for ethical issues, such as value conflicts and ethical dilemmas, that may arise among stakeholders during the development or use of such technologies (Gebken, Drews, Schirmer, 2021; Qureshi et al., 2021).

As DSI research does not yet adequately address ethical issues (Qureshi et al., 2021), the research field of value sensitive design (VSD) could alleviate this (Friedman and Hendry, 2019). VSD offers methods for taking into account the values<sup>7</sup> of various direct and indirect stakeholders (Friedman and Hendry, 2019). In particular, the entanglement between stakeholders and values needs to be addressed to ensure that ethical issues can be detected, addressed, and hopefully even resolved.

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<sup>7</sup> Here, my understanding of value is something that “is important to people in their lives, with [a] focus on ethics and morality” (Friedman and Hendry, 2019, p. 24).

The connection between the multidisciplinary fields of DSI and VSD has not yet been explored to any great extent. Therefore, this dissertation aims to contribute to the connection by using a proactive design-oriented approach called action design research (ADR) (Sein et al., 2011) from information systems (IS) research to illuminate this connection, based on the example of a specific project. To strengthen the knowledge derived from the specific ADR project, phenomenon-driven research (PDR) is additionally employed (Raabe et al., 2021).

The specific project in this case is OpenStreetPay. The OpenStreetPay team, whose co-initiator I am, aims to enable digital donations to and payments for humans experiencing homelessness, thereby addressing the problem of humans experiencing homelessness facing additional difficulties in an increasingly cashless society. The initiative is intended to start where (in Germany) existing institutional solidarity seems to fail and to help people who feel little heard in society and who lack the digital means to pay.

Through my involvement in the creation of OpenStreetPay, I have contributed to research and practice at the same time. The design process of the DSI application can be viewed as a form of informed activism (Taylor, 2023).

## 1.2 Research Aims and Questions

This dissertation aims to acquire phenomenon- and design-oriented knowledge about value-sensitive developed and designed DSI applications that cater to marginalized individuals, particularly humans experiencing homelessness. Along with the design of the DSI application itself, the (research) procedure, reflection, evaluation, and future direction, are examined in more detail. Thereby, special attention is paid to including values and VSD.

To achieve this aim, I have contributed seven publications that deal with different research questions (RQs). For the summary of my cumulative dissertation, I have reflected on my research journey (see Chapter 5) and research contributions (see Chapter 7). The reflection comprised among others consolidating and refining the RQs addressed in the respective publications (see Table 1.1). Table 1.1 shows the overarching research aims with the reflected RQs and the corresponding papers. In addition, symbols and colors for the respective RQs and research aims are introduced in Table 1.1 and used throughout this dissertation.

The **first aim** of this dissertation is to examine why DSI applications should be designed in a value-sensitive way, especially if they address marginalized individuals. The first RQ expresses this aim:

*RQ 1: Why should DSI for marginalized individuals be designed in a value-sensitive way? (see Table 1.1)*

This question arose early in the context of OpenStreetPay through an acceptance test with various stakeholders. The test revealed various value conflicts as well as prejudices toward the target group of humans experiencing homelessness (as a marginalized group), which the OpenStreetPay team had to address. The OpenStreetPay team dealt with the value conflicts and prejudices by developing our own understanding of values and revising the concept on the basis of these values. In this manner, the importance of values was implicitly argued by the progress of the OpenStreetPay project (see Table 1.1, Paper 1, Gebken, Drews, Schirmer (2021)). In the second publication, my co-authors and I substantiated this need by analyzing how values are inscribed at different levels of DSI ecosystems using the example of OpenStreetPay. This clarified the importance of values and VSD for DSI projects (cf. Table 1.1, Paper 2, Gebken, Kurtz et al. (2021)). In Paper 6<sup>8</sup>, my co-authors and I explicitly addressed the question of why DSI applications, particularly those for marginalized individuals, should be intentionally designed with value sensitivity to reflect the implicit assumptions of the previous publications. In this paper, knowledge from the literature and the ADR project was among others translated into a definition of value-sensitive DSI applications (see Table 1.1, Paper 6, Gebken, Schirmer et al. (2023)).

The **second aim** of this dissertation is to elaborate design principles for value-sensitive DSI applications for marginalized individuals using the example of humans experiencing homelessness. Thus, the RQ that guides this aim is as follows:

*RQ 2: How can value-sensitive DSI for marginalized individuals (using the example of humans experiencing homelessness) be designed? (see Table 1.1)*

The research process of the ADR project was also inspired by the practice of OpenStreetPay, with the aim of investigating in more detail how a concept for digital donations and payments for humans experiencing homelessness could be designed. During the research process, my co-authors and I abstracted the findings of the concept design in the form of design principles for value-sensitive DSI applications for humans experiencing homelessness (see Table 1.1, Paper 1, Gebken, Drews, Schirmer (2021)). However, since the design principles were developed using only one value-sensitive DSI application as an example, my co-authors and I

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<sup>8</sup> The papers have been numbered in chronological order to correspond with the writing and revision sequence.



proceeded to examine how other teams have implemented DSI applications for humans experiencing homelessness. Accordingly, we revised the design principles in two further iterations and generalized them with an help of the analysis of 118 DSI applications (see Table 1.1, Paper 4, Kempfert et al. (2022)).

In the course of developing and accompanying the value-sensitive DSI project OpenStreetPay, it became clear that the research and design methods needed to be strengthened (Keijzer-Broers and Reuver, 2016; Komatsu et al., 2016; Winkler and Spiekermann, 2018). Therefore, the **third goal** is to improve methods for value-sensitive DSI application design and research leading to the following RQ:

*RQ 3: How can research and design methods (be extended to) support the development of value-sensitive DSI? (see Table 1.1)*

On the one hand, the dissertation's approach was reflected upon to expand the ADR method to encompass value-sensitive aspects (see Table 1.1, Paper 7, Gebken, Jacobs et al. (2023)). On the other hand, the focus was on the design methods of multidisciplinary teams, such as the OpenStreetPay team. This led to design principles for the selection and adaptation of design methods for value-sensitive DSI teams (see Table 1.1, Paper 3, Gebken et al. (2022)).

To properly fulfill the responsibility associated with working on a DSI application, it is vital not only to proceed appropriately but also to continuously reflect on and evaluate what influence value-sensitive DSI applications have or may have in the future (Friedman and Hendry, 2019). Therefore, the **fourth objective** is to explore how the societal impact of value-sensitive DSI applications can be reflected and evaluated, leading to the following RQ:

*RQ 4: How can the societal impact of a value-sensitive DSI in accordance with its pursued values be reflected and evaluated? (see Table 1.1)*

My co-authors and I used insights from service science to develop a multilevel framework for value-sensitive DSI applications and ecosystems (see Table 1.1, Paper 2, Gebken, Kurtz et al. (2021)). In addition, we incorporated the learnings from the evaluation with marginalized individuals in the evaluation procedure and the design of a value-sensitive DSI (see Table 1.1, Paper 5, Gebken, Cankaya, Jacobs (2023)).






The **fifth** and final **aim** of this dissertation is to develop a future perspective for research on value-sensitive DSI applications dedicated to supporting marginalized individuals. The

following guiding question addresses this overall aim, which revisits the first RQ and connects it to the other RQs:

*RQ 5: Why and how should DSI for marginalized individuals be designed in a value-sensitive way? (see Table 1.1)*

To this end, the new research field of value-sensitive DSI was coined and shaped with the help of the research agenda (see Table 1.1, Paper 6, Gebken, Schirmer et al. (2023)). This is intended to support (new) researchers entering the field.

**Table 1.1. Research Questions**

Symbol	Research aim	Reflected research question	Reference	Paper no.	Section
	Connection between DSI and VSD research	<b>Why</b> should <b>DSI</b> for marginalized individuals be designed in a <b>value-sensitive way</b> ?	(Gebken, Drews, Schirmer, 2021)	P 1	11
			(Gebken, Kurtz et al., 2021)	P 2	12
			(Gebken, Schirmer et al., 2023)	P 6	A.1
	Design principles for value-sensitive DSI to support humans experiencing homelessness	<b>How</b> can <b>value-sensitive DSI</b> for marginalized individuals (using the example of humans experiencing homelessness) be <b>designed</b> ?	(Gebken, Drews, Schirmer, 2021)	P 1	11
			(Kempfert et al., 2022)	P 4	14
	Value-sensitivity in research and design methods	<b>How</b> can <b>research and design methods</b> (be extended to) support the <b>development of value-sensitive DSI</b> ?	(Gebken, Jacobs et al., 2023)	P 7	A.2
			(Gebken et al., 2022)	P 3	13
	Reflection and evaluation of value-sensitive DSI for marginalized individuals	How can the <b>societal impact</b> of a value-sensitive DSI in accordance with its pursued values be <b>reflected and evaluated</b> ?	(Gebken, Kurtz et al., 2021)	P 2	12
			(Gebken, Cankaya, Jacobs, 2023)	P 5	15
	Research agenda for the new research field of value-sensitive DSI for marginalized individuals	<b>Why and how</b> should <b>DSI</b> for marginalized individuals be designed in a <b>value-sensitive way</b> ?	(Gebken, Schirmer et al., 2023)	P 6	A.1

### **1.3 Thesis Structure**

The summary of this cumulative dissertation covers Chapter 1 to 1. The papers can be found from Chapter 11 onwards and are summarized in Table 1.1.

After this introduction, which includes the motivation for the work, the research aims, the RQs, and the structure of the thesis, Chapter 2 presents the related research and theoretical foundations, including DSI, VSD, and a research focus on marginalized individuals. Chapter 3 follows with a description of the OpenStreetPay project. The research approach of this dissertation is highlighted in Chapter 4. In this chapter, the fundamentals of ADR are explained, the stages and iterations of ADR are described in detail and related to this project, and the roles of ADR researchers in their different teams are discussed. The chapter concludes with an overview and brief description of the research methods used. Chapter 5 is a reflection on the research journey along the ADR iterations and the RQ and research aims from Chapter 1, Section 1.2. It highlights the impulses from the project and multidisciplinary research and how these influenced the developmental pathway of the RQs. Chapter 6 provides an overview of the publications, where I summarize the core information of the respective publications in table form. In Chapter 7, I show the core contributions to the research of this dissertation, on the one hand in line with the RQs and research aims and on the other hand in a superordinate manner. Chapter 8 contains the practical contributions of this dissertation. The limitations of this work are highlighted in Chapter 9, and Chapter 1 concludes with an outlook for future research.

## **2 Related Research and Theoretical Foundations**

In this chapter, I outline the related research and theoretical foundations of this dissertation. I draw on the results of DSI research, discuss VSD as a theoretical framework, describe what is meant by the term marginalized individuals, and, in particular, how homelessness affects human beings.

Throughout the dissertation, further research fields are referred to, such as service science and ecosystem architectures. The relevant basics are discussed in more detail in the individual papers.

As terms were defined throughout the research process of this thesis, various terminologies were utilized in the papers. Therefore, I have unified them for the summary of this dissertation:

- Humans experiencing homelessness for homeless neighbors or homeless individuals
- Marginalized people/individuals for vulnerable people or marginalized groups
- Value-sensitive decision log for vsDLog or Decision Log
- Value-sensitive for value-oriented or human value-oriented
- Value-sensitive DSI for value-oriented or VS DSI

### **2.1 Digital Social Innovation**

DSI is a multidisciplinary research field that is gaining prominence in IS research (Buck et al., 2020; Qureshi et al., 2021). DSI applications aim to contribute to the SDGs (Bria et al., 2015). However, the IS research contribution to the SDGs remains limited so far. Leong et al. (2020) examined the extent to which research papers from the IS field contribute to the SDGs. The study identified only 58 papers that conduced to the SDGs, with only three of them addressing poverty. Therefore, at the outset of my research, I examined fields beyond IS research.

During my research, it became evident that a variety of different terms for DSI encompassing similar or identical content and goals exists (Rodrigo et al., 2019). Examples are social technologies, tech for good, social innovation, digital technologies for/in social innovation, and ICT for development (Qureshi et al., 2021; Rodrigo et al., 2019). In a broader perspective, socio-informatics, an interdisciplinary approach stemming from computer science with an (initial) focus on computer supported cooperative work, human–computer

interaction, action research, and participatory design, should be mentioned here (Rohde et al., 2022; Wulf et al., 2018), with its international institute for socio-informatics founded already in 2000.

A common understanding of the term DSI is not yet available. In their overview, Rodrigo et al. (2019) examine the phenomenon of DSI and analyze different definitions. Since DSI is composed of the three terms *digital*, *social*, and *innovation*, it is critical to consider whether these three areas are covered when comparing the definitions in terms of content and terminology (Rodrigo et al., 2019).

The starting point of most definitions is the *social* innovation field. Therefore, the core of DSI is nudging social change and addressing societal challenges (Qureshi et al., 2021; Rodrigo et al., 2019). To address a societal challenge, an *innovation* can be designed in very different ways and forms e.g., as a model, process, solution, practice, product, service, etc. (Rodrigo et al., 2019). As a *digital* element, ICT is often seen as a means of contributing to societal challenges (Rodrigo et al., 2019).

One definition that covers the three above-mentioned DSI areas is the widely used definition by Bria et al. (2015, p. 9). Therefore, I draw on their definition, in which a DSI is ...

*... a type of social and collaborative innovation in which innovators, users, and communities collaborate using digital technologies to co-create knowledge and solutions for a wide range of social needs and at a scale and speed that was unimaginable before the rise of the Internet."*

The social needs that DSIs address are diverse. The SDGs are often drawn on in the DSI literature to describe the diversity of the different goals that can be addressed in DSI projects (Eckhardt et al., 2016; Leong et al., 2020; Qureshi et al., 2021). DSI examples that support marginalized individuals range from applications presenting meaningful collected information for humans experiencing homelessness to applications enabling blind or blind-deaf people to use public transport or improve their access (Azenkot et al., 2011; Burrows, Mendoza et al., 2019).

Although DSIs contribute to societal problems, it should be noted that they do not offer comprehensive solutions to complex societal problems. The belief that technology can simply solve such complex problems is known as solutionism (Morozov, 2014; Terstriep et al., 2020). For example, it is crucial to recognize that while a DSI application may provide

important information for humans experiencing homelessness, it does not address the root cause of homelessness or change an individual's housing situation (Burrows, Mendoza et al., 2019; Kempfert et al., 2022). Changing this complex social problem requires social and political efforts, such as the implementation of Housing First projects (Ly and Latimer, 2015).

In addition to the assumption of solutionism, further ethical challenges may arise in the development of a DSI. Even if a DSI aims to contribute to the SDGs and improve well-being, there is a risk of neglecting ethical issues by assuming that only the desire to do good leads to positive effects on individuals and society (Bhatt, 2021; Qureshi et al., 2021). Ethical issues include, for example, value conflicts and ethical dilemmas (Friedman and Hendry, 2019; Hota et al., 2023). These ethical issues can arise, for example, due to different needs within the stakeholder group or between different stakeholder groups (Whittle et al., 2020).

The importance of considering ethical issues is particularly evident in DSIs designed to support the needs of marginalized people (Hota et al., 2023). Ignoring ethical issues can, for example, lead to security risks for marginalized people, as they are vulnerable to persecution due to their lack of privacy protection. These safety risks may be so serious for marginalized individuals that they decide not to collaborate in the research and development process (Whittle et al., 2020). Additionally, failure to address these ethical issues may have a harmful impact on DSI users or contribute to discrimination (Kempfert et al., 2022).

Therefore, there is a need for reflection on ethical issues and proactive engagement with, for example, value conflicts in the DSI development process (Friedman and Hendry, 2019; Hota et al., 2023; Qureshi et al., 2021; Simon, 2016). This makes it possible to address the needs of different stakeholders, especially those of marginalized people.

One area of research dealing with ethical issues, such as ethical dilemmas and value conflicts, is VSD (Friedman, 1996; Friedman and Hendry, 2019). It has become clear that "VSD offers a well-tested methodology stressing stakeholder involvement and an acknowledgment of societal values that can be employed to support responsibility in technology design" (Simon, 2016, p. 15). Thus, as part of my dissertation, I utilized VSD to responsibly design and develop of a DSI application, thus aiming to make the research field of DSI more responsible overall and to lay the foundations for a dedicated research field of value-sensitive DSI.

## 2.2 Value Sensitive Design

VSD represents an approach that focuses particularly on ethical issues and the long-term impact of technology on all living beings and society (Friedman and Hendry, 2019). VSD has many related approaches that resemble it or have similar goals (Simon, 2016), such as values in design (Knobel and Bowker, 2011) and values at play (Nissenbaum, 2005). In my work, I focus specifically on VSD, which has received a lot of attention from scholars working on values and technologies.

VSD can be used in any sociotechnical context (Friedman and Hendry, 2019). Examples range from informed consent online (Friedman et al., 2000) to support for people with disabilities (Azenkot et al., 2011) and assistance for young people experiencing homelessness (Woelfer et al., 2011; Woelfer, 2014; Woelfer and Hendry, 2009).

Friedman and Hendry (2019, pp. 3–4) define VSD as follows:

*VSD seeks to guide the shape of being with technology. It positions researchers, engineers, policy makers, and anyone working at the intersection of technology and society to make insightful investigations into technology innovation in ways that foreground the well-being of human beings and the natural world. Specifically, it provides theory, method, and practice to account for human values in a principled and systematic manner throughout the technical design process.”*

From a VSD viewpoint, values are often implicitly inscribed in ICT; however, to proactively address ethical issues, values should be made explicit in the design process (Friedman and Hendry, 2019). In the design process, values should therefore be explicitly analyzed and discussed (Friedman, 1996).

In VSD (as in DSI) projects, human well-being is frequently a target value. However, VSD emphasizes that the scope should also be aligned with the context of a project so that the relevant values are elicited from a wider perspective to avoid focusing on a single value (Friedman and Hendry, 2019; Spiekermann, 2021).

Besides values, value conflicts, and their relationships, other dimensions are vital for VSD: focal technology, stakeholders (human beings and society—human and non-human), and design practices. These dimensions should be harmonized with the values agreed on in a certain project context (Friedman and Hendry, 2019; Friedman and Kahn, 2003).



To adequately address these dimensions, conceptual, technical, and empirical investigations should be conducted (Friedman, 1996), which are described as follows:

- Empirical investigations “*examine the human context in which the technology is situated and, as appropriate, may draw upon the entire range of quantitative and qualitative methods used in social science research*” (Friedman et al., 2017, p. 68)
- Conceptual investigations “*comprise analytic, theoretical, or philosophically informed explorations of the central issues and constructs under investigation*” (Friedman et al., 2017, p. 68)
- Technical investigations “*focus on the technology as the unit of analysis, typically involving retrospective analysis of existing technology or proactive design of new technology*” (Friedman et al., 2017, p. 68)

The investigations should be integrative and iterative, since “no one type of investigation is sufficient on its own; rather all three investigation types are needed to inform and shape each other” (Friedman and Hendry, 2019, p. 35). The content of each investigation is purposely open, and the methodological approach should be chosen according to the project context (Friedman et al., 2017; Friedman and Hendry, 2019). The methodological approaches are diverse; they should be pragmatic and applicable to different forms of investigation (conceptual, empirical, and technical) and to stakeholders or purposes (Friedman et al., 2017; Friedman and Hendry, 2019).

VSD is open to including methods from many disciplines if they are found to be useful in the context of the application and the combination makes sense to the project teams (Friedman and Hendry, 2019). VSD draws on the fields of human–computer interaction, organizational studies, psychology, philosophy, sociology, and software engineering, among others. When appropriate methods are lacking or brought in from other fields, they should be considered in the light of VSD (Friedman and Hendry, 2019). This variety of methods, however, can be overwhelming for newcomers to the field of VSD (Winkler and Spiekermann, 2018).

After more than 20 years of VSD research, it has become apparent that technical investigation in particular has received less attention so far (Gerdes and Frandsen, 2023; Winkler and Spiekermann, 2018). Therefore, technical investigation needs a “more systematic push for the application of Value Sensitive Design” (Chen and Zhu, 2019, p. 9). One task in enhancing technical investigation is to improve the traceability of values (Mougouei et al., 2018; Perera, 2019).

My dissertation aims to contribute to the progress of technical investigation by shaping the proactive design of technologies. This is illustrated through the development of OpenStreetPay as an example. Accordingly, during my research, I began to delve deeper into how the rich results of the conceptual and empirical investigation could be suitably integrated into the proactive technical investigation of DSI for marginalized individuals. The purpose is to bring together knowledge from the VSD and DSI fields to leverage the strengths of both and enable the development of value-sensitive DSI applications. This knowledge will serve as the foundation for a distinct research field of value-sensitive DSI.

### **2.3 Focus on Marginalized Individuals**

In this dissertation, I deal with combining DSI and VSD for marginalized individuals, especially humans experiencing homelessness. This section addresses the definition of marginalized individuals and what needs to be considered when working with them in research and development. In particular, I focus on the living situations of humans experiencing homelessness.

When I use the term marginalized individuals in this dissertation, I mean humans who are addressed in the following definition of the European Institute for Gender Equality (2016):

*Different groups of people within a given culture, context and history at risk of being subjected to multiple discrimination due to the interplay of different personal characteristics or grounds, such as sex, gender, age, ethnicity, religion or belief, health status, disability, sexual orientation, gender identity, education or income, or living in various geographic localities.”*

According to the definition, individuals face discrimination from the majority society based on personal characteristics or grounds, resulting in prejudice toward them (European Institute for Gender Equality, 2016). Here, discrimination means according to Altman (2020), the relative disadvantage of a person based on personal characteristics or grounds. This discrimination can occur in three ways (*direct, indirect and organizational, institutional, or structural*) (Altman, 2020).

In my dissertation, I deal with humans experiencing homelessness as a group of marginalized individuals. Therefore, in the following I describe aspects of their living situation and the social context in which I conducted my research.

Homelessness constitutes a major worldwide challenge. It represents a so-called wicked problem, meaning a complex, multifaceted social problem that can only be overcome through broad social and political efforts (Brown et al., 2009; Caulier-Grice et al., 2012). A lack of adequate housing is associated with a number of challenges, such as “a lack of [...] a sense of security, stability, privacy, safety and the ability to control living space” (Humphry, 2019, p. 9). Life in unstable conditions can negatively impact one or more of the social, physical, and safety spheres (Busch-Geertsema et al., 2016; Casey and Stazen, 2021). In addition, inadequate housing and poverty can cause increased stress levels and mental health problems (Lima et al., 2020). However, the relationship between homelessness and health can be seen as complex (Ranmal et al., 2021).

The conditions and difficult living circumstances of humans experiencing homelessness are compounded in many countries by the social stigma. Humans experiencing homelessness frequently experience victim blaming, meaning, that homelessness is seen as a personal failing rather than an institutional problem (Belcher and DeForge, 2012; Eisenmann and Origanti, 2021). These different aspects make people experiencing homelessness a particularly marginalized—and stigmatized—group (European Commission, 2020).

The urgent need to create change has already been acknowledged, for example, by the EU. The EU countries have set a goal to end homelessness by 2030 (Yakimova, 2020). Apart from political efforts, many aid organizations and institutions support people in this difficult situation. The assistance provided varies from Housing First approaches and acute emergency assistance to digital support (Gebken, Drews, Schirmer, 2021; Ly and Latimer, 2015; Mackie et al., 2019). The focus of this dissertation is on digital support.

To counteract a widespread prejudice right at the beginning of the dissertation, which arises when talking about digital technologies and humans experiencing homelessness, there is no evidence of a digital divide (Rhoades et al., 2017). On the contrary, humans experiencing homelessness use digital technologies similarly to the remaining population but in specific life circumstances (Friedman and Hendry, 2019). To emphasize the special living circumstances, I would like to quote Viljo, who has experienced homelessness: “But how are you supposed to organize your life if you only live from day to day and have to constantly worry about where you’re going to sleep next?” (quoted in Gilbert, 2022).

To address the specific life circumstances appropriately, my goal in this dissertation is to investigate how value-sensitive DSI applications need to be developed to meet the needs of

humans experiencing homelessness. The consideration of needs should not be limited solely to the design features of the value-sensitive DSI application but also to the responsible research and development process itself. To facilitate this, other research fields, such as participatory design and research ethics are drawn upon, in addition to the research on VSD and DSI (Aldridge, 2019; Chowdhury, 2022; German Informatics Society, 2018; World Medical Association, 2022).

### **3 OpenStreetPay: A Value-Sensitive Digital Social Innovation Project to Support Humans Experiencing Homelessness**

In the context of this dissertation, I accompanied and co-designed the OpenStreetPay project as part of the OpenStreetPay team and the research teams. The OpenStreetPay team developed a value-sensitive DSI concept. In the following, discuss (1) the development of the OpenStreetPay team over time and its funding, (2) the OpenStreetPay concept and its changes over time, and (3) the values of the OpenStreetPay team.

#### *(1) Development of the OpenStreetPay Team Over Time and its Funding*

The OpenStreetPay team first met in the federal government's *#wirvsvirus* hackathon in 2020<sup>9</sup> (Mair et al., 2021) and has been working mainly voluntarily ever since. Over the course of the project, OpenStreetPay has been part of various innovation funding programs that provide both financial and nonmaterial coaching services. At the beginning, the OpenStreetPay team was part of the German government's *#wirvsvirus* hackathon and then active in the *SolutionEnabler* implementation program (Mair et al., 2021). Once the team became stabler, it applied for financial support from *Calls for Transfer*, a smaller innovation support program of the Hamburg universities (Post et al., 2024). In addition, the project received nonmaterial support from the *Wirkungsbooster Akademie* from mid-2023 to the end of 2023 to strengthen the impact of the project and make it measurable (Geier and Gruber, 2023).

Thanks to a grant from Calls For Transfer (a Hamburg Innovation program), it was possible to hire a research assistant. The team size varied over time between three and fifteen members. The OpenStreetPay project was shaped by the characteristics of its context. The project is a grassroots initiative and has had to deal with limited resources (time, people, and resources) like many other DSI teams (Eckhardt et al., 2017). Thereby, the grassroots team seeks to tackle societal challenges from bottom-up (Weibert et al., 2021).

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<sup>9</sup> The national *#wirvsvirus* hackathon aimed to address societal challenges, particularly those that arose from the COVID-19 pandemic.

## (2) *OpenStreetPay Concept and its Changes Over Time*

The value-sensitive DSI concept of OpenStreetPay has changed and evolved over the years. The functionality described below differs from the original formulation in the first paper (Gebken, Drews, Schirmer, 2021). The changes came about through a better understanding of the stakeholders and the DSI ecosystem.

In the following paragraphs, I illustrate the current concept and describe how the concept has changed compared to the first paper and the OpenStreetPay team's understanding of values.

The idea of the OpenStreetPay team is to support humans experiencing homelessness in their everyday lives through the development and implementation of a digital donation and payment system (see Figure 3.1). The OpenStreetPay team wants to help humans who have fallen through the cracks of the social support system in Germany by developing a new (temporary) type of institutional solidarity (Gebken et al., 2022, 2021; Gebken, Kurtz et al., 2021).

After several iterations, the concept consists of the possibility to donate digitally (*SmallChangeApp*) and the possibility to pay digitally (*SmallChangeCard*).

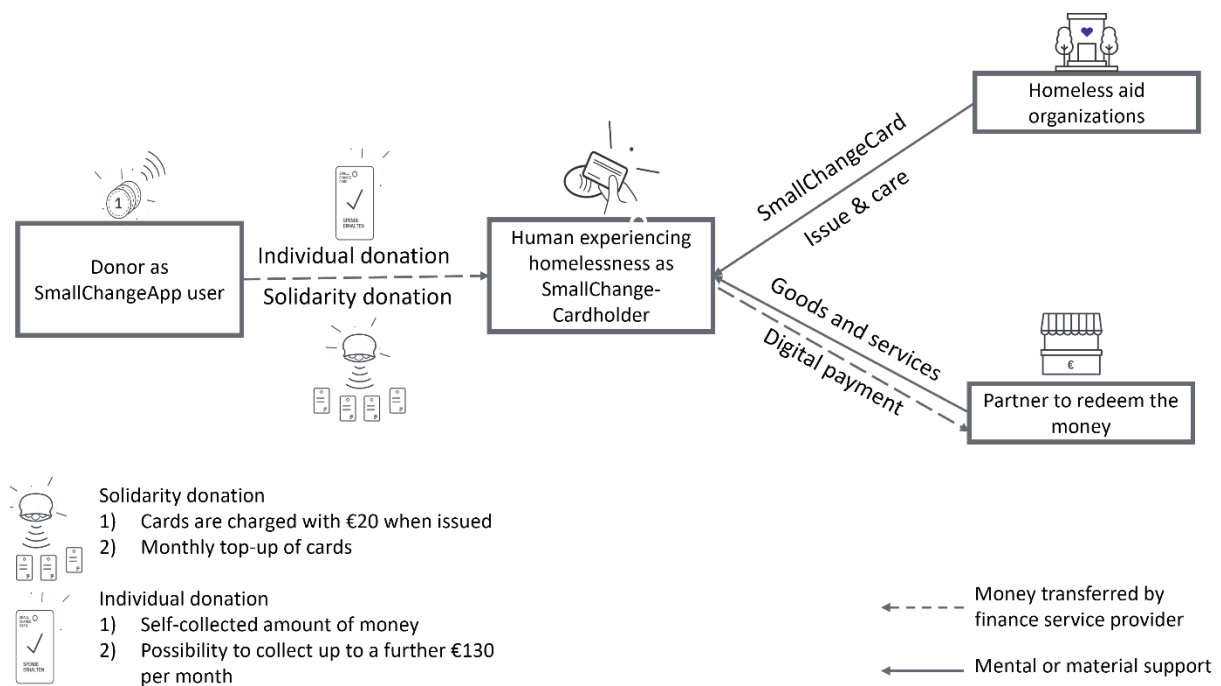
*Donors* can send donations with the *SmallChangeApp* (see Figure 3.1). Donors can decide whether they want to donate individually to one person (*individual donation*) or collectively to all *SmallChangeCard* holders (*solidarity donation*). Donors decide how much to donate.

*Humans experiencing homelessness* can collect donations with the *SmallChangeCard*, or donations are collected for them via the solidarity donation option (see Figure 3.1). Every month, the card is topped up with €20 via the solidarity pot. The cardholder can collect another €130 on their own. They obtain the card from *aid organizations* with which OpenStreetPay cooperates (see Figure 3.1). With the help of the card, the holders can buy products and services in different *shops* (see Figure 3.1). The choice of products and services is left entirely up to the cardholder. The *SmallChangeCard* should be unobtrusively designed and have the same functions as a bank card. This is vital so that holders are not stigmatized because of having the *SmallChangeCard* (Gebken, Cankaya, Jacobs, 2023). In addition, they need to be able to check the amount of money on their cards.

In the first concept and paper, payment was intended to be enabled by a *MerchantApp* (Gebken, Drews, Schirmer, 2021). However, when tested in a real-life scenario with humans experiencing homelessness, it became apparent that a form of payment that distinguishes

them from other customers and thus gives an indication of their living situation could to stigmatization. Therefore, the design of the SmallChangeCard is also important, and it should not be too conspicuous and should function in the same way as a bank card (Gebken, Cankaya, Jacobs, 2023). During the evaluation with individuals experiencing homelessness, one participant expressed concern that employees may treat them differently if they are identified as homeless while using the SmallChangeCard, even if business owners support the initiative. It is important to consider this potential risk when implementing the OpenStreetPay project (Gebken, Cankaya, Jacobs, 2023).

At the time of submitting the dissertation, the project team is still seeking for a financial service provider to support the project with its system so that there is no difference in the digital payment process. Establishing this concept without the support of a financial service provider exceeds the capacities of a volunteer grassroots project because of, for example, a variety of legal conditions. Finding a financial service provider will be critical for the project’s long-term establishment and success.



**Figure 3.1. Digital Donation Concept after Several Iterations (adapted from Gebken, Drews, Schirmer (2021))**

### (3) Values of the OpenStreetPay Team

The work and actions of OpenStreetPay are based on the 10 core values illustrated in Table 3.1 (Gebken, Drews, Schirmer, 2021). As OpenStreetPay team, we defined these at the beginning of the project, as we identified (value) conflicts in the needs of the respective stakeholders. For example, we aim to proactively counteract existing prejudices in society and not inscribe them in our value-sensitive DSI concept (Gebken, Drews, Schirmer, 2021). In doing so, we focus on the well-being of humans experiencing homelessness and consider their needs (Burrows, Mendoza et al., 2019).

**Table 3.1. Core Values of OpenStreetPay (Gebken, Drews, Schirmer, 2021)**

#	Value
1	<b>Be human.</b> In everything we do[,] we do it out of humanity and with passion.
2	<b>Respect dignity.</b> We treat each other, our partners, and each of our [humans experiencing homelessness] with respect. Without exception.
3	<b>Reach out.</b> Small amounts of money make everyday life easier for [humans experiencing homelessness]. We enable self-responsible care.
4	<b>Enable solidarity and individuality.</b> We help with a monthly fixed amount and enable the collection of individual donations. We do not replace any help.
5	<b>Give perspectives.</b> Nobody should have to live permanently on the street. We try to [provide humans experiencing homelessness with] a sustainable way out of need.
6	<b>Be straightforward.</b> Help that reaches out to everyone is the best help. Therefore, OpenStreetPay shall be easy to use.
7	<b>Show transparency.</b> We treat each other fairly and squarely and communicate in this way.
8	<b>Joined forces.</b> We work together instead of against each other [w]ith partners who share our values.
9	<b>Be secure.</b> The security of all data of our donors and [humans experiencing homelessness] is important to us. That's why we protect them.
10	<b>Take responsibility.</b> We are aware that our donors, partners, and [humans experiencing homelessness] trust us. We question ourselves and OpenStreetPay.



## **4 Research Approach**

The main contribution of this dissertation stems from the ADR project that accompanied and shaped the OpenStreetPay project's design and development. Thereby, I am actively involved in the development process of OpenStreetPay and realize the link between "action" and "reflection" of the ADR and the value-sensitive DSI project. This involves the use of a variety of research methods. For the generalization of knowledge, the ADR approach is complemented with descriptive knowledge from the PDR.

In Section 4.1, I discuss the overarching research frame of ADR. I first briefly explain the fundamentals of the ADR approach. Then, I describe the basics of the ADR stages and how I implemented them in my dissertation. Next, I demonstrate how my co-authors and I utilized PDR knowledge to generalize our findings in the fourth stage of ADR. The section concludes with a description of the roles of the researchers and the project participants. In Section 4.2, I introduce the different applied research methods.

Detailed insight into the impulses from the research and the project can be found in a separately described research journey (see Chapter 5). The results of this research approach are illustrated in the theoretical contributions (see Chapter 7) and practical contributions (see Chapter 8).

### **4.1 Action Design Research**

#### **4.1.1 Introduction to Societal-Driven Action Design Research**

ADR originated from the need to prioritize organizational relevance over technological rigor (Sein et al., 2011). ADR researchers aim to have a real impact on practice-inspired problems in a particular (organizational) context through the involvement and anchoring of the research (Cronholm et al., 2016). Living up to the claim of having a real impact and contributing to the identified problem, the researchers iteratively go through the stages of ADR, aiming to develop an artifact and intervene with it (Sein et al., 2011).

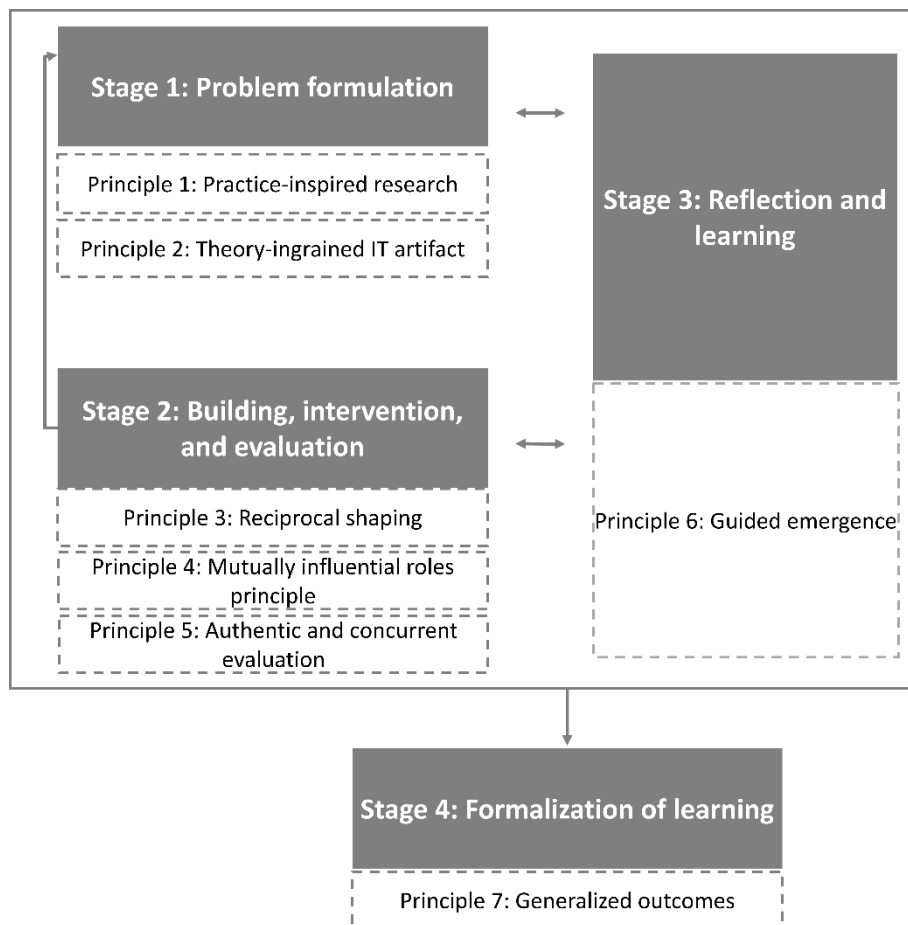
Keijzer-Broers and Reuver (2016) highlight that DSI research, as pursued in this dissertation, can be shaped as ADR. In addition, they draw attention to the fact that the classical focus of ADR research is either IT-dominant or organization-dominant. Hence, they propose complementing IT-dominant and organization-dominant research with societal-driven research to adequately address societal challenges and utilizing ADR for this purpose.

In my research, I applied the ADR approach to accompany the DSI project OpenStreetPay, which became a value-sensitive DSI project over time. From its beginning, my research was societal-driven, similar to Keijzer-Broers and Reuver (2016).

During the research, it became apparent that societal-driven research prompted the need to incorporate special features into the design of the ADR approach. My co-authors and I dedicated a publication to these alterations, such as reflecting the ethical impact of the RQ(s) and societal needs and understanding stakeholder values (Gebken, Jacobs et al., 2023). In the theoretical contribution, I briefly illustrate the alterations (see Chapter 7, Subsection 7.1.3).

#### 4.1.2 Stages and Iterations of the Action Design Research Project

In this dissertation, I follow the ADR process in terms of its stages. The four stages comprise the following: (1) problem formulation, (2) building, intervention, and evaluation (BIE), (3) reflection and learning, and (4) formalization of learning (see Figure 4.1). These stages are conducted iteratively, as is the entire ADR process (Sein et al., 2011). Details of the stages can be found in Subsections 4.1.2.1–4.1.2.4.



**Figure 4.1. Action Design Research Stages and Principles (Sein et al., 2011, p. 41)**

My co-authors<sup>10</sup>, my value-sensitive team, and I went through the ADR cycle for three iterations. Within each three iterations, the four ADR stages were passed through iteratively.

During these iterations, the different teams achieved various findings for both our OpenStreetPay project and our research. To mirror this double contribution and combine and outline the respective main value-sensitive DSI project phase with the major research results of this phase, I have named the iterations accordingly. The title consists of the main DSI project phase (first part of the title) and its major research result (second part of the title):

- Iteration 1: Creation of a DSI initiative – Impetus for value sensitivity in DSI research
- Iteration 2: Stabilization with a variety of tasks – Design and reflection of value-sensitive DSI applications
- Iteration 3: Roll-out problems and evaluation – Reflection on the value-sensitive research approach and related research fields

The next four subsections explain the four stages of ADR in general and how they were carried out in this dissertation. Elaborate explanations of the specific iterations can be found in their corresponding publications.

#### *4.1.2.1 Problem Formulation*

The first stage is to examine the practice-inspired and theory-driven problem in more detail and determine what needs to be researched according to Principles 1 and 2 of the ADR approach (Sein et al., 2011).

The origin of the research comes from practice (Sein et al., 2011), which in this dissertation is a societal problem. The societal problem being focused on is homelessness. The development of this idea of helping humans experiencing homelessness and the digital donation system is being carried out by the value-sensitive DSI team of OpenStreetPay, while the research teams are responsible for theoretically embedding the problem in the fields of DSI, VSD as well as in the work with marginalized individuals.

The examination of the problem takes place iteratively and is repeatedly sharpened and revised (Sein et al., 2011; Simonsen, 2009). Individual subproblems are considered in the respective papers of this cumulative dissertation. Chapter 5 outlines the research journey,

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<sup>10</sup> Several researchers from the fields of IS and computer ethics supported me in writing the different papers. The team's composition varied based on the need for specialist expertise for a certain topic of the multidisciplinary field of value-sensitive DSI research.

including the development path of the (sub)problem formulation and, therefore, the corresponding RQs.

Various research methods were used to explore the problem area. In particular, interviews (see Section 4.2.4), literature analysis (see Section 4.2.1), and the first survey (see Section 4.2.3) helped sharpen the research interest.

#### *4.1.2.2 Building, Intervention, and Evaluation*

In the second stage, building, intervention and evaluation (BIE), researchers develop artifacts together with practitioners. These artifacts will be continuously revised, evaluated, and strengthened, in particular through the involvement of different stakeholders (Sein et al., 2011).

The principles of this ADR stage are reciprocal shaping of the artifact (Principle 3), integration of the mutually influential roles (Principle 4), and con-current evaluation of the results (Principle 5) (Sein et al., 2011).

Throughout this stage, different artifacts were produced in each of the three iterations conducted in this dissertation. The artifacts covered the concept, including customer journeys and service blueprints, as well as an initial prototype and improved versions of OpenStreetPay's digital donation system.

A special characteristic of this ADR approach at the BIE stage is context-sensitive work with marginalized individuals. To develop the artifacts, my OpenStreetPay team, the research teams and I used interviews and focus groups (see Section 4.2.4) and surveys (see Section 4.2.3) to incorporate and embed the diverse stakeholder perspectives of the value-sensitive DSI ecosystem. As a value-sensitive DSI team we documented our work using protocols and a value-sensitive decision log (see Section 4.2.2). Furthermore, knowledge for the development of the artifacts was obtained through both a literature review (see Section 4.2.1), and document analysis (see Section 4.2.2). The document analysis, in particular, provided PDR knowledge about the design of other DSI applications for humans experiencing homelessness (Kempfert et al., 2022).

#### *4.1.2.3 Reflection and Learning*

Reflecting on the learning in ADR projects is an essential part of facilitating problem-solving for other instances of the same class (Sein et al., 2011). Stage three aims to allow researchers

to reflect on the process and artifacts developed and to draw initial lessons. This takes place in parallel with stages one and two (Sein et al., 2011). The aim is to reflect on the design and redesign that emerged during the value-sensitive DSI project, to evaluate existing principles from research for the class of problems, and to reflect on the results with regard to the goals originally set (Principle 6) (Sein et al., 2011). I collaborated with my co-authors to reflect on the design of the value-sensitive DSI application and on the design and research approach of the value-sensitive DSI and research teams.

Since the reflection and learning stage of the ADR project is described very openly in Sein et al. (2011), I developed my own approach for this stage. This was necessary, as I acted as the liaison between the various research teams and the OpenStreetPay project, and it was my responsibility to assemble the individual parts and pieces. Therefore, I brought together insights from the daily value-sensitive DSI project activities and the explicit design of the value-sensitive DSI concept and prototype, as well as knowledge from the individual research findings from design- and phenomenon-based research. Thus, my aim was to stimulate reflection by enhancing exchanges about the manifold insights from the value-sensitive DSI project and from the different research teams. Hence, this approach supports both a creative research process (Monteiro et al., 2023) and simultaneous documentation of reflections and learning.

The means by which this exchange was realized is a collaboration board. We used the collaboration board Miro. Here, I gathered the growing parts and pieces from the project and the research process. For each sub-research problem (i.e., each RQ), I created an area on the board, which I initially filled with insights from the empirical work of the OpenStreetPay project in the form of notes about the surveys, interviews, and focus groups, as well as the document analysis. With the help of the literature, I then categorized or amplified them.

Step-by-step, this empirically informed action was enhanced by research findings. In consultation and regular coordination rounds with my co-researchers, in which we consulted the growing knowledge base and shared insights, we reworked the RQs and added findings. In doing this, we used different formats (e.g., illustrations, models, and design principles), which we developed and documented on the collaboration board. The coordination rounds served in particular to gain impulses from the varied specialist expertise of my co-researchers and to collect feedback on the RQs and findings.

During this creative research process with my co-researchers, new questions and ideas for solving these questions continually emerged. I incorporated these questions into my research process by understanding my research agenda as open. Furthermore, while refining the RQs by envisioning the board, I could reflect on its progress. Thereby, I traced the impulses from the discussions, empirical data, and theoretical input that led to revision. This is outlined in Chapter 5 on the research journey (Monteiro et al., 2023; Simonsen, 2009).

#### *4.1.2.4 Formalization of Learning*

Researchers draw on insights from stages one to three to develop generalized outcomes in stage four, the formalization of learning. ADR outcomes tend to be context-specific due to the focus on artifacts from one particular context (Raabe et al., 2023; Sein et al., 2011; Vom Brocke et al., 2020). However, in stage four, the researcher attempts to generalize from the “specific-and-unique” to the “generic-and-abstract” (Sein et al., 2011, p. 44).

The class of problems considered in this dissertation is value-sensitive DSI applications, which aim to support marginalized people, especially humans experiencing homelessness.

During generalization, several different types of knowledge can be developed (Drechsler and Hevner, 2018; Raabe et al., 2021; Vom Brocke et al., 2020). In my dissertation, I differentiate between phenomenon knowledge and design-oriented knowledge (Raabe et al., 2021; Vom Brocke et al., 2020), as follows:

- (1) Knowledge about the phenomenon itself, its context, and related challenges
- (2) Knowledge about the regularities of the phenomenon
- (3) Knowledge about research approaches for understanding and designing for novel phenomena
- (4) Design knowledge to address (parts of) the emerging challenges
- (5) Design entities, such as artifacts, to address a challenge in its entirety

The development of phenomenon and design-oriented knowledge aims to provide the most comprehensive picture possible for the development and research of value-sensitive DSI applications for marginalized people and to counteract existing problems of ADR (e.g., narrow context specificity) (Raabe et al., 2023).

(1) and (2) are phenomenon knowledge and (3)–(5) are design-oriented knowledge (Raabe et al., 2021; Raabe et al., 2023). The theoretical contribution section refers to these knowledge types (KTs) to clarify and categorize the knowledge gained (see Chapter 7). Categorization of

the KTs is also a result of reflection and learning and the formalization of the learning stages and is based on knowledge and cooperation with Raabe et al. (2021) and Raabe et al. (2023).

At this point, I focus exemplarily on developing design principles as a form of formalization. Design principles are KT (4) design knowledge (Raabe et al., 2021; Vom Brocke et al., 2020) and are at the core of the formalization of learning in ADR (Sein et al., 2011). With my co-authors, I have derived three different types of design principles (for the design of value-sensitive DSIs (Gebken, Drews, Schirmer, 2021; Kempfert et al., 2022), for the value-sensitive decision log (Gebken, Jacobs et al., 2023), and for the method selection and adaptation (Gebken et al., 2022)).

The purpose of establishing design principles is to generate design knowledge that was previously implicit and inform future project problem solving (Drechsler and Hevner, 2018; Gregor and Hevner, 2013; Hevner et al., 2019). Chandra Kruse's (2018) and Gregor et al.'s (2020) papers served as guidelines for formulating the design principles. The papers describe the necessary elements to be included in design principles (implementer, goal, user, context, mechanism, and rationale) to provide all the relevant information for other projects (Chandra Kruse, 2018; Gregor et al., 2020).

During the development of the design principles, my co-authors and I identified two outstanding challenges regarding the nature of design principles. First, design principles often stem from one design-oriented project alone rather than incorporating further knowledge (Vom Brocke et al., 2020). This limits their transferability. To address this issue, we incorporated phenomenon knowledge into our approach, utilizing document analysis based on a meta-study of 118 DSI applications (see Subsection 4.2.2) (Raabe et al., 2021; Raabe et al., 2023).

Second, the relationship between design principles and values has not yet been clearly clarified. Specifically, it remains uncertain whether values should be incorporated into design principles, abstracted as design features, or considered in a more comprehensive form (Liu et al., 2016; Liu et al., 2018; Puroo and Wu, 2013; Yetim, 2016). While my dissertation did not fully address this issue, my theoretical contribution picked up this topic and presents the current state of research in this area (see Chapter 7, Subsection 7.2.1.2).

### 4.1.3 Action Design Research Project Roles

The role of the researcher in the ADR context is characterized by special features. In this section, I therefore describe researchers' tasks and describe the context of my research and project work carried out with my teams. Again, the aim is to make the research and design process more transparent (Järveläinen et al., 2022).

ADR research is based on design-oriented research and action research (AR) (Sein et al., 2011). ADR researchers can therefore draw on a wide range of knowledge from both fields (Sein et al., 2011). For example, as the ADR literature does not provide detailed researcher role descriptions, extensive insights from the AR literature can be drawn upon (Simonsen, 2009).

ADR or AR researchers take on proactive and formative roles in the relevant (organizational) context (Cole et al., 2005; Sein et al., 2011). They are actively involved and can be described as engaged researchers (Cole et al., 2005; Mathiassen and Nielsen, 2008). Their aim is to understand, support, and improve the respective context (Mathiassen, 1998). Thereby, they take on responsibility within the project and thus gain firsthand experience from practice (Simonsen, 2009). The knowledge developed is theory-in-practice based knowledge (Simonsen, 2009).

Researchers face the task of setting up ADR projects with various interested stakeholders (Simonsen, 2009). Additionally, researchers must manage the project, which is a time-consuming endeavor, navigate conflicts among the team, and contribute to the outcomes and actions (Simonsen, 2009).

Hence, conducting research and embedding oneself as an ADR researcher can be personally challenging, as the focus is on the project's progress and success, along with ensuring research validity (Simonsen, 2009). To strengthen the validity of the research, the research process should be transparent (Järveläinen et al., 2022; Simonsen, 2009). The approach of Järveläinen et al. (2022) can be used to bring transparency to the research and design process and provide an overview of which results have been developed by which team (research or project team) to be able to trace the development path of both the project and the research.

For the three ADR cycles, I used Järveläinen et al.'s (2022) approach to summarize which activities and outcomes were developed by which team (research or project). With this, I aimed to contribute to the transparency of the design and research process over time and, at



















the same time, show the close interconnections between activities and outcomes from the different teams. Following this aim, I delineate the activities and sub-contributions to the research and the project. This is depicted in Table 4.1 where the columns distinguish the research teams and the value-sensitive DSI team (OpenStreetPay). The ADR iterations can be found in the rows. The iterations are further subdivided according to the content of the papers.

Summarizing Table 4.1 overall, the OpenStreetPay team has strongly driven the concept and prototype development, as well as the collaboration with the different stakeholders (aid organizations, humans experiencing homelessness, shopping facilities, lawyers, donors, and financial service providers). The research teams with the various co-authors helped reflect on the practical knowledge and make it available for other value-sensitive DSI projects. The impulses and findings from the respective teams were incorporated into the work of the other teams. I facilitated the connections between these teams. My role as an ADR researcher was to be the link between the (value-sensitive DSI project) OpenStreetPay team and the various research teams. The parts and pieces from the different teams were shared and documented on the collaboration board (see Subsection 4.1.2.3) and brought to fruition in combination throughout my dissertation.

In my work as an ADR researcher, I also realized that in a concrete project context, researchers face the potential risk that their influence on the research agenda may not be (completely) under their control (Simonsen, 2009). In the context of this dissertation, this led to the emergence of new topics, such as the examination of the method selection and adaptation for value-sensitive DSI. In addition, not only the research focus expanded but also the knowledge gained with regard to value-sensitive DSI. However, it was vital not only to demonstrate this gain in knowledge in the research results but also to take it into account by reflecting on and sharpening the RQs (Monteiro et al., 2023). This reflection and sharpening process is presented in the research journey (see Chapter 5) by highlighting impulses from the multidisciplinary research and the project.

**Table 4.1. Action Design Research Project Members and their Activities in the Design and Research Process**

	OpenStreetPay team (value-sensitive DSI project team)	Research team(s)
<b>Involved members</b>	3–16 team members from different fields	3–11 team members from different fields
<b>Iteration 1: Creation of a DSI initiative – Impetus for value sensitivity in DSI research</b>	<p><i>Paper 1</i> </p> <p>Development of the OpenStreetPay concept and first prototype in the hackathon</p> <p>Empirical survey and project-related evaluation</p> <p>Value development based on empirical data</p> <p>Development of an ecosystem for the DSI</p>	<p><i>Paper 1</i> </p> <p>Empirical survey and evaluation</p> <p>Survey and comparison with other projects</p> <p>Systematic evaluation/recording of the value influence on the project</p> <p>Development of design principles derived on the basis of project knowledge and taking into account VSD and DSI literature and literature from the field of homeless assistance</p>
<b>Iteration 2: Stabilization with a variety of tasks – Design and reflection of value-sensitive DSI applications</b>	<p><i>Paper 2</i> </p> <p>Iterative value-sensitive redesign of the concept and prototype on the basis of the project extension to a DSI ecosystem</p> <p>Development and use of the value-sensitive decision log</p> <hr/> <p><i>Paper 3</i> </p> <p>Selection and adaptation of methods</p> <p>Implementation of the respective methods and preparation of the tasks</p> <hr/> <p><i>Paper 4</i> </p> <p>Iterative value-sensitive redesign of the concept and prototype with input from research on other apps for humans experiencing homelessness from research</p> <p>Expansion of the DSI ecosystem</p>	<p><i>Paper 2</i> </p> <p>Discussion of the influence of values on the DSI and society</p> <p>Development of a multi-level framework for human value-oriented DSI ecosystems</p> <p>Development and evaluation of the value-sensitive decision log</p> <hr/> <p><i>Paper 3</i> </p> <p>Observation and systematic reflection on the tasks and methods used</p> <p>Introduction of known methods from the VSD/DSI/IS areas</p> <p>Development of the design principles for the method selection and adaptation</p> <hr/> <p><i>Paper 4</i> </p> <p>Meta-study of apps for humans experiencing homelessness</p> <p>Self-evaluation based on criteria in the form of a hybrid coding method</p> <p>Contrasting the design principles from the ADR project and meta-study to achieve generalized design principles</p>

	OpenStreetPay team (value-sensitive DSI)	Research team(s)
<b>Iteration 3: Roll-out problems and evaluation – Reflection on the value-sensitive research approach and related research fields</b>	<i>Paper 5</i> 	<i>Paper 5</i> 
	Development of the evaluation criteria	Development of evaluation criteria
	Development of evaluation procedure	Coordination with ethics committee and development of informed consent
	Coding of results and evaluation using creativity techniques	Development of evaluation procedure
	Initial approaches to revising the concept	Derivation of overarching lessons learned for the procedure and value-sensitive DSI applications
	<i>Paper 6</i>  	<i>Paper 6</i>  
	Revision of the impact logic and systematic analysis of the DSI with the help of the Impact Booster Academy and other participating organizations	Development of research agenda based on the experience of the OpenStreetPay team and the literature on VSD, DSI, participatory design, and research ethics guidelines
	Question: Do we still want to go in exactly the same direction?	
	<i>Paper 7</i> 	<i>Paper 7</i> 
	Use of the value-sensitive decision log	Reflection on the value-sensitive decision log
	Iterative value-sensitive redesign of the concept and prototype based on new inputs from different stakeholders	Reflection on the procedure with regard to ADR
		Development of value-sensitive ADR approach

Note. ADR = action design research; DSI = digital social innovation; IS = information systems; VSD = value sensitive design

## **4.2 Research Methods**

Throughout my dissertation, I employed various methods, which I will discuss in the following section. The meaning of the methods for the ADR stages is explained in Subsection 4.1.2. Further details can be found in the respective publications.

### **4.2.1 Literature Search and Analysis**

Literature analyses are essential for building on existing research (Webster and Watson, 2002). In my dissertation, I conducted both unsystematic and systematic literature analyses as the foundation of my work (Brink, 2013). The unsystematic searches were aimed at exploring the research context, while the systematic search provided a more in-depth perspective (Brink, 2013).

The systematic approach of the literature analysis followed Vom Brocke et al.'s (2009) approach. In the first step, the aim of the analysis was defined. In the subsequent step, the terms were conceptualized and grouped. In the third step, a literature search was conducted, refining the search terms progressively over time. For example, the search began with the Boolean search string of “value sensitive design” AND “digital social innovation,” which combined the two main research areas. The search terms were gradually refined based on the RQs. For Paper 1 (Gebken, Drews, Schirmer, 2021), this involved adding “values” and “design principles” to the search terms. For this search, I utilized Google Scholar as the core database. Additionally, I conducted forward and backward searches for the papers I considered particularly relevant for my dissertation, such as the reviews of the research fields of VSD by Friedman and Hendry (2019) and Winkler and Spiekermann (2018) and of DSI by Qureshi et al. (2021).

Once the literature search was complete, the fourth step was to carry out the literature analysis. For this, I developed my own step-by-step procedure and initially recorded the most significant findings from the articles using hybrid coding (Mayring, 2004). I realized this at the reflection and learning stage with the help of a collaboration board (see Subsection 4.1.2.3). The literature analysis findings served as a foundation for my respective papers, while the practical work findings were compared, supplemented, or expanded.

### **4.2.2 Document Search and Analysis**

Document analysis entails reviewing and evaluating documents systematically (Bowen, 2009). The documents may be in a variety of formats, such as meeting minutes, newspaper

articles, and publicly available online documents. To ensure the scientific validity of empirical knowledge, it is crucial to critically analyze of the data or documents (Bowen, 2009).

For this dissertation, document analysis was conducted to gain an overview of the existing DSI applications for supporting humans experiencing homelessness (Gebken, Drews, Schirmer, 2021; Kempfert et al., 2022). In addition, the document analysis served to better understand the contexts and life situations of humans experiencing homelessness and to perceive the current discourse on homelessness in society (Gebken, Cankaya, Jacobs, 2023; Gebken, Drews, Schirmer, 2021; Kempfert et al., 2022). In addition, the documents from the everyday project work (among others, minutes, Miro boards, and the value-sensitive decision log) were also recorded and analyzed (Gebken et al., 2022; Gebken, Cankaya, Jacobs, 2023; Gebken, Jacobs et al., 2023; Gebken, Kurtz et al., 2021).

The search for DSI applications and the documentation and evaluation of the day-to-day project work significantly impacted this dissertation. The exploration of other DSI applications in the form of a meta-study served to develop of phenomenon knowledge (Raabe et al., 2023). For this purpose, a method based on Brink (2013) was developed. For details, see Paper 4 (Kempfert et al., 2022).

Furthermore, a dedicated method was developed to document the daily project work. Initially, the value-sensitive DSI team used meeting minutes. After several months of project work, the team found the previous methods inadequate due to the lack of an overview. To solve this problem, the team began working with a decision log to document the team's decisions (Bressen, 2012). Additional elements were added to the decision log throughout the project, with the primary purpose of recording the team's decisions and the rationale behind them. The development and contents of the value-sensitive decision log can be found in Paper 7 (Gebken, Jacobs et al., 2023).

### **4.2.3 Surveys**

Surveys are standardized sets of questions. The aim is to use the respondents' answers to test theoretical concepts and relations (Probst, 1996).

Two surveys were conducted in the course of this dissertation: the first one to classify the acceptance and positions of the different target groups of the OpenStreetPay ecosystem (homeless aid organizations, humans experiencing homelessness, and donors) (Gebken,

Drews, Schirmer, 2021) and the second one a proof of concept with humans experiencing homelessness in two homeless aid organizations (Gebken, Cankaya, Jacobs, 2023).

Both surveys were developed iteratively. The questions originated from the research interests of the OpenStreetPay team and the respective research team. The focus was on recording the opinions of the various stakeholders in relation to OpenStreetPay and, in particular, their needs (McLeod, 2007), values (Friedman and Hendry, 2019), and emotions (Burrows, Mendoza et al., 2019) regarding the DSI concept.

Especially when working with humans experiencing homelessness as a marginalized group, it is critical to proceed with caution and allow their voices to be heard (Aldridge, 2019). Therefore, research ethics guidelines must be taken into account so that the survey does not cause more harm than long-term help to the marginalized individuals (German Informatics Society, 2018; World Medical Association, 2022). To meet this requirements, the ethics committee was consulted and researchers from the fields of psychology, homelessness support and computer ethics gave feedback.

#### **4.2.4 Interviews and Focus Groups**

Interviews and focus groups allow researchers to obtain comprehensive information from diverse stakeholders (Myers and Newman, 2007). The design of interviews is particularly important for the subsequent gain in knowledge (Myers and Newman, 2007).

In the course of this research, interviews and focus group discussions were conducted to obtain deeper insights from experts in the fields of the needs of humans experiencing homelessness, working with humans experiencing homelessness, legal ePayment, and the needs of shop owners (Gebken, Cankaya, Jacobs, 2023; Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021). Thereby, it was the aim of the OpenStreetPay team to identify stumbling blocks to the idea and necessary requirements for the concept. Since it was, in most cases, our first interaction with the organizations, it was important to build up a good basis for future work, and therefore, I refrained from recording. The interviews were conducted in a semi-structured form, and the findings were recorded in notes (Gläser and Laudel, 2010).

## 5 Reflection on the Research Journey

Since my research was shaped by various impulses from the value-sensitive DSI project and a multitude of topics and results from different research fields, I want to outline my research journey. The purpose of reflecting on my research journey is to increase transparency in the complex research setting and clarify the origin of ideas and contributions (Järveläinen et al., 2022). Reflecting on the journey is relevant in the context of my dissertation, as (a) the project and the research brought out a variety of different impulses, and (b) the multidisciplinary setting in particular repeatedly led to new directions.

In Chapter 4, Subsection 4.1.3, I mentioned that ADR poses the challenge that the original purpose of the research can shift (Simonsen, 2009). In the case of my dissertation, this happened due to a variety of impulses. In this process, I openly admitted the twists and turns of the value-sensitive DSI project and research and regularly reflected with my co-researchers on the impulses and RQs we intended to address (Monteiro et al., 2023).

For the summary of my cumulative dissertation in particular, I once again undertook a process of reflection. To this end, I systematically reviewed the individual knowledge chunks (Raabe et al., 2021; Raabe et al., 2023: article submitted for publication)<sup>11</sup> of the respective papers with regard to their KT<sub>s</sub> (see Chapter 4, Subsection 4.1.2.4 and Chapter 7, Subsection 7.1) and then gradually reflected on the core findings of my dissertation by reflecting on the RQs and research aims (see Chapter 1, Section 1.2). This corresponds to the approach of Monteiro et al. (2023, p. xi): “Rather than isolating the research question up front, we take inspiration from both the literature and encounters with empirical phenomena, and we refine research questions as our analysis deepens.”

Therefore, in the following, I present my research journey along the ADR iterations. Many ADR project activities took place in parallel and influenced each other.

Figure 5.1 highlights the most significant impulses from research and practice that impacted the respective papers. It also provides a schematic outline of which new research ideas emerged in the course of which publication. The findings and knowledge chunks are described in the theoretical contributions (see Chapter 7, Section 7.1).

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<sup>11</sup> The paper by Raabe et al. (2023) is currently still in the submission process. The reflection and elaboration was very helpful for the progress of my research, but I have decided not to include the work in my dissertation due to the thematic breadth of the subject area.

The following sections describe the pre-ADR project phase and the three ADR iterations, and show how the RQs were sharpened over time. The final section of the chapter provides a brief summary and presents, in tabular form, the reflected RQs, along with those RQs from the papers (see Table 5.1).

## **5.1 Pre-Phase before the Action Design Research Project**

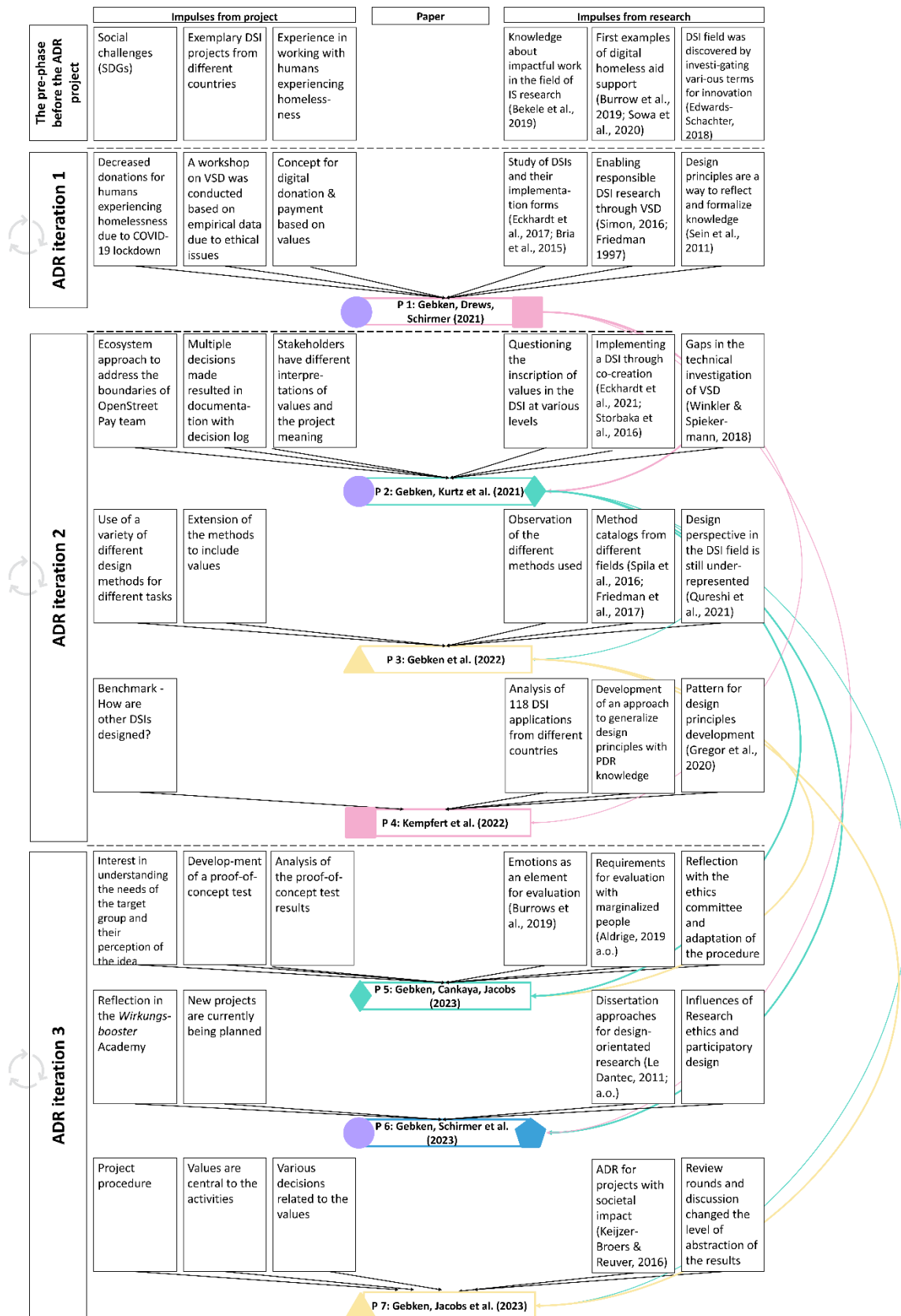
When my research began, I had different thematic expectations of where my journey should take me. My initial focus was on exploring the potential and challenges of digital technologies in large-scale construction projects (Gebken et al., 2019), but as I progressed through my research, I realized that I wanted to help people directly.

The research project and encounter that had the greatest impact on me was a presentation by Rahel Bekele on a project aiming to reduce maternal mortality in Ethiopia using an application (Bekele et al., 2019). This presentation was part of a colloquium at the Department of Computer Science at the University of Hamburg. Rahel Bekele made me realize that IS research can be targeted at societal challenges.

In conversation with my supervisor, we worked out a topic on which I wanted to focus. Here, I pursued my desire to bring my experiences from my volunteer work closer to my research. My goal was to help people experiencing homelessness and to investigate how innovations could be designed for them responsibly.

To achieve this goal, I began researching digital homelessness support in late 2019/early 2020. I reviewed the relevant literature, including the works by Burrows, Mendoza et al. (2019), Sowa (2019), and Sowa et al. (2020). Additionally, I explored various innovation concepts, such as social innovation, responsible innovation, and digital innovation, as discussed by Edwards-Schachter (2018). Through a systematic literature review, I came across the topic of DSI through a combination of search terms (Bria et al., 2015; Eckhardt et al., 2016). From that point on, I focused on this area because it was clearly defined and had the support of the SDGs as its primary focus (Bria et al., 2015; United Nations, n.d.).





**Figure 5.1. Research Journey along the Action Design Research Iterations**

Note. ADR = action design research; DSI = digital social innovation; KT = knowledge type; PDR = phenomenon-driven research; VSD = value sensitive design.

On a practical level, I also investigated which aid organizations are active in Hamburg to support humans experiencing homelessness. Furthermore, I searched for possible approaches that aim to provide assistance to humans experiencing homelessness. In addition to the most promising analog approach of Housing First (Ly and Latimer, 2015), I also found digital approaches that aim to provide assistance to humans with specific problems (Burrows, Mendoza et al., 2019). In my initial search, I found 23 applications from different countries worldwide that address the topic of helping humans experiencing homelessness.

In addition to these activities, I conducted initial interviews with staff and volunteers of homeless aid organizations about their need for digital support.

During the preliminary phase, it became clear to me that this societal problem has so far received little attention in IS or DSI research. Furthermore, the impulses from the pre-phase influenced my research, and I revisited them during the ADR project.

## **5.2 Iteration 1: Creation of a Digital Social Innovation (DSI) Initiative – Impetus for Value Sensitivity in DSI Research**

### **5.2.1 Paper 1: Gebken, Drews, Schirmer (2021)**

After the foundations for my new dissertation topic were laid, I took part in the #wirvsvirus Hackathon organized by the German government for combating COVID-19 challenges in spring 2020. The hackathon lasted a weekend.

The OpenStreetPay team was formed as a result. The project was founded with the desire to help humans experiencing homelessness, as social distancing had significantly limited the possibility of receiving donations. Immediately after the hackathon, the team met and decided to continue working on the project. I agreed with my team to accompany the concept's development with an ADR project.

As it quickly became clear that digital donations to and payments for humans experiencing homelessness could not simply be developed and implemented by a grassroots team, a digital donation concept was created that involved various stakeholders. This concept was empirically evaluated and revised with an acceptance test in the form of a quantitative survey of and interviews with homeless aid organizations, donors, shopping facilities, and lawyers.

The quantitative survey and interviews clarified that the various stakeholders, as well as the OpenStreetPay team itself, had different understandings of values as well as varying views of

human dignity and who should be helped. Therefore, value conflicts (e.g., about who should receive help) arose. A consensus was needed to avoid recurring discussions about values in the OpenStreetPay project's daily work (Gebken, Drews, Schirmer, 2021).

One team member came up with the idea of holding a value workshop to define OpenStreetPay's core values and assess their implications for the DSI. This was the first time that the need for values emerged from the everyday work of the project and triggered a discussion at the research team level about the VSD research field.

The values developed by the OpenStreetPay team provided clear positions on value conflicts. The values also influenced the design. After the values workshop, the OpenStreetPay concept was revised in accordance with the values. For example, the concept sets out what can be bought with the donated money (Gebken, Drews, Schirmer, 2021).

Parallel to the OpenStreetPay project work, I familiarized myself with the fields of digital homelessness services (Burrows, Mendoza et al., 2019; Sowa et al., 2020), DSI (Buck et al., 2020; Eckhardt et al., 2016; Keijzer-Broers and Reuver, 2016), and responsible research and VSD (Flanagan et al., 2008; Friedman, 1997; Friedman et al., 2008; Simon, 2016).

In discussions with my co-researchers (Gebken, Drews, Schirmer, 2021), we again raised the following question from the pre-phase: "How can innovations for humans experiencing homelessness be designed responsibly?" The question was sharpened using the example of OpenStreetPay, taking into account VSD knowledge to enable responsible development (Simon, 2016).

However, it was initially challenging to formulate a clear goal for the research due to the large number of impulses. Knowledge from ADR research helped here and clarified to my co-researchers and me that design principles are a common tool in IS research to transfer learned design knowledge to future (value-sensitive) DSI projects (Sein et al., 2011). The aim of Paper 1 was to raise knowledge from practice to an abstract level.

The original idea from the pre-phase was translated into the question "What can be learned from the process of developing value-based and stakeholder-oriented digital social innovations for vulnerable people?" (Gebken, Drews, Schirmer, 2021), which was sharpened in the reflection process of my dissertation summary to "How can value-sensitive DSI for marginalized individuals (using the example of humans experiencing homelessness) be designed?" (see Table 5.1) to clarify the main idea.

In addition, the question “Why should DSI for marginalized individuals be designed in a value-sensitive way?” (see Table 5.1) was implicitly raised by the daily project work. Therefore, VSD was introduced. However, the importance of this question was not yet clear at the beginning of my research, as it seemed to be a logical conclusion due to everyday practice, and I was not aware at the beginning that the practical impulse for values would become a fundamental element of my research.

## **5.3 Iteration 2: Stabilization with a Variety of Tasks – Design and Reflection of Value-Sensitive Digital Social Innovation Applications**

### **5.3.1 Paper 2: Gebken, Kurtz et al. (2021)**

Inspired by Paper 1 (Gebken, Drews, Schirmer, 2021), the research idea of how design decisions are inscribed in DSI ecosystems, especially in co-creative processes, emerged during discussions with my co-researchers. This research idea was inspired by discussions on design decisions and the core values of the OpenStreetPay team, as well as first-hand insights from the project field.

A value-sensitive decision log was used as the basis for the researchers’ reflections. This log (see Chapter 4, Subsection 4.2.2) was developed with a member of the value-sensitive DSI team to keep track of the large number of decisions. This also proved to be a good knowledge base for the research.

During the reflection process, we, as researchers identified a lack of structure for systematically evaluating the findings. Initially, this resulted in discussions at various levels of abstraction, including shifting between overarching values, individual design decisions, the stakeholders’ behavior, and the overall societal impact.

To systematically carry out the reflection, my co-authors and I consulted knowledge from the VSD and DSI fields. We found that initial approaches were available in VSD, but the technical investigation did not cover the desired level of detail for reflection (Winkler and Spiekermann, 2018)<sup>12</sup>. In the DSI field, we found that models for the analysis of DSI ecosystems already exist (Eckhardt et al., 2021), but that they primarily focus on the analytical (and external) rather than the design-oriented (and internal) perspective of DSI projects. The review article by Qureshi et al. (2021) further highlights the importance of

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<sup>12</sup> This appears to be the case until the completion of my dissertation (Gerdes and Frandsen, 2023).

inscribing values in DSI, emphasizing that ethical challenges have received insufficient attention in DSI research thus far.

The impetus to examine the field of service science, as OpenStreetPay can be considered a service, was provided by my co-authors (Gebken, Kurtz et al., 2021). The multilevel design framework from service science (Grotherr et al., 2018; Grotherr et al., 2020; Storbacka et al., 2016) was particularly useful in providing a structured and detailed approach to systematically discuss and reflect on the inscription of values in the DSI ecosystem. Thus, the original research idea was concretized as follows: “How can the multilevel perspective of service systems research be adopted for DSI research in order to support the multilevel analysis of value inscription and reflection?” (Gebken, Kurtz et al., 2021).

While reflecting on my research journey, it became apparent that the most significant contribution of this work to research and practice is in examining the inscription of values. Therefore, I rephrased the RQ in the summary of the dissertation to “How can the societal impact of a value-sensitive DSI in accordance with its pursued values be reflected and evaluated?” (see Table 5.1).

For my further research, I learned from this paper that changing perspectives at the macro, meso, and micro levels in reflection is very beneficial for understanding.

### **5.3.2 Paper 3: Gebken et al. (2022)**

Alongside the development of the Paper 2 and the evaluation of the decisions, my co-authors and I revealed the diversity of the methods and tasks of the value-sensitive DSI team (Gebken et al., 2022).

We found summaries of methods for developing value-sensitive technologies (Friedman et al., 2017; Friedman and Hendry, 2019) and digital (social) innovations (Komatsu et al., 2016; Kumar, 2013; Spila et al., 2016) in various research fields. The OpenStreetPay team members also contributed their multidisciplinary knowledge of different design methods from practice.

In the course of this work, we, as researchers, identified the selection and adaptation of design methods to the value-sensitive DSI context as a particularly interesting focus. We learned that the combination of methods from different fields had not yet taken place and that values were not taken into account in digital innovation and DSI methods in particular. Furthermore, there was a lack of understanding of how methods were selected and adapted.

As a result, we set out to investigate the following RQ: “Which principles can guide the selection and adaptation of methods in value-sensitive DSI projects?” (Gebken et al., 2022).

Reflecting on my research journey revealed that design methods and research methods are related. In the teams, we introduced values into both the design and the research methods. This shows the wide range of changes that conscious value sensitivity brings and the need for research and practice to respond to these changes. As a result, I summarized this RQ with the revised research approach to clarify the thematic proximity: “How can research and design methods (be extended to) support the development of value-sensitive DSI?” (see Table 5.1).

What I have learned from this research for my further research and project work is that the practice team’s flexibility in selecting and adapting methods is a fundamental pillar in the creative work of a value-sensitive DSI team and that it is the task of research to examine how these methods are connected to make use them in the most resource-saving way possible.

### **5.3.3 Paper 4: Kempfert et al. (2022)**

During the initial iteration cycle of the ADR, my co-authors and I developed design principles for value-sensitive DSI applications. However, we recognized the limitations of our research, as these design principles were based solely on the knowledge gained from one ADR project, thus limiting their transferability to other projects (Vom Brocke et al., 2020).

To enhance the generalizability of the findings, it was essential for us to investigate the current status of DSIs for people experiencing homelessness. This should provide a benchmark for the OpenStreetPay team and a baseline for the phenomenon of DSI for people experiencing homelessness. Therefore, we formulated the following RQ: “What can be learned from the analysis of existing DSIs (from different countries) for the future design and development of value-sensitive DSIs for homeless neighbors?” (Kempfert et al., 2022)

To approach this question as a research team (Kempfert et al., 2022), we first questioned how to systematically evaluate DSI applications, developed evaluation criteria based on DSI and VSD knowledge, and conducted an empirical survey to identify DSI applications for humans experiencing homelessness.

This study extended the design principles developed in the first study (Gebken, Drews, Schirmer, 2021) with PDR knowledge about other DSI applications for humans experiencing homelessness. The comparison included knowledge on the nature of design principles for systematic description (Chandra Kruse, 2018; Gregor et al., 2020).

While reflecting on my RQs, I refined the RQ in order to formulate the core content more clearly: “How can value-sensitive DSI for marginalized individuals (using the example of humans experiencing homelessness) be designed?” (see Table 5.1).

As I continued to work in the project team, I incorporated knowledge of different DSI applications for people experiencing homelessness into my daily project work, and I was reminded of the need to adapt to the context.

## **5.4 Iteration 3: Roll-Out Problems and Evaluation – Reflection on the Value-Sensitive Research Approach and Related Research Fields**

### **5.4.1 Paper 5: Gebken, Cankaya, Jacobs (2023)**

In the third iteration of the ADR project, we were able to evaluate our idea with humans experiencing homelessness and aid organizations due to the less acute COVID-19 situation. Under other circumstances, the design work would have taken place directly with the marginalized people to directly include the voices of people experiencing homelessness (Aldridge, 2019) and thus answer the question of what they need in terms of support. Due to the COVID-19 pandemic and the challenging situation in homeless aid, we decided, for ethical reasons, to shift our focus to other areas to ensure that our research and work did not cause more harm than good (German Informatics Society, 2018; World Medical Association, 2022).

Preparation for the test involving people experiencing homelessness began during the second ADR iteration (Gebken et al., 2022; Gebken, Kurtz et al., 2021). Working with my team at OpenStreetPay, I developed a questionnaire to better understand the needs of people experiencing homelessness. The questionnaire included questions about values (Friedman and Hendry, 2019), needs (McLeod, 2007), and emotions (Burrows, Mendoza et al., 2019).

The question design and evaluation process underwent several revisions in collaboration with researchers from the fields of homelessness assistance, psychology, and ethics and with the ethics committee of the Department of Informatics of the University of Hamburg. Research results from studies using participatory design were particularly helpful in preparing for careful and responsible interactions with marginalized individuals (Aldridge, 2019; Chowdhury, 2022; Salazar and Abrams, 2005). Furthermore, Le Dantec (2011) has demonstrated how to design an evaluation involving homeless individuals in the VSD field.

The evaluation was conducted collaboratively by the research and practice teams. The findings were used to revise the OpenStreetPay concept, including the functionality and future design of the SmallChangeCard. Additionally, we, as the research team, refined our RQ after realizing that we had collected more than just the needs of the target group: “What lessons can be learned from the evaluation with marginalized people in terms of the design of the DSI and the value-sensitive methodological approach?” (Gebken, Jacobs et al., 2023).

Since evaluation (Gebken, Cankaya, Jacobs, 2023) and reflection (Gebken, Kurtz et al., 2021) work hand in hand, I summarized these two research papers under the key question of “How can the societal impact of a value-sensitive DSI in accordance with its pursued values be reflected and evaluated?” (see Table 5.1) and sharpened the focus. The findings of the evaluation must be further reflected upon in the future and evaluated with the help of the multilevel framework (Gebken, Kurtz et al., 2021).

The collaboration over several weeks with people experiencing homelessness provided valuable insight for further research—in particular, the perception and realization of the intensity of the days between the meetings.

#### **5.4.2 Paper 6: Gebken, Schirmer et al. (2023)**

In addition to the evaluation with the target group, in the third ADR iteration, I also reflected on the entire course and content of my research. The impetus for this came in particular from research, as I realized that there are already prominent reviews of DSI (Buck et al., 2020; Qureshi et al., 2021) and VSD research (Friedman and Hendry, 2019; Gerdes and Frandsen, 2023; Winkler and Spiekermann, 2018) but that the connection between the two multidisciplinary fields has so far been less emphasized.

While collaborating with my co-authors (Gebken, Schirmer et al., 2023), particularly the researcher from the field of ethics in IT, it became evident that the underlying question of my research is why DSI should be designed in a value-sensitive manner. To address this, I revisited the implicit question posed in Papers 1 (Gebken, Drews, Schirmer, 2021) and 2 (Gebken, Kurtz et al., 2021) and complemented it with the following RQ: “Why and how should DSI for marginalized individuals be designed in a value-sensitive way?” (see Table 5.1; Gebken, Schirmer et al., 2023).

The path to this RQ involved an intensive examination of two dissertations from the DSI (Keijzer-Broers, 2016) and VSD fields (Le Dantec, 2011). The analysis focused on their



approach, special features related to working with marginalized people, and the main focal points of the projects. These findings were compared to the results of my research and other research projects.

The significance of research ethics and participatory design as a complement to VSD and DSI was reaffirmed.

During this time, the OpenStreetPay team received support from the Wirkungsbooster Academy for impact measurement (Geier and Gruber, 2023) and was promoted to reflect on the added value for society, which was incorporated into the research work. Furthermore, there were several new project ideas to which I wanted to apply the knowledge gained from the ADR project and considering the existing literature. In particular, my goal with this paper was to share knowledge for future design-oriented projects.

For the future work, I particularly noted the questions that arise in the context of research and conceptual work on value-sensitive DSI for marginalized people.

#### **5.4.3 Paper 7: Gebken, Jacobs et al. (2023)**

The paper that contains the value-sensitive decision log (Gebken, Jacobs et al., 2023) underwent numerous revisions. It originated from the OpenStreetPay project, in which an increasing number of decisions were made. The original documentation in the form of minutes proved to be unsuitable for finding decisions quickly, resulting in a lack of transparency in the long term. To address this issue, a value-sensitive decision log was used as the basis for research in Papers 2 (Gebken, Kurtz et al., 2021) and 3 (Gebken et al., 2022).

This paper faced a challenge in determining the appropriate level of abstraction for describing the value-sensitive decision log and its meaning. We initially categorized the work in the field of ecosystem and enterprise architecture management in combination with architectural thinking and added insights from project management, DSI research, and VSD (Aier et al., 2015; Bressen, 2012; Burmeister et al., 2019; Drews and Schirmer, 2014; Eckhardt et al., 2021; Friedman and Hendry, 2019; Perera, 2019). In particular, this should help to increase the traceability of values at different sociotechnical architectural levels (Perera, 2019) and contribute to the technical investigation of VSD in the long term (Gerdes and Frandsen, 2023). My co-authors and I were thus originally guided by the following question: “How can a lightweight value-sensitive and architecture-based decision log support value sensitive design in DSI?”

During the submission process to various conferences and a journal, it became apparent that the importance of the value-sensitive decision log and its design principles was unclear due to the large number of different topics. The description of the value-sensitive decision log was strongly interwoven with everyday project work and project details, making it appear like a project report due to the low level of abstraction.

Through the new impetus from my co-authors' research, I realized that the value-sensitive decision log had more influence than previously described and, in particular, that its significance for the research process itself was illuminating. This realization prompted me to reflect on the relationship between ADR and VSD in my research project.

This turn of events reminded me of one of the first articles that influenced me during my dissertation. In their work, Keijzer-Broers and Reuver (2016) demonstrated that ADR research can also address societal challenges. They proposed new principles for ADR for social innovation, such as “[b]alanc[ing] political, economic and social values for evaluating ADR results” (Keijzer-Broers and Reuver, 2016, p. 14). However, the actual approach for fulfilling these principles remains open. From the first iteration, my teams and I considered these principles to be the foundation for developing value-sensitive DSI applications.

Upon reflection, we realized (Gebken, Jacobs et al., 2023) that the classic ADR approach (Sein et al., 2011) needs to be complemented with further steps from VSD to meet the requirements of a value-sensitive DSI. As a result, the RQ was revised to “How can action design research be extended to support researchers and practitioners in value-sensitive decision-making and development?” (Gebken, Jacobs et al., 2023). Our goal was to clarify the implicit values in the project and research practice, making ADR more accountable and transparent.

In the course of reflecting on and sharpening the RQs, we summarized Paper 7 with Paper 3—the method selection and adaptation—to present a holistic picture of design methods for research methods. The reflected RQ was: “How can research and design methods (be extended to) support the development of value-sensitive DSI?” (see Table 5.1) However, it should be emphasized that this research paper has not yet been completed and is currently under revision. In the revision, we plan to incorporate the findings from this research journey and the roles in ADR.

For further research, I drew from this work in particular that research is not neutral, especially in technology design (Friedman and Hendry, 2019) and that it is crucial to address this fact to enable transparency in the research process and make implicit values clear.

## 5.5 Summary

The impetus for the reflection work on the research journey came in particular during the work on the last two papers (Gebken, Jacobs et al., 2023; Gebken, Schirmer et al., 2023). During the research journey, the primary goal was to make available the design-oriented knowledge gained from the ADR project, along with the results from the review of the literature on value-sensitive DSI for marginalized people. Thus, the work on the last two papers—value-sensitive ADR (Gebken, Jacobs et al., 2023) and the research agenda (Gebken, Schirmer et al., 2023)—focused on reflecting on the entire research process and the research results. Thereby, the value-sensitive and responsible facets required for value-sensitive DSI research were also highlighted.

In the course of this chapter, the development path of the RQs has been made transparent. Table 5.1 shows a comparison of the reflected RQs of this dissertation and the respective papers. In addition, the ADR iteration during which the respective research paper was written has been shown.

Furthermore, this chapter has shown (a) where the respective impulses of the individual papers came from (i.e., from the project context or the literature review). Moreover, I have dealt with (b) the influence of multidisciplinary research. Outlining the research journey in this chapter has also illustrated (c) how the phenomenon of value-sensitive DSI sharpened as the research progressed.

With regard to (a), it once again became clear in the course of the reflection that practice had a major influence as a source of inspiration and that, for example, the need to include values arose from the project itself. However, it also emerged from the reflection that the degree of abstraction of the research increased over the course of the ADR iterations and led from project-related descriptions and RQs to a research agenda and reflection on the entire research approach.



With regard to (b), it became evident that the more my research work progressed, the more fields of research were utilized. The background to this is that a major societal problem, such as homelessness or the support of marginalized people, cannot be satisfactorily illuminated

with knowledge from just one research field (Mädche, 2017). The use of different fields of research was often prompted by the needs of the project itself, such as the selection of VSD for scientific guidance on dealing with values (Gebken, Drews, Schirmer, 2021) or the use of knowledge to obtain information on how marginalized people can be included responsibly in research and practice (Gebken, Cankaya, Jacobs, 2023).




In addition, reflection on the research showed once again that (c) although the research impulses were often led by the project, the phenomenon of value-sensitive DSI was gradually sharpened by answering the questions that arose. Thus, the first overview article on existing DSI supporting people experiencing homelessness provides a basis for further research and a benchmark for future value-sensitive DSI projects supporting people experiencing homelessness (Kempfert et al., 2022).

Overall, the reflection on the research journey underlines again that although this dissertation started from within the IS field, it has already broadened the perspective beyond the IS field with the first publication and the consideration of the multidisciplinary research fields of DSI and VSD.

**Table 5.1. Reflected Research Questions and Research Questions from the Respective Papers**

Symbol	Reflected research question	Reference	Paper no.	Research question in the paper	ADR iteration
	Why should DSI for marginalized individuals be designed in a value-sensitive way?	(Gebken, Drews, Schirmer, 2021)	P 1	How can we design a concept that allows digital donations for homeless neighbors? What can be learned from the process of developing value-based and stakeholder-oriented digital social innovations for vulnerable people?	I 1
		(Gebken, Kurtz et al., 2021)	P 2	How can the multilevel perspective of service systems research be adopted for DSI research in order to support the multilevel analysis of value inscription and reflection?	I 2
		(Gebken, Schirmer et al., 2023)	P 6	Why and how should DSI for marginalized individuals be designed in a value-sensitive way?	I 3
	How can value-sensitive DSI for marginalized individuals (using the example of humans experiencing homelessness) be designed?	(Gebken, Drews, Schirmer, 2021)	P 1	How can we design a concept that allows digital donations for homeless neighbors? What can be learned from the process of developing value-based and stakeholder-oriented digital social innovations for vulnerable people?	I 1
		(Kempfert et al., 2022)	P 4	What can be learned from the analysis of existing DSIs (from different countries) for the future design and development of value-sensitive DSIs for homeless neighbors?	I 2

*Note.* DSI = digital social innovation; I = Iteration; P = Paper.

Symbol	Reflected research question	Reference	Paper no.	Research question in the paper	ADR iteration
	How can research and design methods (be extended to) support the development of value-sensitive DSI?	(Gebken, Jacobs et al., 2023)	P 7	How can action design research be extended to support researchers and practitioners in value-sensitive decision-making and development?	I 3
		(Gebken et al., 2022)	P 3	Which principles can guide the selection and adaptation of methods in value-sensitive DSI projects?	I 2
	How can the societal impact of a value-sensitive DSI in accordance with its pursued values be reflected and evaluated?	(Gebken, Kurtz et al., 2021)	P 2	How can the multilevel perspective of service systems research be adopted for DSI research in order to support the multilevel analysis of value inscription and reflection?	I 2
		(Gebken, Cankaya, Jacobs, 2023)	P 5	What lessons can be learned from the evaluation with marginalized people in terms of the design of the DSI and the value-sensitive methodological approach?	I 3
	Why and how should DSI for marginalized individuals be designed in a value-sensitive way?	(Gebken, Schirmer et al., 2023)	P 6	Why and how should DSI for marginalized individuals be designed in a value-sensitive way?	I 3

*Note.* DSI = digital social innovation; I = Iteration; P = Paper.

## 6 Publications

**Table 6.1. List of Included Papers**

No.	Paper	Section
1	Gebken, L., Drews, P. and Schirmer, I. (2021) ‘Stakeholder and value orientation in digital social innovation: designing a digital donation concept to support homeless neighbors’, in Proceedings of the 54 <sup>th</sup> Hawaii International Conference on System Sciences, Maui, Hawaii.	11
2	Gebken, L., Kurtz, C., Drews, P., Schirmer, I. and Böhmman, T. (2021) ‘Human-value-oriented digital social innovation: a multilevel design framework’, in Proceedings of 42 <sup>nd</sup> International Conference on Information Systems, Austin, Texas.	12
3	Gebken, L., Drews, P. and Schirmer, I. (2022) ‘Selecting and adapting methods for analysis and design in value-sensitive digital social innovation projects: toward design principles’, in Proceedings of the 55 <sup>th</sup> Hawaii International Conference on System Sciences, Maui, Hawaii.	13
4	Kempfert, I., Gebken, L. and Raabe, J.-P. (2022) ‘Refining design principles for value-sensitive digital social innovation to support homeless neighbors’, in Proceedings of the 30 <sup>th</sup> European Conference on Information Systems, Timisoara, Romania.	14
5	Gebken, L., Cankaya, F., and Jacobs, M. (2023) ‘Interim evaluation of value-sensitive digital social innovation – lessons learned from a project to support humans experiencing homelessness’, in Workshop Proceedings of the 31 <sup>st</sup> European Conference on Information Systems, Kristiansand, Norway.	15


**Table 6.2. Paper in the submission process**

<b>No.</b>	<b>Paper</b>	<b>Section</b>
6	Gebken, L., Schirmer, I., Simon, J., and Drews, P (2023) ‘Value-sensitive digital social innovations for marginalized individuals: Towards a research agenda’ <b>accepted</b> for 15 <sup>th</sup> International Social Innovation Research Conference, in Guimarães, Portugal, <b>under review</b> for 84 <sup>th</sup> Academy of Management Conference, in Chicago, USA.	A.1
7	Gebken, L., Jacobs, M., Drews, P., Schirmer, I. and Drechsler, A. (2023, <b>in second round of revisions, accept with major revisions</b> ), ‘Value-sensitive action design research: Improving the consideration and traceability of values in design decisions’, in Scandinavian Journal of Information Systems.	A.2



**Table 6.3. Paper 1 of this Cumulative Dissertation**

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<b>Reference</b>	Gebken, L., Drews, P. and Schirmer, I. (2021)  ‘Stakeholder and value orientation in digital social innovation: designing a digital donation concept to support homeless neighbors’, in Proceedings of the 54 <sup>th</sup> Hawaii International Conference on System Sciences, Maui, Hawaii.
<b>Ranking</b>	VHB-JOURQUAL3: C
<b>Type</b>	Completed research paper
<b>Track</b>	Organizational Systems and Technology, Social Impact, and Information Systems
<b>Mini track chairs</b>	Amber Young, University of Arkansas Jordana George, Texas A&M University Sirkka Jarvenpaa, University of Texas at Austin
<b>Methodology</b>	ADR including the following steps: interviews, focus groups, a document search (evaluation of other apps for homeless neighbors), a systematic literature search, collaboration and observation, a survey with qualitative and quantitative questions, prototyping, and VSD (technical, conceptual, and empirical investigation).
<b>Research question</b>	How can we design a concept that allows digital donations for homeless neighbors?   What can be learned from the process of developing value-based and stakeholder-oriented digital social innovations for vulnerable people?
<b>Research contribution</b>	This describes the ecosystem-based concept of DSI OpenStreetPay. In particular, the sharpening of the concept based on values is presented. This paper brings together the fields of DSI and VSD and develops design principles for value-sensitive DSI for people experiencing homelessness.
<b>Co-authors contributions</b>	Paul Drews and Ingrid Schirmer co-authored this article. Joint meetings were held to discuss the common theme, structure, and content of the article. Paul Drews did the proofreading.

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**Table 6.4. Paper 2 of this Cumulative Dissertation**

<b>Reference</b>	Gebken, L., Kurtz, C., Drews, P., Schirmer, I. and Böhmman, T. (2021) ‘Human-value-oriented digital social innovation: a multilevel design framework’, in Proceedings of the 42 <sup>nd</sup> International Conference on Information Systems, Austin, Texas.
<b>Ranking</b>	VHB-JOURQUAL3: A
<b>Type</b>	Completed research paper
<b>Track</b>	Societal Impact of IS
<b>Track chairs</b>	Hala Annabi, University of Washington Jason Chan, University of Minnesota Chee Wei (David) Phang, University of Nottingham Ningbo China
<b>Methodology</b>	ADR including the following steps: interviews, focus groups, a document search (evaluation of other apps for homeless neighbors), a systematic literature search, collaboration and observation, a survey with qualitative and quantitative questions, prototyping, VSD (technical, conceptual, and empirical investigation), a decision log based on weekly protocols of the project team, and co-creation of the user experience design.
<b>Research question</b>	How can the multilevel perspective of service systems research be adopted for DSI research in order to support the multilevel analysis of value inscription and reflection?
<b>Research contribution</b>	The main contribution of this paper is the development of a multilevel framework to help researchers consider how values are inscribed in (value-sensitive) DSI at different levels of co-creation processes. To accomplish this goal, insights from the service science discipline were utilized and adapted for value-sensitive DSI. The adaptation procedure was guided by focusing on the values, societal impact, and ethical challenges that emerged from the different statements and actions of the stakeholders of the OpenStreetPay project.
<b>Co-authors contributions</b>	Christian Kurtz, Paul Drews, Ingrid Schirmer, and Tilo Böhmman co-authored this publication. Christian Kurtz, Paul Drews, and Ingrid Schirmer supported the development of the framework by engaging in discussion sessions to shape the idea and providing feedback on the iteratively developed framework. Christian Kurtz wrote the first draft of the first two paragraphs on service systems and co-creation, which were jointly revised in several iterations. Ingrid Schirmer and Paul Drews also provided feedback on the article and the higher-level structure. Paul Drews did the proofreading. Paul Drews, Christian Kurtz, and Tilo Böhmman provided support on how to incorporate the reviewers’ feedback.


**Table 6.5. Paper 3 of this Cumulative Dissertation**

<b>Reference</b>	Gebken, L., Drews, P. and Schirmer, I. (2022) ‘Selecting and adapting methods for analysis and design in value-sensitive digital social innovation projects: toward design principles’, in Proceedings of the 55 <sup>th</sup> Hawaii International Conference on System Sciences, Maui, Hawaii.
<b>Ranking</b>	VHB-JOURQUAL3: C
<b>Type</b>	Completed research paper
<b>Track</b>	Organisational Systems and Technology, Social Impact and Information Systems
<b>Mini track chairs</b>	Amber Young, University of Arkansas Jordana George, Texas A&M University Sirikka Jarvenpaa, University of Texas at Austin
<b>Methodology</b>	ADR including the following steps: interviews, focus groups, a document search (evaluation of other apps for homeless neighbors), a systematic literature search, collaboration and observation, a survey with qualitative and quantitative questions, prototyping, VSD (technical, conceptual, and empirical investigation), a decision log based on weekly protocols of the project team, and co-creation of the user experience design.
<b>Research question</b>	Which principles can guide the selection and adaptation of methods in value-sensitive DSI projects?
 <b>Research contribution</b>	The purpose of this article is to reflect on the selection and adaptation of the (value-sensitive) DSI teams’ methods and to derive design principles for them. Initially, the OpenStreetPay approach was considered, examining its exemplary tasks and how the OpenStreetPay team utilized DSI/VSD/IS methods. This allowed for an illustration of how these methods can be interconnected. Ultimately, the core outcome of this is design principles. The design principles assist other design-oriented researchers and (value-sensitive) DSI teams in selecting and adapting appropriate methods.
<b>Co-authors contributions</b>	Paul Drews and Ingrid Schirmer co-authored this article, which was refined through joint discussions. The selection of tasks and methods was exemplified by Ingrid Schirmer, who also supported the development of mapping the method selection over time. Paul Drews contributed to the development of the red thread and encouraged the use of design principles in writing up the results section, which improved the article’s quality. Additionally, Paul Drews assisted with proofreading.


**Table 6.6. Paper 4 of this Cumulative Dissertation**

<b>Reference</b>	Kempfert, I., Gebken, L. and Raabe, J.-P. (2022) ‘Refining design principles for value-sensitive digital social innovation to support homeless neighbors’, in Proceedings of the 30 <sup>th</sup> European Conference on Information Systems, Timisoara, Romania.
<b>Ranking</b>	VHB-JOURQUAL3: B
<b>Type</b>	Completed research paper
<b>Track</b>	Digitization of Education, Private Industries, and Society
<b>Track chairs</b>	Jane Fedorowicz, Bentley University Chee-Wee Tan, Copenhagen Business School Safa’a AbuJarour, An-Najah National University
<b>Methodology</b>	Meta-study including the following steps: a systematic literature search, a document search (evaluation of other apps for homeless neighbors), self-evaluation based on criteria in the form of a hybrid coding method, and contrasting the design principles from the ADR project and the meta-study.
<b>Research question</b>	What can be learned from the analysis of existing DSIs (from different countries) for the future design and development of value-sensitive DSIs for homeless neighbors?
<b>Research contribution</b>	In this paper, we deepen the knowledge of the societal challenges of homelessness and make it applicable from the social science context to the multidisciplinary context of DSI and VSD. The main outcome of this work is generalized design principles for value-sensitive DSIs for people experiencing homelessness, based on the systematic study of 118 DSIs.
<b>Co-authors contributions</b>	Inga Kempfert and Jun-Patrick Raabe co-authored this paper. Jun-Patrick Raabe helped formulate the scientific approach and provided helpful references. Inga Kempfert made a major contribution to the foundations of this article, which is based on her master’s thesis. The idea and approach of the study were developed jointly by Inga Kempfert and me. The development of the evaluation criteria was iterative. Inga Kempfert had access to my literature sources, to which she added a large number. Inga Kempfert took over the in-depth data collection on the 118 apps, expanding on the 23 apps already identified. The derivation of the findings was again iterative, with several feedback loops. The design principles presented in the article were developed jointly by Inga Kempfert and me. The main work in writing the article was mine. Inga Kempfert gave feedback in several loops and created the overview of the criteria and evaluations.


**Table 6.7. Paper 5 of this Cumulative Dissertation**

<b>Reference</b>	Gebken, L., Cankaya, F., and Jacobs, M. (2023) ‘Interim evaluation of value-sensitive digital social innovation – lessons learned from a project to support humans experiencing homelessness’, in Proceedings of the 31 <sup>st</sup> European Conference on Information Systems, Kristiansand, Norway.
<b>Ranking</b>	VHB-JOURQUAL3: B
<b>Type</b>	Research in progress
<b>Track</b>	Workshop: Social Justice and Inclusion to Co-create Sustainable Digital Futures
<b>Editor</b>	Sam Zaza, Middle Tennessee State University
<b>Methodology</b>	ADR including the following steps: interviews, focus groups, a document search (evaluation of other apps for homeless neighbors), a systematic literature search, collaboration and observation, a survey with qualitative and quantitative questions, prototyping, VSD (technical, conceptual, and empirical investigation), a decision log based on weekly protocols of the project team, co-creation of the user experience design, and hybrid coding in the use of creativity methods (service blueprint).
<b>Research question</b> 	What lessons can be learned from the evaluation with marginalized people in terms of the design of the DSI and the value-sensitive methodological approach?
<b>Research contribution</b>	In this paper, my co-authors and I contribute lessons learned from the evaluation with marginalized people, especially humans experiencing homelessness. Furthermore, we also developed the first lessons learned for the value-sensitive DSI concept and relate them to values.
<b>Co-authors contributions</b>	Fulya Cankaya and Mattis Jacobs co-authored this article. I developed the evaluation criteria in collaboration with the OpenStreetPay team. Fulya Cankaya revised the process. The systematic processing of the quantitative and qualitative data was done by Fulya Cankaya as part of her master’s thesis. Fulya Cankaya and I worked together with OpenStreetPay on the analysis of the evaluation and the lessons learned. The manuscript was written by me and Mattis Jacobs, and Fulya provided helpful feedback during the revision process.

**Table 6.8. Paper 6 of this Cumulative Dissertation (Paper in the Submission Process)**

<b>Reference</b>	Gebken, L., Schirmer, I., Simon, J., and Drews, P (2023)  ‘Value-sensitive digital social innovations for marginalized individuals: Towards a research agenda’ <b>accepted</b> for 15 <sup>th</sup> International Social Innovation Research Conference, in Guimarães, Portugal, <b>under review</b> for 84 <sup>th</sup> Academy of Management Conference, in Chicago, USA.
<b>Ranking</b>	Not listed in common information systems rankings
<b>Type</b>	Completed research paper
<b>Track</b>	Social Innovation and Engineering, Design, and New Technologies
<b>Editors</b>	Benny Tjahjono, Coventry University Madalena Araújo, University of Minho
<b>Methodology</b>	Reflection on the systematic literature review and ADR research process.
<b>Research question</b>	How can value-sensitive digital social innovation be designed and which methods support the design process?
 <b>Research contribution</b>	In this paper, we introduce value-sensitive DSI as a new research field. Integrating insights, goals, and methods from DSI, VSD, participatory design, and research ethics guidelines, we propose a new research agenda for more ethically and socially responsible research, design, and development of novel technologies. We argue that value-sensitive DSI can improve research and design processes in general but is particularly needed when developing technologies for and with marginalized groups and individuals.
<b>Co-author contributions</b>	Ingrid Schirmer, Judith Simon, and Paul Drews contributed to this article. Paul Drews helped in particular with the preliminary draft and with identifying the topic area. Ingrid Schirmer and Judith Simon helped in several feedback loops to elaborate on and revise the core of the article. I took over the writing of the article and the literature search. Judith Simon revised the abstract and introduction.

**Table 6.9. Paper 7 of this Cumulative Dissertation (Paper in the Submission Process)**

<b>Reference</b>	Gebken, L., Jacobs, M., Drews, P., Schirmer, I. and Drechsler, A. (2023, in second round of revisions, accept with major revisions)  ‘Value-sensitive action design research: Improving the consideration and traceability of values in design decisions’, Scandinavian Journal of Information Systems.
<b>Ranking</b>	VHB-JOURQUAL3: C
<b>Type</b>	Completed research paper
<b>Editors</b>	Sune D. Müller, University of Oslo Henri Pirkkalainen, Tampere University Elena Parmiggiani, NTNU Olgerta Tona, University of Gothenburg
<b>Methodology</b>	ADR including the following steps: interviews, focus groups, a document search (evaluation of other apps for homeless neighbors), a systematic literature search, collaboration and observation, a survey with qualitative & quantitative questions, prototyping, VSD (technical, conceptual, and empirical investigation), and a decision log based on the weekly protocols of the project team.
<b>Research question</b>	How can action design research be extended to support researchers and practitioners in value-sensitive decision-making and development?
 <b>Research contributions</b>	The core contribution of this article is the extension of ADR to the VSD approach. The focus is the concrete steps in the research process to support researchers in making their research more responsible. The value-sensitive decision log was developed as a concrete tool for documentation and reflection.
<b>Co-authors contributions</b>	This article was revised in many iterations together with my co-authors Mattis Jacobs, Paul Drews, and Ingrid Schirmer. In the process, Mattis Jacobs strengthened the VSD knowledge and wrote the paragraph on VSD and, like Paul Drews and Ingrid Schirmer, supported me with regular feedback loops. Through another round of reviews, Andreas Drechsler joined as a co-author. He helped in particular with the final revision with regard to the structure and the proofreading.

## 7 Theoretical Contributions

This chapter reflects on the theoretical contribution and is divided into two sections. The first section describes the contribution in accordance with the reflected research questions, and the second section discusses the further overarching contributions to DSI, VSD, and research with marginalized people.

### 7.1 Contributions to the Reflected Research Questions

In this section, the dissertation's contribution to knowledge is presented based on the RQs outlined in Chapter 1, Section 1.2. To achieve this, I reflected on and categorized the individual knowledge chunks of my papers according to their KTs (Raabe et al., 2021; Raabe et al., 2023), as described in the research journey (see Chapter 5).

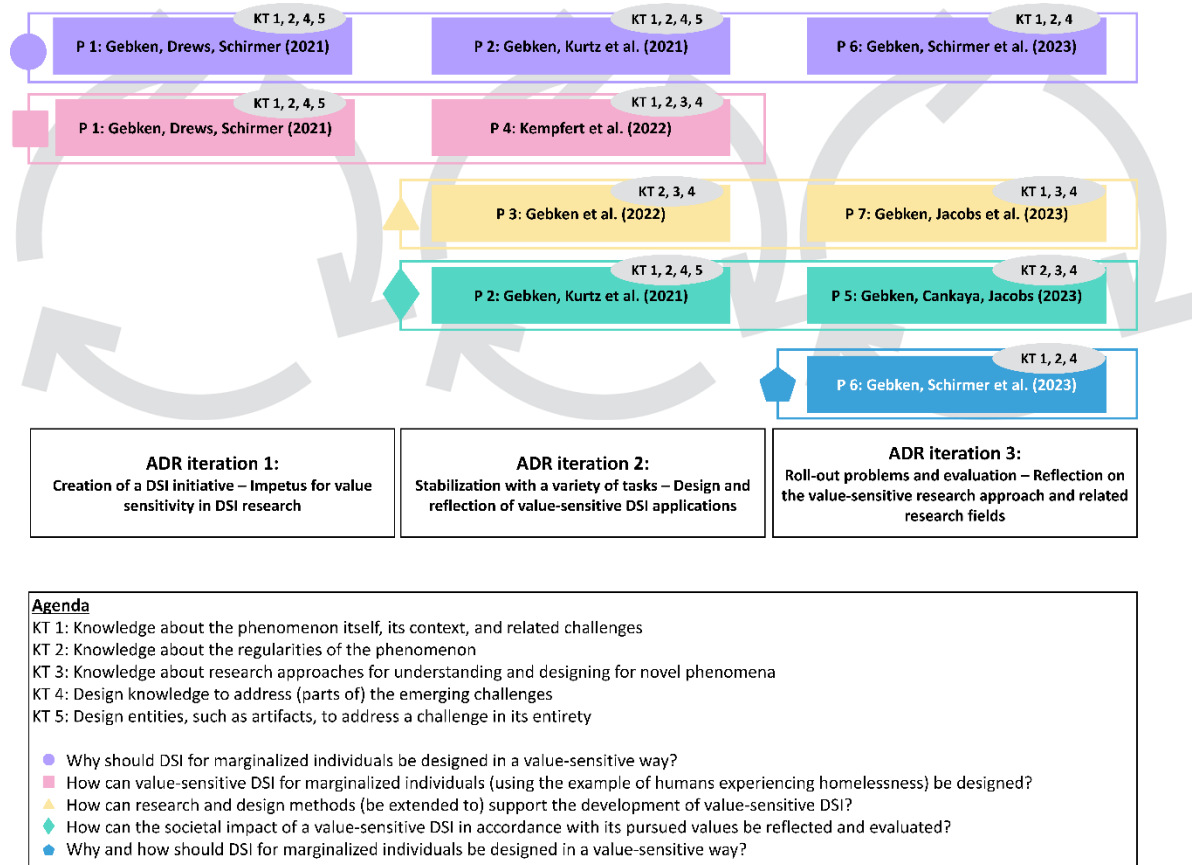
The resulting overarching summary of this reflection phase is presented in Figure 7.1. For each RQ (represented by symbols and colors) and each paper (P), the KTs generated in which ADR iteration are illustrated. The KTs were introduced in Chapter 4, Subsection 4.1.2.4. Papers 1, 2, and 6 are listed twice since they contribute to two RQs.

In summary, the figure clarifies when the RQs were tackled. The question of why DSIs should be designed to be value-sensitive (see Figure 7.1, purple/circle) and how they should be designed was predominant (indirectly) from the outset (see Figure 7.1, pink/square). In contrast, RQs 3 (see Figure 7.1, yellow/triangle) and 4 (see Figure 7.1, green/trapezoid) arose somewhat later in detail (from iteration 2), with questions about the selection of the design methods and the expansion of the scientific methods, as well as the questions of reflection and evaluation of DSI for marginalized people. The overall results were summarized in the form of a research agenda on why and how to develop value-sensitive DSI in iteration 3 (see Figure 7.1, blue/pentagon).

At the same time, Figure 7.1 shows that the first RQ on why DSI should be designed in a value-sensitive way was addressed in all three ADR iterations, albeit indirectly in Papers 1 and 2, as described in the research journey (see Chapter 5). Additionally, the figure indicates that the RQs were introduced in one iteration and revised in a later iteration. Revisions usually took place from a more abstract perspective (e.g., for RQ 3, the design methods were considered in Iteration 2 and the research methods in Iteration 3).



It is vital to note that KT1 and 2, which refer to knowledge about the phenomenon, were often used as the basis for the design-oriented outcomes in the papers and were rarely the core results of the papers themselves. The different KT1s are generally presented in a balanced ratio throughout the various iterations and papers.



**Figure 7.1. Knowledge Types of each Paper Sorted by the Action Design Research Iterations and Reshaped Research Questions**

*Note.* ADR = action design research; DSI = digital social innovation; KT = knowledge type; P = paper.

Figure 7.1 is based on an analysis of the knowledge chunks and their KT1s in each paper. The following five subsections provide a detailed decomposition of the KT1s and associated explicit knowledge chunks. For this purpose, the knowledge chunks were categorized according to the KT1s for each reflected RQ and the corresponding papers. Furthermore, the knowledge chunks of the corresponding papers are discussed according to the current state of research, and the core results are shown as examples.

### **7.1.1 Connection between Digital Social Innovation and Value Sensitive Design Research**

The first research aim was to establish a link between DSI and VSD research and thus answer the RQ of “Why should DSI for marginalized individuals be designed in a value-sensitive way?” As mentioned in the research journey (see Chapter 5), this goal and question emerged implicitly through daily project work (Gebken, Drews, Schirmer, 2021; Paper 1). It was further elaborated in Paper 2 (Gebken, Kurtz et al., 2021) through a deeper understanding of how values are inscribed in DSI ecosystems and completed with an explicit examination in Paper 6 (Gebken, Schirmer et al., 2023).

The knowledge chunks relevant to this RQ are highlighted in bold in Figure 7.2. In particular, they represent a knowledge gain for phenomenon knowledge. Papers 1, 2, and 6 address two RQs, resulting in additional knowledge chunks. These are described in detail in Subsections 7.1.2, 7.1.4, and 7.1.5 and listed in Figure 7.2 for completeness.

The core results of this RQ are briefly outlined below.

The argumentation as to why a DSI should be designed to be value-sensitive in particular (see Figure 7.2, KT 1, DSI in the need for value sensitivity) has already been outlined in Chapter 2. I explain this in more detail below as the first theoretical contribution of my dissertation.

During my thesis, I discovered that the impression of solutionism can arise quickly in the DSI field (Morozov, 2014; Terstriep et al., 2020). This refers to the belief and assertion that a complex problem can be fully resolved through a (technical) innovation. Our research shows how important it is to be aware of the limitations and impacts of DSI work and to recognize that DSI teams can only make a certain contribution to a complex problem like homelessness (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021). For instance, the OpenStreetPay team aims to assist people experiencing homelessness with digital donations to help them meet their daily needs. However, it is imperative to acknowledge the necessity and significance of a long-term solution to address homelessness at the governmental and institutional levels (Gebken, Kurtz et al., 2021).

While teams may be aware of the limitations of their DSI, ethical challenges can still arise, particularly when working with marginalized individuals (Hota et al., 2023; Qureshi et al., 2021). In our initial project, numerous ethical challenges arose during the daily project work. For instance, we encountered questions about what goods and services a person experiencing

Research question	Paper no.	Knowledge contribution and types					
		Phenomenon-/Ω-knowledge		Design-/λ-knowledge			
		Knowledge type 1	Knowledge type 2	Knowledge type 3	Knowledge type 4	Knowledge type 5	
Why should DSI for marginalized individuals be designed in a value-sensitive way?	P 1	DSI in the need for value sensitivity	Overview of 23 existing DSIs to assist humans experiencing homelessness	Understanding of societal challenges related to homelessness, ecosystem actors, and requirements for DSI		Design principles for value-sensitive DSI to support humans experiencing homelessness	Ecosystem-based concept guided by values
	P 2		Identified limitations of value traceability	Understanding and reflecting on the influence of values on various levels of a co-created DSI ecosystem		Multi-level framework for human value-oriented DSI ecosystems	
	P 6		Definition of value-sensitive DSI	Requirements for research with marginalized individuals		Research agenda for value-sensitive DSI	

**Figure 7.2. Knowledge Chunks of the Connection between Digital Social Innovation and Value Sensitive Design Research (Research Question 1)**

*Note.* DSI = digital social innovation; P = Paper

homelessness is permitted to purchase with donated money (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021).

The DSI team's assessment and engagement with these ethical issues is particularly significant because it "might impact their social mission, operations, and the most marginalized stakeholders" (Hota et al., 2023, p. 3). Thus, the lack of attention to ethical issues could, among other things, indirectly inscribe the hidden values of the various stakeholders, as well as those of the DSI team. The inscription of these values could, for example, lead to biases and prejudices that unconsciously influence the development and application of the DSI (Friedman and Hendry, 2019). Despite this obvious need, it has so far received little attention in DSI research (Hota et al., 2023; Qureshi et al., 2021).

To meet this responsibility of DSI development and not do more harm than good, especially when working with marginalized people, value sensitivity was therefore considered central, and consequently VSD was included as a research area for this dissertation (Chowdhury, 2022; Hota et al., 2023; Le Dantec, 2011; World Medical Association, 2022). This should help ensure that ethical issues be detected, addressed, and hopefully even resolved (Gebken, Schirmer et al., 2023).

The far-reaching influence of values on the design of a DSI application was developed together with my co-authors (Gebken, Kurtz et al., 2021) using the example of OpenStreetPay and thus further substantiated the argument (see Figure 7.2, KT 2, Understanding and reflecting on the influence of values on various levels of a co-created DSI ecosystem). Paper 2 addresses ethical issues, such as what people can buy with donated money. In this context, the OpenStreetPay team prioritized the values of autonomy and freedom from bias and wanted to promote them in the design. This had far-reaching consequences for the design. The corresponding example is shown in

Table 7.1 and illustrates the influence of the values (macro level), on the value-sensitive DSI application level (meso level) in addition to the individual action options of individual persons (micro level). A detailed description can be found in the corresponding publication.

**Table 7.1. Excerpt from the Paper 2 (Gebken, Kurtz et al., 2021): Exemplary Value Discussion and Inscription**

#	Macro level	Addressed value according to Friedmann and Hendry (2019)	Meso level	Micro level	Co-creator	Methods
2	Reach out. Small amounts of money make everyday life easier for our homeless neighbors. We enable self-responsible care.	Freedom from bias, autonomy	No restriction on SmallChange Card and information for donors to reduce stigmas about alcoholism and/or drug use	No restrictions on the purchase of goods for homeless neighbors Willingness to donate despite autonomy for donors Briefing of volunteers and employees of homeless aid organizations Briefing of partner shop employees Open communication [with] all stakeholder groups via app/website, etc.	Homeless aid organizations, donors, homeless neighbors, lawyers, project team	Acceptance test, interviews

The connection of the two fields DSI and VSD, also resulted in a definition of value-sensitive DSI applications (Gebken, Schirmer et al., 2023; Figure 7.2, KT 1, Definition of value-sensitive DSI). Thereby, we defined value-sensitive DSIs as follows:

*...[d]igital-based ways of addressing societal challenges. In order to improve the well-being of living beings in the long term and to gradually make the world a better place, they must be designed responsibly through the collaboration of many actors, taking into account stakeholders, values and value conflicts - especially those of the most vulnerable. Collaboration is characterized by the constant alignment of (shared) values, technology, and stakeholders according to the resources available in the design process.*<sup>13</sup> (Gebken, Schirmer et al., 2023, p. 11)

<sup>13</sup>The definition is adapted from Friedman and Hendry (2019) and Bria et al. (2015).

By connecting the two fields of VSD and DSI in response to the need for value-sensitive DSI development, I aim to leverage the strengths of both fields. The DSI field provides a clear direction or goal, namely, to address societal challenges with digital technologies (Bria et al., 2015; Qureshi et al., 2021), and the field of VSD offers stimuli for how to responsibly design the path to this goal (Friedman and Hendry, 2019).

### **7.1.2 Design Principles for Value-Sensitive Digital Social Innovation to Support Humans Experiencing Homelessness**

The second RQ, “How can value-sensitive DSI for marginalized individuals (using the example of humans experiencing homelessness) be designed?” led to the development of design principles for value-sensitive DSI to support humans experiencing homelessness.

In the course of the paper, a large number of knowledge chunks were developed (see Figure 7.3). As noted, this RQ focuses on the design principles and their revisions (highlighted in bold in the figure). The design principles represent design knowledge to address (parts of) the emerging challenges. They were refined in three iterations. Paper 1 (Gebken, Drews, Schirmer, 2021) contains the first iteration of the design principles based on the knowledge of the ADR project. As an intermediate step before publication, the design principles of the second iteration were developed but not published in a paper. In Paper 4 (Kempfert et al., 2022) the design principles of the third iteration are described based on the findings of the ADR project and on phenomenon knowledge from a meta-study of 118 DSIs seeking to support humans experiencing homelessness. In the following paragraphs, I briefly discuss the different knowledge chunks and outline the design principles of the third iteration.

At the beginning of my research, I realized that there was little knowledge in IS research about digital support for people experiencing homelessness. Therefore, I conducted a literature analysis based on the results from different relevant research fields (e.g., psychology, social sciences, human–computer interaction, VSD, and DSI) (see Figure 7.3, KT 2, (Deepened) understanding of societal challenges related to homelessness, ecosystem actors, and requirements for DSI). Initial insights were already available in the fields of VSD, human–computer interaction, and the social sciences. These studies show what needs to be considered when digitizing for people experiencing homelessness, what can lead to the termination of DSI projects with people experiencing homelessness, what criteria can be used to evaluate an application, and what collaborative development with marginalized people can

look like (Burrows, Mendoza et al., 2019; Le Dantec, 2011; Sowa, 2019; Sowa et al., 2020; Whittle et al., 2020).

However, there was a particular lack of information about what is critical when designing an application for people experiencing homelessness. Therefore, with my co-authors (Gebken, Drews, Schirmer, 2021), I reflected on the ecosystem-based concept guided by the values of OpenStreetPay (see Figure 7.3, KT 5, Ecosystem-based concept based on values). The reflection then led to an abstraction of the knowledge in the form of the design principles for the design of value-sensitive DSIs for humans experiencing homelessness (Gebken, Drews, Schirmer, 2021).



Research question	Paper no.	Knowledge contribution and types							
		Phenomenon-/Ω-knowledge		Design-/λ-knowledge					
		Knowledge type 1	Knowledge type 2	Knowledge type 3	Knowledge type 4	Knowledge type 5			
How can value-sensitive DSI for marginalized individuals (using the example of humans experiencing homelessness) be designed?	P 1	DSI in the need for value sensitivity	Overview of 23 existing DSI to assist humans experiencing homelessness	Understanding of societal challenges related to homelessness, ecosystem actors, and requirements for DSI ↓ Deepened understanding of societal challenges related to homelessness, ecosystem actors, and requirements for DSI	Criteria for the evaluation of DSIs supporting humans experiencing homelessness and results of the analysis	Different research approaches to study 118 DSI applications	Methodical approach to generalize design principles with PDR knowledge	Design principles for value-sensitive DSI to support humans experiencing homelessness	Ecosystem-based concept guided by values
	P 4		Overview of 118 existing DSI to assist humans experiencing homelessness					Refined design principles for value-sensitive DSI to support humans experiencing homelessness	

**Figure 7.3. Knowledge Chunks of Design Principles for Value-Sensitive Digital Social Innovation to Support Humans Experiencing Homelessness (Research Question 2)**

*Note.* DSI = digital social innovation; P = Paper; PDR = phenomenon-driven research.

However, since the design principles were developed on the basis of only one project, it was necessary to generalize them (Raabe et al., 2023; Vom Brocke et al., 2020). We carried out the generalization in the research team by first conducting a meta-study of 118 applications (see Figure 7.3, KT 1) and deriving design principles from it (Iteration 2). The design principles of the second iteration were then compared with the design principles of the first iteration, and in combination, they formed the design principles of the third iteration (Kempfert et al., 2022). The design principles of the third iteration were as follows:

*Design Principle 1: For DSI initiatives, it is important to include (an awareness of) values in the development process to make them explicit, consider the downsides directly, and design the solution according to the values.*

*Design Principle 2: Because DSIs for homeless neighbors are a very sensitive transformation of social practice, it is important for DSI initiatives to include vulnerable people in the design and development process to create solutions that fit their requirements and support their willingness to use the DSI.*

*Design Principle 3: To counter stigmatization, DSI teams should always be careful to see humans as such and represent them as humans in their solution. Both direct and indirect stakeholders should be considered equally, and the understanding of their living circumstances is important.*

*Design Principle 4: Trust in the DSI is very important, as some stakeholders are under time pressure and suffer from stress. For this reason, DSI initiatives should avoid mistakes and provide important (meta) information.*

*Design Principle 5: DSIs are solutions that go beyond software to make them accessible to all users, DSI initiatives should analyze barriers to use, especially by considering potential physical and psychological issues.*

*Design Principle 6: It is important for DSI teams to consider the local and cultural context within the DSI to incorporate life circumstances, shared understanding of values, and legal frameworks, where applicable, to adapt the solution to the context.”*  
(Kempfert et al., 2022, pp. 7–11)

The derivation of the design principles and the approach of the meta-study (KT 3), the evaluation criteria developed and applied therein (KT 2), and the findings from the meta-study (KT 1) represent separate knowledge chunks, as shown in Figure 7.3. The details can be found in Paper 4.

### **7.1.3 Value Sensitivity in Research and Design Methods**

For the third RQ, “How can research and design methods (be extended to) support the development of value-sensitive DSI?,” I aimed to reflect on the approach at both the design and research methods levels and thus provide knowledge for future projects for a responsible approach. To this end, different knowledge chunks were extracted (see Figure 7.4).

The main result for the research methods is the extension of ADR tasks to include VSD and other aspects relevant to value-sensitive DSI in the form of knowledge about research approaches for understanding and designing for novel phenomena (see Figure 7.4, KT 3, Extension of ADR tasks to include VSD aspects). This result is supplemented with a practical tool (the value-sensitive decision log) for use in research (see Figure 7.3, KT 4, Extended decision log by values, architectural layers, and project management aspects). The main result for the design methods is the design principles for the selection and adaptation of methods for DSIs, which can be understood as design knowledge to address (parts of) the emerging challenges (see Figure 7.4, KT 4) and are intended to help ADR researchers and practitioners in particular. The findings are tailored to teams with a grassroots character who want to address societal challenges responsibly.

The need for a deeper understanding of the methodological approach emerged, as the objective of DSI research is based in particular on the results of or ideas for improving societal problems, and the path to impactful DSI often seems to remain open. Therefore, practitioners and researchers must design and follow this path independently, without drawing on the findings of already successful teams (Karanasios and Slavova, 2019; Qureshi et al., 2021).

Research question	Paper no.	Knowledge contribution and types							
		Phenomenon-/Ω-knowledge		Design-/λ-knowledge					
		Knowledge type 1		Knowledge type 2	Knowledge type 3		Knowledge type 4		Knowledge type 5
How can research and design methods (be extended to) support the development of value-sensitive DSI?	P 7	Identified limitations of ADR in regard of values and VSD	Identified limitations of value traceability		Different research approaches to create descriptive and prescriptive knowledge	Extension of ADR tasks to include VSD aspects	Extended decision log by values, architectural layers, and project management aspects	Design principles for a value-sensitive decision log	
	P 3			Tasks of a value-sensitive DSI team (exemplary)	Way to proceed to develop a value-sensitive DSI; combination of VSD/DSI/IS methods	Connection of VSD/DSI/IS methods	Design principles for the selection and adaptation of methods for DSIs		

**Figure 7.4. Knowledge Chunks of Value Sensitivity in Research and Design Methods (Research Question 3)**

*Note.* ADR = action design research; DSI = digital social innovation; IS = information systems; P = Paper; VSD = value sensitive design

As described in the research journey (see Chapter 5), Keijzer-Broers and Reuver (2016) outlined the first design principles for ADR projects for societally relevant projects and set the goal of contributing to society in addition to describing scientific findings through design-oriented research. In doing so, they laid the foundation for socially oriented projects in ADR research and made it clear that these are more than just IT-dominant or organization-dominant projects (Keijzer-Broers and Reuver, 2016; Sein et al., 2011).

To do justice to the responsibility of researching and developing a DSI, it is therefore necessary to take a more comprehensive look at the path of technology design. Since this is addressed and achieved by the field of VSD, among others, the need to draw on this field has already been recognized in the IS field, and more responsible design-oriented research has been called for (Benke et al., 2020; Schuppan and Köhl, 2017). My and my co-researchers' work (Gebken, Jacobs et al., 2023) has emphasized this and developed concrete contributions in the form of the expansion of ADR tasks and the value-sensitive decision log.

The contribution of my dissertation in this regard is to combine the ADR and VSD approaches by adding VSD- and DSI-relevant tasks to the ADR research approach (see Table 7.2). The supplemented tasks along the four ADR stages are shown in italics in Table 7.2. The extensions are based among others on a value-sensitive decision log that I developed together with my OpenStreetPay team as a tool for documenting decisions in projects in relation to values (Gebken, Jacobs et al., 2023). In the long term, these extensions should help increase the traceability of values (Mougouei et al., 2018; Perera, 2019) and thus strengthen the less researched technical investigation of VSD (Gerdes and Frandsen, 2023; Winkler and Spiekermann, 2018).

**Table 7.2. Extended and Modified Tasks in each Action Design Research Stage for Achieving Value Sensitivity. (Gebken, Jacobs et al., 2023; Under Review)**

<p><b>Tasks in problem formulation</b></p> <p>(1) <i>Identify societal problem(s)</i></p> <p>(2) Identify and conceptualize the research opportunity</p> <p>(3) Formulate the initial research questions</p> <p>(4) <i>Reflect on the ethical impact of the research question(s) and societal need</i></p> <p>(5) Cast the problem as an instance of a class of problems</p> <p>(6) Identify contributing theoretical bases and prior <i>societal and</i> technology advances</p> <p>(7) Secure long-term organizational commitment</p> <p>(8) Set up roles and responsibilities</p>
<p><b>Tasks in building, intervention, and evaluation (BIE)</b></p> <p>(1) Discover initial knowledge-creation target</p> <p>(2) Select or customize the BIE form: IT-dominant, organization-dominant, or <i>societal-dominant</i></p> <p>(3) <i>Understand stakeholder values and elicit shared values</i></p> <p>(4) Execute BIE cycle(s) <i>while considering values and documenting decisions and value relations with the value-sensitive decision log</i></p> <p>(5) Assess need for additional cycles, repeat</p>
<p><b>Tasks in reflection and learning</b></p> <p>(1) Reflect on the design and redesign during the project</p> <p>(2) <i>Reflect on the value influence in decision-making based on value-sensitive decision log documentation</i></p> <p>(3) Evaluate adherence to principles</p> <p>(4) Analyze intervention results according to stated goals, <i>values, and societal impact</i></p>
<p><b>Tasks in formalization of learning</b></p> <p>(1) Abstract the learning into concepts for a class of field problems</p> <p>(2) <i>Reflect on the value influence on the concepts for a class of field problems</i></p> <p>(3) Share outcomes and assessment with practitioners <i>and stakeholders</i></p> <p>(4) Articulate outcomes as (<i>value-laden</i>) design principles</p> <p>(5) Articulate learning in light of theories selected</p> <p>(6) Formalize results for dissemination</p>

*Note.* Based on Sein et al. (2011); changes indicated in italics

From the design method perspective, the theoretical contribution lies in reflecting on which tasks the OpenStreetPay project team had to master and which combined methods from different areas we used to solve them as a team (see Figure 7.3, KT 2 and 3). Existing catalogs of methods for social innovation (Komatsu et al., 2016; Spila et al., 2016), VSD (Friedman et al., 2017), and design methods (Kumar, 2013), which can help in mastering the tasks, were previously available independently. Accordingly, the combination of these methods represents a further contribution to knowledge of this dissertation (see Figure 7.4, KT 3, Connection of VSD/DSI/IS methods).

The lessons learned were used to strengthen method selection and adaptation for value-sensitive DSIs on an abstract level in the form of design principles. With these design principles, we supplement existing work, such as method catalogs, which provide good overviews of the basic content and nature of the methods, with knowledge of what needs to be considered in particular when selecting and adapting methods for value-sensitive DSI teams using and combining different method catalogs (see Figure 7.4, KT 4). The design principles are as follows (Gebken et al., 2022, pp. 6925–6930):

*Design Principle 1: Allow autonomy in method selection*

*Design Principle 2: Investigate and understand the interrelationships of the methods*

*Design Principle 3: Select the right point in time for the value discussion (not too early, not too late)*

*Design Principle 4: Address the diversity of tasks and responsibilities by selecting different IS, DSI[, ] and VSD methods*

*Design Principle 5: Evaluate methods based on their ethical properties*

*Design Principle 6: Integrate values into methods that do not capture any value perspective or choose VSD method alternatives instead*

*Design Principle 7: Open higher-level “method frames” (such as design thinking) for VSD methods and make them value[-]sensitive*

*Design Principle 8: Repetitively discuss value inscription during intermediate versions of the prototype and challenge core values if necessary*

*Design Principle 9: Include new tasks for ethical consideration of values in[] the DSI design process*

*Design Principle 10: Include methods for analysis and understanding of the ecosystem for long-term anchoring.*

*Design Principle 11: Provide an integrated digital tool infrastructure for supporting the use of methods*

*Design Principle 12: Apply methods according to achieve “progress, not perfection” (Friedman and Hendry, 2019, p. 6)”*

The derivation of the design principles and their descriptions can be found in detail in Paper 3 (Gebken et al., 2022).

#### **7.1.4 Reflection and Evaluation of Value-Sensitive Digital Social Innovation for Marginalized Individuals**

In this section, with the aim of strengthening the reflection and evaluation of value-sensitive DSI for marginalized people, I address the fourth RQ, “How can the societal impact of a value-sensitive DSI in accordance with its pursued values be reflected and evaluated?”

The knowledge chunks developed in the course of writing the research papers in relation to this RQ are shown in Figure 7.5. The core findings for this RQ are shown in bold in the figure.

As a main finding, we, as researchers (Gebken, Kurtz et al., 2021) developed a multilevel framework for human value-oriented DSI ecosystems (see Figure 7.5, KT 4) to answer the RQ related to reflection. In addition, we complemented the knowledge on the evaluation of value-sensitive DSI applications with lessons learned from the evaluation of OpenStreetPay (Gebken, Cankaya, Jacobs, 2023; see Figure 7.5, KT 4). In the remainder of this section, the knowledge chunks and key findings are discussed in more detail.

Reflection on technologies is an elementary component of VSD research (Friedman and Hendry, 2019). Various models are available in research for this purpose, such as the action–reflection model, according to Yoo et al. (2013). Reflection is also an important part of DSI research (Eckhardt et al., 2021). However, reflection is often implemented from the external perspective of a DSI, such as through a model that considers the co-creation of a DSI ecosystem (Eckhardt et al., 2021).



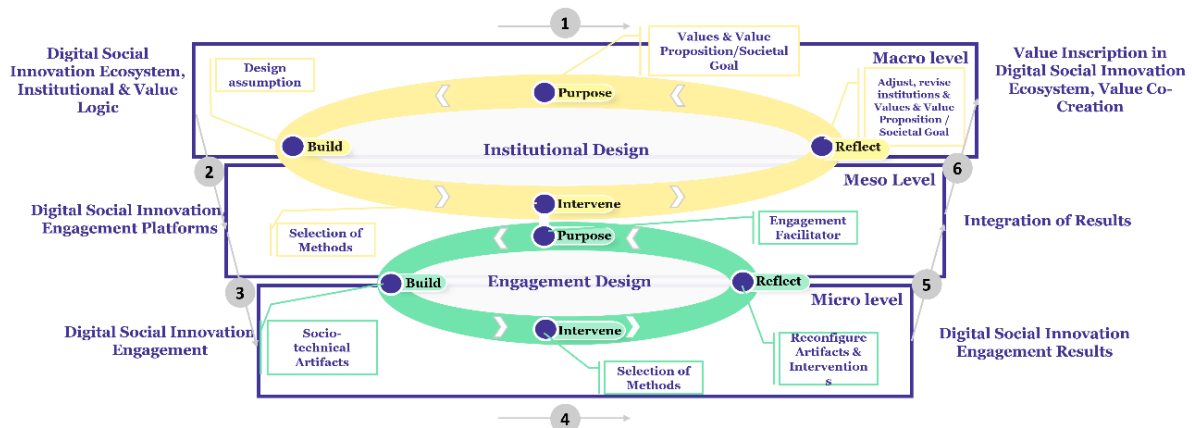
Research question	Paper no.	Knowledge contribution and types						
		Phenomenon-/Ω-knowledge		Design-/λ-knowledge				
		Knowledge type 1	Knowledge type 2	Knowledge type 3	Knowledge type 4	Knowledge type 5		
How can the societal impact of a value-sensitive DSI in accordance with its pursued values be reflected and evaluated?	P 2	DSI in the need for value sensitivity	Identified limitations of value traceability	Understanding and reflecting on the influence of values on various levels of a co-created DSI ecosystem		Multi-level framework for human value-oriented DSI ecosystems		Demonstration: Ecosystem engagement concept of the DSI guided by values
	P 5			Criteria to evaluate value-sensitive DSI with humans experiencing homelessness	Procedure of evaluation for value-sensitive DSI	Lessons learned for the value-sensitive DSI concept & ecosystem	Lessons learned for the evaluation approach with marginalized individuals	

**Figure 7.5. Knowledge Chunks of Value-Sensitive Digital Social Innovation for Marginalized Individuals (Research Question 4)**

*Note.* DSI = digital social innovation; P = Paper

The existing DSI and VSD research has lacked the possibility to reflect on value inscription at different levels of abstraction (macro, meso, and micro) of a value-sensitive DSI ecosystem. Therefore, we, as researchers (Gebken, Kurtz et al., 2021), used knowledge from service science (Grotherr et al., 2018; Grotherr et al., 2020; Storbacka et al., 2016) and thus sharpened the understanding and reflection of the influence of values at different levels of a co-created DSI ecosystem (see Figure 7.5, KT 2).

The core contribution of my research to reflection is the development and provision of a multilevel framework for human value-oriented DSI ecosystems (see Figure 7.6, KT 4). This framework is tailored to the reflection needs of design-oriented value-sensitive DSI projects and has been demonstrated using the example of OpenStreetPay (see Figure 7.5, KT 5). In future, the framework should help value-sensitive DSI researchers reflect on their actions and those of their value-sensitive DSI team in light of social impact and responsibility (Gebken, Kurtz et al., 2021).



**Figure 7.6. Multilevel Framework for Human-Value-Oriented DSI Ecosystems. Adapted from Grotherr et al. (2018); Grotherr et al. (2020); Storbacka et al. (2016)**

To strengthen the multilevel framework for human value-oriented DSI ecosystems, the OpenStreetPay concept was evaluated through an intervention and reflection (see Figure 7.6) with people experiencing homelessness. This was intended to take into account the perspectives of people experiencing homelessness and, at the same time, to reflect on whether the values of OpenStreetPay have been inscribed and whether the value-sensitive DSI concept has a positive impact on their living situations.

Drawing on knowledge from research, the OpenStreetPay team undertook the evaluation. To ensure that the perspectives of people experiencing homelessness could be taken into account in the design. The focus was on dealing with marginalized people and responsibly (see Figure 7.5, KT 3) and on what criteria could be used to evaluate a value-sensitive DSI application (see Figure 7.5, KT 2). Knowledge from VSD, DSI, participatory design, and research ethics guidelines was used for this purpose (Aldridge, 2019; Chowdhury, 2022; Le Dantec, 2011; Salazar and Abrams, 2005; World Medical Association, 2022).

As a central finding of Paper 5 (Gebken, Cankaya, Jacobs, 2023), the evaluation derived initial lessons learned for designing value-sensitive DSI applications (see Figure 7.5, KT 4), and the lessons learned were discussed in light of values. For example, after the intervention and reflection with people experiencing homelessness, it became clear that the need for autonomy, in the form of the independent ability to check their account balance, was present among the participants and needed to be taken into account in the OpenStreetPay concept.

In addition, during the reflection, we developed lessons learned from the evaluation with marginalized people (see Figure 7.5, KT 4). These are intended to support future value-sensitive DSI teams when evaluating marginalized people. For example, we have shown that the option of supervision within the team should be considered in a timely manner. A detailed description of the lessons learned can be found in Paper 5.

### **7.1.5 Research Agenda for the New Research Field of Value-Sensitive DSI for Marginalized Individuals**

As part of the last and fifth RQ, I addressed the question of “Why and how should DSI for marginalized individuals be designed in a value-sensitive way?” with the research goal of outlining a research agenda for the new research field of value-sensitive DSI for marginalized individuals. This RQ supplements the first RQ with the “how” in the form of a research agenda (see Figure 7.7, KT 4). The research agenda’s structure is based on the topics and results presented in this dissertation and has been expanded to include additional topics relating to marginalized individuals and research conditions.

This research agenda is intended to lay the foundation for a new research field of value-sensitive DSI, especially for marginalized people. The research agenda takes a clear and transparent position on design-oriented and activist research (Taylor, 2023). In addition, by combining design-oriented and activist research, we (Gebken, Schirmer et al., 2023) emphasize the contribution to society by looking at the limits of value-sensitive DSI, thus

initiating a reflection on implicit solutionism of the researchers and thus demanding taking a position (Morozov, 2014; Terstriep et al., 2020).

As entering a new field of research, such as VSD, can be challenging (Winkler and Spiekermann, 2018), a research agenda can help by providing RQs (Gebken, Schirmer et al., 2023; Vial, 2021). As Hoang Thuan et al. (2019, p. 2) note, “Posing research questions is a fundamental step to guide and direct knowledge development in research.”

For the development of the research agenda, my co-authors and I initially took the requirements for research with marginalized individuals (see Figure 7.7, KT 2) from various research fields: participatory design (Aldridge, 2019; Chowdhury, 2022; Salazar and Abrams, 2005) and ethical guidelines from research ethics (German Informatics Society, 2018; World Medical Association, 2022). This knowledge was incorporated into the structure, focus areas, and questions of the research agenda and supplemented the knowledge from the VSD (Friedman et al., 2017; Friedman and Hendry, 2019; Simon, 2016) and DSI (Buck et al., 2020; Qureshi et al., 2021) fields.

As a theoretical contribution, the research agenda is intended to help researchers tackle the problems of marginalized people in a systematically and attentively, thus placing the addressing of problems at the center of their actions and research without claiming that a value-sensitive DSI application solves a complex social problem merely through a technology.

The research agenda contains four dimensions: (i) reflective value-sensitive goal-setting, (ii) an extended research method and shaping of research conditions, (iii) consideration of stakeholder values and possible discrimination, and (iv) value-sensitive DSI development. In particular, dimension (ii) represents an extension of the topics already discussed here, as the research conditions in particular must also be addressed to enable responsible research in the first place. For each dimension, three in-depth research topics and questions are listed, which are supported by the relevant literature (Gebken, Schirmer et al., 2023). Further details of the research agenda can be found in Appendix A.1.

Research question	Paper no.	Knowledge contribution and types						
		Phenomenon-/Ω-knowledge		Design-/λ-knowledge				
		Knowledge type 1	Knowledge type 2	Knowledge type 3	Knowledge type 4	Knowledge type 5		
Why and how should DSI for marginalized individuals be designed in a value-sensitive way?	P 6	DSI in the need for value sensitivity	Definition of value-sensitive DSI	Requirements for research with marginalized individuals			Research agenda for value-sensitive DSI	

**Figure 7.7. Knowledge Chunks of the Research Agenda for the New Research Field of Value-Sensitive Digital Social Innovation for Marginalized Individuals (Research Question 5)**

*Note.* DSI = digital social innovation; P = Paper

## **7.2 Overall Theoretical Contributions**

In this section, I return to the overarching theoretical contributions of my research. The focus here is on the three main areas of my work: DSI, VSD, and working with marginalized people. The findings are essentially interwoven with the findings of the RQs described above. This section is intended to summarize my research's overarching classification in the respective research fields.

### **7.2.1 Contributions to Digital Social Innovation Research**

As a key contribution to DSI research, I add knowledge of values and value-sensitive design of technologies and thus contribute to the responsible design of DSI. This is reflected in the results described in Section 7.1 by (1) developing an argumentation and definition for value-sensitive DSI applications, (2) deriving design principles for the design of value-sensitive DSI applications for marginalized people, especially for people experiencing homelessness, (3) reflecting on and expanding the approach to research and design methods for value-sensitive DSI applications, (4) gaining insights for reflecting on and evaluating value-sensitive DSI for marginalized people, and (5) setting a research agenda and thus laying the foundation for a separate research field.

In the following, I return to the theoretical contributions, particularly from the perspective of the IS field (see Subsection 7.2.1.1) and the as yet little investigated connections between design principles and values (see Subsection 7.2.1.2). These two topics have not yet been explicitly addressed in the answers to the RQs.

#### *7.2.1.1 Specific Contribution to Barely Acknowledged SDGs in IS Research*

Six of the seven papers included in this dissertation have been published in the field of IS research. The urgent need for IS research to take action and make its contribution to the SDGs is shown by Leong et al. (2020). However, there are still too few researchers in the IS field who clearly position themselves with regard to the relevance of the SDGs to their research (Hasan et al., 2017), thus aligning their interests in research with the SDGs and contributing to them (Leong et al., 2020).

Leong et al. (2020) identified 58 studies from the IS field that contribute to the SDGs. Among these 58 studies, only 5 studies chose a mixed-methods approach, as we as researchers did, and only 3 studies addressed poverty at a thematic level.

With my work, I am thus contributing to IS research by providing different perspectives on a value-sensitive DSI application for marginalized people, using the example of a societal challenge and a specific project. In addition to the design perspective, the focus of my dissertation is also on the methodological perspective, which has been less researched in the DSI field to date. In particular, I achieve this by drawing on knowledge from the VSD research field and strengthening accountability through the explicit examination of values (Friedman and Hendry, 2019; Simon, 2016).

However, it should be emphasized, as described at the beginning of Chapter 2, that DSI research is a multidisciplinary field of research. My research is not limited to the body of knowledge of IS research. Rather, from the beginning, I considered different fields of research in which research on DSI but also VSD is being conducted. Thus, the contribution of my dissertation is relevant not only to the IS field but also to the multidisciplinary fields of DSI and VSD research.

#### *7.2.1.2 Intertwining Design Principles and Values*

Design principles are a common tool for providing problem-solving knowledge for other projects—in this case, value-sensitive DSI projects for marginalized people (Sein et al., 2011; Chapter 4, Subsection 4.1.2.4). The fundamental question of how values and design principles relate to each other remains open (Purao and Wu, 2013).

My dissertation illustrates the still open relationship between design principles and values. Within the three ADR iterations, three groups of design principles were developed for three different thematic fields (the design of value-sensitive DSI applications, the method selection and adaptation, and the value-sensitive decision log) (Gebken et al., 2022, 2021; Gebken, Jacobs et al., 2023; Kempfert et al., 2022). These design principles represent different relationships to the values.

As I would like to emphasize, my research highlights two perspectives on the relationship between design principles and values that have already been identified in research. On the one hand, values are inscribed in the design principles by implicitly or explicitly naming and addressing them (Purao and Wu, 2013), and, on the other hand, the fundamental necessity of considering values at all in a design principle is formulated: “Balance political, economic and social values for evaluating ADR results” (Keijzer-Broers and Reuver, 2016, p. 14). I discuss these two types in more detail in this subsection.

At the design level of the concept of value-sensitive DSI application, we have inscribed the values in the design principles, especially in the third iteration (implicitly and explicitly) (Gebken, Drews, Schirmer, 2021; Kempfert et al., 2022). In doing so, we emphasize that the design principles and values must be adapted to the respective contexts.

The values are explicitly named in the design principles of the third iteration (see Subsection 7.1.2), such as trust and accessibility, or are described implicitly as “see humans as humans” (Kempfert et al., 2022, p. 10). This view is similar to the approach of Puro and Wu (2013), who see design principles as an instrument for inscribing values into the design. By inscribing the values in the design principles, the values should be translated into the design of an application. This is intended to shape the future and society positively (Liu et al., 2016; Puro and Wu, 2013).

At the methodological level, in our papers (Gebken et al., 2022; Gebken, Jacobs et al., 2023) and Gebken, Jacobs et al. (2023), values are abstractly named as an important element to consider in the design principles. This corresponds to the approach of Keijzer-Broers and Reuver (2016), for example, in which it becomes clear that different values should be considered and balanced. The reason for naming values at this more abstract level within methodological design principles is that researchers and project teams should consider their research context and elicit the values the context needs (Friedman and Hendry, 2019).

Further research is necessary to test and validate the respective perspectives. In the course of my research, it became increasingly clear to me that it is vital for DSI and IS research that researchers disclose their own understanding of values or their researchers stance, especially in the context of developing design principles. This is already required and practiced in VSD (Friedman and Hendry, 2019). The intention is to ensure that researchers do not unconsciously inscribe their values (e.g., in the design principles) and that the researchers’ position are clearly disclosed to the readers (Friedman and Hendry, 2019; Yetim, 2016).

## **7.2.2 Contributions to Value Sensitive Design Research**

For the VSD research field, the aim of my dissertation is to strengthen proactive technical investigation in particular. Through the practical implementation of empirical, conceptual, and technical investigations in the context of OpenStreetPay and the addition of knowledge from DSI and IS research, in particular the ADR method, I was able to approach this goal.



In the following subsection, I first discuss the research contribution of the technical investigation and then show the overarching contribution to informed proactive activist research.

#### *7.2.2.1 Focus on the Technical Investigation*

At the beginning of my research, technical investigation in VSD research was found to be an area that has received less attention so far (Winkler and Spiekermann, 2018), and even during the finalization of my dissertation, a review article emphasized that there is still much scope for research in this area (Gerdes and Frandsen, 2023). Technical investigation is both a means of carrying out analytical analyses of the value perspectives of a technology and of proactively accompanying and shaping value inscription in a technology (Friedman et al., 2006; Gerdes and Frandsen, 2023).

Through my research, I have contributed, in particular, to proactive technical investigation for ecosystem-based value-sensitive DSI projects and thus also to the VSD research field. In particular, Papers 1 (Gebken, Drews, Schirmer, 2021), 2 (Gebken, Kurtz et al., 2021) and 7 (Gebken, Jacobs et al., 2023) have made a significant contribution to the VSD field, which I discuss below.

In Paper 1 (Gebken, Drews, Schirmer, 2021), we used the example of OpenStreetPay to show the influence of values on an ecosystem-based DSI project and described the changes to the concept and design that have resulted based on the values. This extends the existing body of knowledge on VSD to include proactive technical investigation at the ecosystem level, using the example of a value-sensitive DSI for people experiencing homelessness, which has been less studied to date (Friedman and Hendry, 2019; Gerdes and Frandsen, 2023).

Paper 2 (Gebken, Kurtz et al., 2021) contains the multilevel framework for human-value-oriented DSI ecosystems and the exemplary consideration of value inscriptions in the DSI ecosystem of OpenStreetPay at different levels of abstraction (see Subsection 7.1.4). It strengthens proactive technical investigation by demonstrating how empirical and conceptual investigations can be translated into design through reflection and the subsequent revision of a concept. Previous work on reflection has, for example, included a more stakeholder- and designer-oriented perspective (Yoo et al., 2013), and we complement this knowledge with a multilevel perspective that includes the ecosystem, the DSI application, individually acting stakeholders as different levels of abstraction.

The final research methodological consideration in Paper 7 (Gebken, Jacobs et al., 2023) strengthens proactive technical investigation by promoting, in particular, the traceability of values (Mougouei et al., 2018; Perera, 2019) by means of the value-sensitive decision log (Bressen, 2012). In addition, by bringing VSD together with design-oriented research, especially ADR (Järveläinen et al., 2022; Sein et al., 2011), we strengthen the methodological approach to design technologies and contribute to transparency in the design process. The VSD design process has so far been described as “part science, part art” (Friedman and Hendry, 2019, p. 178). To strengthen the traceability of the creative and design-oriented process (Järveläinen et al., 2022), Chapter 5 describes the research journey and traces the development process of different RQs. This provides a contribution to both VSD and IS research. The findings from the research journey and the corresponding approach will be incorporated into the revision of Paper 7, which is under review.

#### *7.2.2.2 Focus on Informed Proactive Activist Research*

Either analytic or proactive research is conducted in VSD research (Friedman and Hendry, 2019), as well as in DSI research (Qureshi et al., 2021). These different approaches can be found in the reviews by Friedman and Hendry (2019) and Qureshi et al. (2021) and thus contribute to research and society in different ways.

The focus of my work was proactive research, with a clear focus on supporting marginalized people, especially people experiencing homelessness, which I implemented using the ADR, PDR, and VSD approaches.

As VSD can be used in all contexts (Friedman and Hendry, 2019), the particular focus on a societal goal—poverty alleviation—is deliberate activist positioning (Taylor, 2023) to contribute to current societal challenges. I chose this deliberate positioning because societal challenges are too great and urgent (Guterres, 2020, April 23) for me to find a purely observational role suitable. My research approach was characterized by choosing the proactive approach in particular but also informing it with analytical research, such as the meta-study (Kempfert et al., 2022).

Together with my co-authors, I contributed to activist value-sensitive DSI research at the design-oriented level by focusing on the question of how a value-sensitive DSI application could be responsibly designed using the example of the OpenStreetPay project (Gebken, Cankaya, Jacobs, 2023; Gebken, Drews, Schirmer, 2021). On the analytical and reflective side, our contribution was to investigate which other DSIs have already been developed for

people experiencing homelessness (Kempfert et al., 2022). The latter was particularly relevant not only to learn from the positive aspects of other DSIs but also to understand the negative aspects of DSI applications, including value inscriptions and, in particular, the importance of negative implications for marginalized people.

### **7.2.3 Contributions to Research with Marginalized Individuals**

Research and practical work with marginalized people requires a responsible approach (German Informatics Society, 2018; World Medical Association, 2022). Knowledge from DSI and VSD was used to address the societal challenge of homelessness and thus help people experiencing homelessness with a digital application. To complement these multidisciplinary fields, especially with regard to the ethically responsible treatment of marginalized people, we drew on knowledge from participatory design and research ethics (Gebken, Schirmer et al., 2023).

As a core contribution to research involving marginalized people, we used the example of working with humans experiencing homelessness to show how the evaluation of a value-sensitive DSI can be designed (Gebken, Cankaya, Jacobs, 2023). This makes a methodological contribution and shows how the voices of people experiencing homelessness can be heard and how they can be treated with respect (Aldridge, 2019). Thus, we illustrate how to conduct a careful evaluation and intervention (Rohde et al., 2022). In particular, this provides added value, as previous research has primarily focused on thematic results rather than the methodological approach (Burrows, Mendoza et al., 2019; Le Dantec, 2011).

In addition, the research agenda makes a significant contribution by highlighting the future prospects for value-sensitive DSI for marginalized people (Gebken, Schirmer et al., 2023) and compiling knowledge from VSD, DSI, participatory design, and research ethics. My research once again emphasized that complex societal problems require knowledge from a variety of different research streams to do justice to marginalized people (Mädche, 2017; Rohde et al., 2022).

## 8 Practical Contributions

In addition to the theoretical contributions, I was able to work with the research teams and the OpenStreetPay team to gain practical insights, as is common for ADR and design-oriented projects (Sein et al., 2011). In particular, a contribution to practice is made by providing grassroots teams with limited resources (Bria et al., 2015; Eckhardt et al., 2021) with knowledge on the approach and design of value-sensitive DSI applications for marginalized individuals. Many of the contributions have already been described in Chapter 7, so in the following, I briefly discuss the respective findings from a practical perspective.

As part of the development of the value-sensitive DSI application, it was possible to show what was important in its design for marginalized individuals with regard to the design and responsible treatment of individuals. In particular, the need for practice teams to deal with values and a responsible approach to development was demonstrated by adopting different perspectives that can be useful to practice teams. For example, it was shown how the inscription of values in the design of a DSI ecosystem can be carried out and reflected upon (Gebken, Kurtz et al., 2021), how participation and evaluation can be designed with different formats and stakeholders, especially with marginalized persons (Gebken, Cankaya, Jacobs, 2023; Gebken, Drews, Schirmer, 2021), and exemplary what tasks can be mastered with which methods (Gebken et al., 2022).

In addition, individual tasks were selected, and solutions were developed for use in practice. For example, the value-sensitive decision log was devised to document an overview of the decisions made in the project and thus strengthen the traceability of the values and the consistency of the decisions (Gebken, Jacobs et al., 2023).

The design principles set out in the papers for different purposes can (see Chapter 7, Subsection 7.2.1.2), even if developed as theoretical knowledge through reflection, be used as guidance in the project context. However, the design principles still need to be tailored to the target group of practitioners (Gregor et al., 2020).

In the research agenda (Gebken, Schirmer et al., 2023), I developed future goals for practice with my co-authors. The agenda guides design-oriented teams through the entire development process of a value-sensitive DSI for marginalized people and shows the fundamental challenges the teams may face (e.g., continuous questioning of the target direction). However, it is precisely this knowledge that needs to be made available to practitioners in a

suitable format instead of on a research agenda. A collaboration board (using Miro) is planned along the four focal points of the research agenda (see Chapter 7, Subsection 7.1.5), which will be equipped with appropriate methods and instructions for each topic area and thus support the respective teams in the development of their value-sensitive DSI.

In addition to the results presented in the dissertation, I have also started to use science communication in the form of science slams to draw attention to my research in society at large. In the future, I will continue to do this in greater depth.

## 9 Limitations

This dissertation, like any research project, has limitations. In this section, these limitations are addressed by first identifying the limitations of each reflected RQ and, second, drawing an overall conclusion regarding the limitations.

### 9.1 Connection between Digital Social Innovation and Value Sensitive Design Research

*Multidisciplinary and interdisciplinary collaboration is very important. This is a much needed development in academia. The solution to the big and urgent problems in the world will not be found in one discipline, in one journal or in one book. Moreover, adequate solutions will always be systems solutions, and they will most likely deal with technology and human behavior with values and norms. Science, social science and humanities – no solution to real world problems will be adequate if it does not comprise these perspectives.” (Mädche, 2017, p. 300)*

According to the quote above, this dissertation can be understood as an approach to more comprehensively guide the development of value-sensitive DSI adapted to the life situations of marginalized individuals by combining the two research fields of DSI and VSD, as well as approaches from participatory design and research ethics (see Chapter 7, Subsection 7.1.1).

In addition to these research fields, however, many other fields are potentially interesting for understanding value-sensitive DSI for marginalized individuals, as well as for working out the complex problem of supporting people experiencing homelessness with a digital donation system.

Subsequently, I discuss three additional areas of research—ethnographic research, requirements engineering, and socio-informatics—that are relevant to value-sensitive DSI research for marginalized people. Ethnographic research (Bekele et al., 2019; Kibere, 2016) could be used to examine embedding VSD in different cultural contexts. Friedman et al. (2021) note that the consideration of values in different cultural contexts remains an outstanding task for VSD research. Whereby, first studies on intercultural computer clubs have been conducted and provide first steps for filling the gap in the context of VSD (Weibert et al., 2017). With the help of requirements engineering, it is possible to strengthen the inscription and traceability of values in technology and DSI (Gebken, Jacobs et al., 2023;

Perera, 2019). The socio-informatics approach (Rohde et al., 2022; Wulf et al., 2018) could strengthen the user perspective and facilitate a more detailed investigation of how DSI applications can better assist users. In addition, as this approach significantly extends IS methods by using social science, human–computer interaction, and psychological methods in the design process, further collaboration could be helpful in the provision and selection of design methods. Furthermore, as ICT design for societal challenges has been addressed for years, especially in the context of health care, as well as for elderly people and people with disabilities (Hornung et al., 2017; Müller et al., 2015; Wan et al., 2016), future collaboration could strengthen the argumentation and impact of value-sensitive DSI, especially in the IS community.

Therefore, future multidisciplinary research on value-sensitive DSI for marginalized people should include additional fields and address the challenges of multidisciplinary research, such as appropriate communication for each target group (Dalton et al., 2021). Therefore, it is recommended to adopt a socio-informatics perspective that utilizes methods from various disciplines to address societal problems in an appropriate manner. This ensures that the focus is not limited to the boundaries of a single research field (Rohde et al., 2022; Wulf et al., 2018).

## **9.2 Design Principles for Value-Sensitive Digital Social Innovation to Support Humans Experiencing Homelessness**

The second research aim was to develop design-oriented knowledge in the form of design principles (see Chapter 7, Subsection 7.1.2), in addition to the first overarching question of connecting VSD and DSI research. This development and generalization of design principles for value-sensitive DSI applications to support humans experiencing homelessness was addressed in two articles (Gebken, Drews, Schirmer, 2021; Kempfert et al., 2022).

This result, however, is also constrained. These limitations primarily related to (1) the fundamental nature of the design principles, (2) the previously underlying data used to establish the design principles, and (3) the ability to translate the design principles into actual designs in practice.

Regarding (1), Gregor et al. (2020, p. 36) note “that the generalizability of any design principle is limited to the contexts that share its boundary conditions.” This implies that the transfer of the design principles must be tested in each case, and the similarities of the

boundary conditions of the context to which principles must be examined (Gregor et al., 2020; Seidel and Watson, 2014). Thereby, it is necessary, as described in Chapter 7, Subsection 7.1.1, to pay particular attention to the cultural context and, if applicable, adapt the design principles to the cultural context (Friedman et al., 2021; Weibert et al., 2017). Furthermore, as discussed in Chapter 7, Subsection 7.2.1.2, it is especially relevant to reflect on the connection between values and design principles (Purao and Wu, 2013).

Besides its fundamental nature, (2) the underlying knowledge base of these design principles also has limitations. The principles developed in this thesis are based on the results of the OpenStreetPay project (Gebken, Drews, Schirmer, 2021) and a meta-study of 118 DSI projects (Kempfert et al., 2022). Subsequent expansion with additional data would be interesting for future research. A long-term study on the societal impact of a value-sensitive DSI application for people experiencing homelessness could be conducted. This study could also derive design principles for the reflection and learning stage of ADR and compare them with the existing ones.

Finally, it is important to note that there are limitations when it comes to testing (3) the transferability of design principles to other value-sensitive DSIs for people experiencing homelessness. Further studies are needed to investigate the extent to which practitioners in the value-sensitive DSI field can cope with the theoretical knowledge of the design principles and whether they are able to apply them for designs in practice (Gregor et al., 2020).

### **9.3 Value Sensitivity in Research and Design Methods**

This research also resulted in findings in the research and design methods area, as outlined in Chapter 7, Subsection 7.1.3 (Gebken et al., 2022; Gebken, Jacobs et al., 2023). The limitations of the findings on this RQ lie in particular in (1) the exploratory nature of the research and (2) the balancing act between project and research work.

With regard to (1) the exploratory approach to integrating VSD into a design-oriented DSI project, it was challenging that, as outlined in Chapter 7, Subsection 7.2.2.1, technical investigation and thus the explicit inscription of values in technology has not yet been explored extensively (Gerdes and Frandsen, 2023). With this work, I and my co-authors (Gebken et al., 2022; Gebken, Jacobs et al., 2023) have shown how design and research methods can be expanded and what needs to be considered, particularly when selecting design methods for a value-sensitive DSI. However, research here is still in its infancy, and



the findings need to be validated by using and systematically evaluating the modified research and design approaches in further research projects and, where necessary, improved or deepened.

The second limitation in this area is due, in particular, to (2) the balancing act between project and research work. In the context of the project, the grassroots team had limited resources and time, which required a pragmatic (research) approach. This is described in Chapter 4, Section 4.2. For example, instead of recording and transcribing the interviews, minutes were taken. For future design-oriented research work, it would be worth investigating how, for example, knowledge from the social sciences, human–computer interaction, or psychology can be used pragmatically and quickly to create high-quality survey instruments for empirical research. As mentioned in Section 9.1, socio-informatics could be a very good extension for incorporating the knowledge of these fields (Rohde et al., 2022; Wulf et al., 2018).

#### **9.4 Reflection and Evaluation of Value-Sensitive Digital Social Innovation for Marginalized Individuals**

The fourth reflected RQ of this dissertation aimed to investigate the reflection and evaluation of value-sensitive DSI for marginalized individuals. The findings on this are presented in Chapter 7, Subsection 7.1.4. The limitations of the research conducted to date are also apparent here, and will be discussed in more detail in the following. This section emphasizes three aspects: (1) the need for further research into the long-term societal impact of value-sensitive DSI and its influence on the multilevel design framework, (2) the need to ensure the comprehensibility and transferability of the multilevel framework to other value-sensitive DSI projects, and (3) the need to address the link between reflection and evaluation.

Concerning (1), this dissertation has so far succeeded in reflecting on the current status of OpenStreetPay, using a multilevel design framework and evaluating the concept (Gebken, Cankaya, Jacobs, 2023; Gebken, Kurtz et al., 2021). However, the long-term effect of a DSI plays a decisive role in both evaluation and reflection to enable added value for marginalized people, especially people experiencing homelessness. After all, even if a system has been developed with the best intentions and values in mind, its ultimate use by users may be different (Friedman and Hendry, 2019). Due to the current status of OpenStreetPay, however, this long-term perspective could not yet be mapped, as the project is still in the pilot phase yet

and not in the operational phase (see Chapter 3). Therefore, further studies should aim to accompany and examine projects at different stages of development.

As already noted in Section 9.3, the data basis of the results developed in this dissertation is limited. This also influences the assertions regarding (2) the transferability and verification of the comprehensibility of the multilevel framework for the human value-oriented DSI ecosystem. Further research with additional value-sensitive DSI teams in other contexts is needed.

Another limitation is the missing closer integration of (3) reflection and evaluation. For example, a smaller evaluation study was conducted with people experiencing homelessness, but the results of this study have not yet been analyzed using the multilevel framework for a human value-oriented DSI ecosystem. This should be done as the next step.

## **9.5 Research Agenda for the New Research Field of Value-Sensitive Digital Social Innovation for Marginalized Individuals**

The final RQ dealt with the development of a research agenda for value-sensitive DSI for marginalized individuals (see Chapter 7, Subsection 7.1.5). I described the challenges and previous limitations of multidisciplinary research in Section 9.1. By combining the fields of DSI and VSD (as well as including participatory design and research ethics), it was possible to adopt different perspectives, but a number of questions remain. In this section, the focus is particularly on the critical consideration of (1) DSI and (2) VSD research.

The SDGs are often used for the general focus of (1) DSI. This was not critically examined in the course of this dissertation but rather taken as a given. One critic of the SDGs emphasizes, for example, the following:

*The hypothesis is that the SDGs [see below], when they are critically evaluated through these three new-millennial analytical paradigms, are not a suitable roadmap for the type of truly sustainable present and future development that must ensure the continuation of all (not only human) life on Earth. The main reason for this is because despite their reference to, and shallow alignment with, the three-pillared approach to sustainable development (environmental, social and economic concerns), the SDGs mostly push environmental interests to the periphery of their concern while prioritiz[ing] human-focused social and economic development at the expense of global Earth system integrity.” (Kotzé, 2018, p. 41)*

Accordingly, further work in the field of value-sensitive DSI for marginalized people must question whether the SDGs offer an appropriate orientation or whether other goals and prioritizations would be more suitable.

Critical voices can also be heard in the (2) VSD field. Elsewhere, I have explained that the use of ethnographic methods is necessary to broaden the cultural perspective beyond the Western context, as Martin et al. (2023, p. 2) note:

*This article argues that mainstream value-sensitive approaches to design, such as Value Sensitive Design (VSD) or Design for Values (DfV) have been based on narrow understandings of personhood and social dynamics. These are biased towards Western Educated Industrialized Rich and Democratic (WEIRD) cultures and contradicted by empirical evidence. Not only that the specific values promoted by VSD and DfV are not representative of global populations, but neither can human collective behavior be adequately understood in terms of values alone. By contrast, we posit that design benefits from understanding user behavior from the joint perspective of values and norms, especially across cultural contexts.”*

Therefore, it is relevant for the VSD side of the new value-sensitive DSI research field to question whether the fundamental focus on values offers an appropriate perspective. Additionally, it is important to consider other focuses, as mentioned in Section 9.1, that may also be helpful.

## **9.6 Overall Limitations**

In summary, the five RQs were used to develop different facets of value-sensitive DSIs for marginalized individuals. As shown in the previous sections, there are still limitations in each topic that need to be addressed in future research. The developed research agenda (Gebken, Schirmer et al., 2023) reflects a perspective for future design-oriented value-sensitive DSI projects for marginalized individuals and is intended to build the basis for those projects. This will enable a larger data basis for the systematic evaluation of such value-sensitive DSI projects.

Finally, one fundamental question should be mentioned at this point—whether value-sensitive DSI applications are appropriate instruments for humans experiencing homelessness at all needs to be investigated. At the beginning of this dissertation, I pointed out that value-sensitive DSI can only support the sub-problems of homelessness or societal challenges

(Morozov, 2014). In the course of the meta-study (Kempfert et al., 2022), however, it became apparent that DSI applications are used in particular where a large number of people experiencing homelessness live and where there are hardly any long-term prospects, such as Housing First (Ly and Latimer, 2015). Additional research is necessary to determine whether DSI initiatives could alleviate pressure on the state to provide effective support to people in difficult circumstances, thereby shifting the burden to the initiatives of individual citizens.

## 10 Implications for Future Research

Chapter 9 outlined the limitations of this dissertation and detailed further research opportunities according to the five reflected RQs. Therefore, the focus of this chapter is on the implications for future research on a more holistic level. For this purpose, I structure and guide this chapter according to the future perspectives already elaborated in the research agenda (Gebken, Schirmer et al., 2023) and complement them with a general call for further design-oriented value-sensitive DSI research.

In the course of the research agenda, four dimensions were identified for future research: (i) reflective value-sensitive goal-setting, (ii) an extended research method and shaping of research conditions, (iii) consideration of stakeholder values and possible discrimination, and (iv) value-sensitive DSI development (Gebken, Schirmer et al., 2023).

For future value-sensitive DSI research for marginalized people, it is particularly important to support researchers (and practitioners) by equipping them with tailored design and research methods to continuously (i) reflect on their goals to ensure that the societal problem addressed is appropriately selected, can be supported through value-sensitive DSI, and that a positive societal impact can be achieved for the target group (Aldridge, 2019; Qureshi et al., 2021; Tracey and Stott, 2017). In doing so, it is also crucial to question whether there are any assumptions regarding solutionism (Morozov, 2014).

For further research, it is essential (ii) to complement existing research methods with value-sensitive aspects to uncover the implicit values of stakeholders and researchers (Yetim, 2011, 2016) and enhance the transparency of value inscription by design. Moreover, the extent to which research benefits marginalized people should be continuously evaluated (Chowdhury, 2022; World Medical Association, 2022). To ensure the long-term nature of value-sensitive DSI initiatives, it is necessary for future research that research conditions are designed to be sustainable (Keijzer-Broers, 2016; Taylor, 2023; Vogel, 2021; Wulf and Friedman, 2017).

Further research is needed to strengthen the ability of value-sensitive DSI teams (iii) to consider the values of their stakeholders and, in particular, to deal responsibly with discrimination. To this end, it remains critical for these teams to strike a balance between the conflicting values of their stakeholders and ensure that discrimination is addressed appropriately (Friedman and Hendry, 2019). This can be established in various innovative collaboration formats to be provided and explored by and within the research community.

However, these innovative formats must always take into account and adequately include the most vulnerable in our society (Ertl et al., 2021).

Beyond this, (iv) the development of value-sensitive DSI applications for marginalized people needs to be designed appropriately. Here, more research focus should be placed on revealing the influence of values on value-sensitive DSI. Furthermore, future research should extend the established design and research approaches to explicitly guide, reflect, and evaluate the inscription of values (Friedman and Hendry, 2019; Yoo et al., 2013). One way to conduct future research is by testing design and research methods in real-world laboratories. An example from the field of socio-informatics illustrates how to establish real-world laboratories, known as living labs (Müller et al., 2015; Ogonowski et al., 2018).

It is precisely these four aspects that hopefully contribute to the long-term positive impact of design-oriented, value-sensitive DSI research in the real world (Gebken, Schirmer et al., 2023).

This is especially urgent, as the current global situation and crises show that how we as humans interact with the world but also with each other seems to be reaching its limits. It is the responsibility of society and each individual to make a difference to address societal challenges such as inequality, poverty, and climate change (United Nations, n.d.).

Tackling societal challenges requires the will and courage to face complex problems and work toward a better society one step at a time (Friedman and Hendry, 2019).

Through my dissertation and my work in the OpenStreetPay project, I hope to have made a contribution and, in particular, to have raised further awareness of our societal problems and the possibility of taking action in the field of IS research (Leong et al., 2020).

This dissertation is one of numerous attempts in the fields of DSI and VSD aiming to contribute to shaping the world in a sustainable way. However, further proactive, and design-oriented research is still needed to meet arising societal challenges with appropriate and informed strategies for solutions. As scientists, I believe we have the opportunity to work together in a scientifically informed way to build a better future. Therefore, I hope to encourage more researchers to do socially relevant research with design-oriented approaches because, in my opinion, the challenges of our time are too serious for us to just observe them from the sidelines (Taylor, 2023).

# **11 Paper 1: Stakeholder and Value Orientation in Digital Social Innovation: Designing a Digital Donation Concept to Support Homeless Neighbors**

## *Abstract*

During the first wave of COVID-19 lockdowns, the infrastructure for supporting homeless neighbors disintegrated in many countries. As one important area of support, it became difficult to provide small donations to homeless neighbors. In an action design research-based project, as part of a national hackathon initiative and accelerator program, we contributed to the development of a digital donation concept. We frame this process as a digital social innovation for vulnerable people and highlight the need to consider stakeholder and value orientation during the design, implementation, and evaluation stages. Our findings include a reflection of the project course, a description of the developed concept, an analysis of how values shaped the design, and a formalization of learnings.

### **11.1 Introduction**

In times of COVID-19, it has become visible again that the poorest in a society are the worst affected by crises (Guterres, 2020, April 23). Many organizations for homeless neighbors had to close because they could not meet the health-related safety standards, and many of their volunteers belong to the high-risk group. In Germany, organizations expressed two major needs during the lockdown: First, they claimed to offer immediate decentralized accommodation for homeless neighbors<sup>14</sup>, since many of these people also belong to the high-risk group and are not able to protect themselves (Guterres, 2020, April 23). Second, digital and contactless help is needed to enable self-protection while maintaining care. Homeless aid organizations had to reorganize their work to quickly inform and help homeless neighbors without endangering their health, but they lacked the appropriate concepts and tools.

During Germany's national COVID-19 hackathon #WirVsVirus, various teams worked on generating ideas to support homeless neighbors during the pandemic in the problem area of care provision for vulnerable groups (4Germany UG, 2020). In this paper, we focus on the initiative OpenStreetPay, which started during the hackathon. One of the authors actively

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<sup>14</sup> Homeless neighbor is the short form of "neighbors who experience homelessness." It is used to emphasize the perspective on people not homelessness [15].

participates in this (still ongoing) project. This allowed us to access the data and people of this initiative. The goal of OpenStreetPay is to enable digital donations and contactless payments for homeless neighbors while taking into account their limited resources and living conditions (e.g., no permanent residence, no permanent access to electricity, the Internet, or mobile devices). OpenStreetPay is a concept that includes a digital donation and payment system to enable contactless donations to homeless neighbors. The donation can be made via the donor app or a webpage. The donation receipt and the store payment are processed via a card (SmallChangeCard) and the merchant app. In addition, the concept includes collaboration aspects between homeless neighbors and aid organizations. We frame the initiative as the development of a digital social innovation (DSI) according to the United Nations Sustainable Development Goals, as it aims at taking care of the needs of vulnerable people (United Nations, n.d.). To realize the DSI, we draw on approaches from the field of value sensitive design (VSD). Hence, our paper addresses two research questions:

*RQ1: How can we design a concept that allows digital donations for homeless neighbors?*

*RQ2: What can be learned from the process of developing value-based and stakeholder-oriented digital social innovations for vulnerable people?*

We contribute to information systems (IS) research by presenting a digital donation concept and a formalization of learnings related to this concept (RQ1). We also provide in-depth descriptions of how values influenced the design, with a reflection of the learnings related to using VSD to structure the process of developing a DSI for vulnerable people that follows stakeholder and value orientation (RQ2).

## **11.2 Related Research**

The related literature for our study stems from three streams: First, related to our first research question, we investigated recent studies about digital innovations in the field of support for homeless neighbors. Second, we position our study in the field of DSI and the area of DSI for vulnerable groups. Third, we consider existing research on VSD, as DSI studies and our action design research (ADR) project guided us toward the strong relevance of considering values in the design process.

The reasons for becoming homeless are multilayered, and it can cause issues such as “reduced life expectation, health problems, discrimination, isolation and barriers to access to



basic public services and benefits” (European Commission, 2020). To support people living in homelessness, Sowa et al. (2020) the important considerations for digital transformation in the field of homeless aid support (e.g., the risk of further stigmatization of needy people or the disclosure of highly sensitive information).

One existing prejudice is that homeless neighbors do not have a telephone or access to the Internet. Two studies from Australia and the USA have addressed this issue. The study from Australia (with  $n = 95$  in 2014) showed that 68 of the participants owned a smartphone, but only 49% had a paid Internet service on their phone (Humphry, 2014). In the other study from the USA (with  $n = 461$  in 2017), the authors found that there is no digital divide between homeless and non-homeless neighbor in the same age group and that approximately 58% own a smartphone (Rhoades et al., 2017). Even if there is no large divide within the age group, 42% still do not own a smartphone (Rhoades et al., 2017).

Nevertheless, the first apps for homeless neighbors exist to provide them with digital support. Especially in the field of CSCW and HCI, this topic has been addressed. Burrows et al. (2019) evaluated the design of the mobile web app Ask Lizzy regarding emotional concerns and thereby considering psychological aspects. The app supports homeless neighbors in Australia with information about where to find help. To date, to the best of our knowledge, no study deals with analyzing or developing a digital donation concept for homeless neighbors in detail.

Therefore, we considered literature about DSI, as it serves as the broader field of research we seek to contribute to with our study. DSI is an upcoming topic in the IS field (Buck et al., 2020) and has the aim of challenging societal problems (Eckhardt et al., 2016). The subject areas of DSI are diverse and include (among others) education, poverty reduction, and sustainable development. Our study is related to the area of DSI for vulnerable groups. Related studies in this area employed similar methods or were even tackling the challenges of homeless neighbors.

An ADR-based study by Keijzer-Broers and Reuver (2016) discusses the dimensions of developing a DSI (a service platform for health and wellbeing) for vulnerable groups (elderly people). We adapted the learnings from this study for our research: We broke down the societal problem into stakeholder problems, and we continuously reshaped digital innovation, and social practice, we involved citizens as early as possible, and we integrated a discussion of values.

One project that specifically aimed at developing a DSI for the vulnerable group of homeless neighbors is called #patchwork. This project is a field research study in which a diverse research group tried to develop a disruptive digital innovation to support homeless neighbors together with homeless aid organizations. The project ended because the homeless aid organization feared that the security of homeless neighbors might be threatened. Whittle et al. (2020) identified missing shared values as one reason for members to disengage or to leave the project.

Whittle et al.'s study and the experiences in the project of our study guided us toward considering literature from the area of VSD. VSD allows us to link DSI with specific contextual factors that are relevant for consideration in the design process. Therefore, we include the field of VSD as the third research stream (Simon, 2016). In the sense of VSD, innovations are always morally linked, as they support or inhibit certain values. The influence or impact is different for each technology (Brey, 2010). Thus, it is necessary to critically analyze the DSI concerning its effects on society and the environment (Friedman et al., 2008; van den Hove et al., 2012).

Friedman (1997) commenced the discussion about VSD by answering questions regarding unintentional and intentional inscription of values in IT artifacts. She hypothesizes that it is essential to include values in the development process. If there is no conscious consideration of values, the values still exist, but the discussion and reflection of them do not occur (Friedman, 1997; Simon, 2016). The discourse about the concept of value still exists, and the term is interpreted very differently in different disciplines (Simon, 2016). In our study, we refer to Friedman's perspective, according to which *"a value refers to what a person or group of people consider important in life"* (Friedman et al., 2008).

Through the early involvement of stakeholders and the focus on values, technical design and development should lead to a DSI that meets societal needs and lives up to its responsibility (Simon, 2016). Therefore, it is essential to investigate different perspectives and different kinds of values (Flanagan et al., 2008; Friedman et al., 2008). Friedman et al. (2008) differentiate the different kinds of (human) values and describe a method to define the values of one's project.

By analyzing the existing literature, we found that research has not yet developed a well-founded understanding of which guidelines can support the development of a digital donation concept for homeless neighbors (RQ1). Furthermore, we aim at learning from studies like

Whittle et al. (2020) by incorporating values into the development to sustain the commitment of different stakeholder groups. Furthermore, we draw on Friedman et al. (2008) to realize VSD in the DSI development process. By reflecting this approach, we seek to contribute to the realization of DSI for vulnerable groups, such as homeless neighbors, based on VSD (RQ2).

### **11.3 Research Design**

The aim of our study is to develop a concept (framed as a DSI) for digital donations for homeless neighbors (RQ1) and to reflect on the use of stakeholder orientation and values during the design process for a DSI (RQ2). We structured our study based on the ADR approach by Sein et al. (2011) to enable an embedded and reflected development in the context. Our research process was structured into four stages (cf. Figure 11.1). In stage 1, we formulated the problem. In stage 2, we described the iteratively built and evaluated digital donation concept and values. In stage 3, we reflected on our learnings, and in stage 4, we formalized our learnings.

In **stage 1**, three streams of activities led to an initial understanding of the problem area. In 2019, we started to analyze the use of DSI by homeless neighbors by conducting three interviews and an analysis of existing apps. We also commenced a literature research. At the beginning of the COVID-19 crisis, one of the authors participated in the national hackathon and became a member of the OpenStreetPay project. During the initial collaboration in this project, the idea emerged that we could accompany the project from a research perspective and start an ADR-based study. The OpenStreetPay team, which consisted of 15 people at that time, started working on a concept for helping homeless neighbors with digital donations. The team had already integrated some partners within the first 48 hours of the development process to obtain feedback about the idea. For the first stage of ADR, it is necessary to formulate the problems encountered. In our project, we are working in the field of societal issues and trying to solve them with a DSI. For that, we analyzed the problem area as understanding the current situation of homeless neighbors during the hackathon and the first lockdown. Afterwards, we integrated the theoretical background based on the literature research.

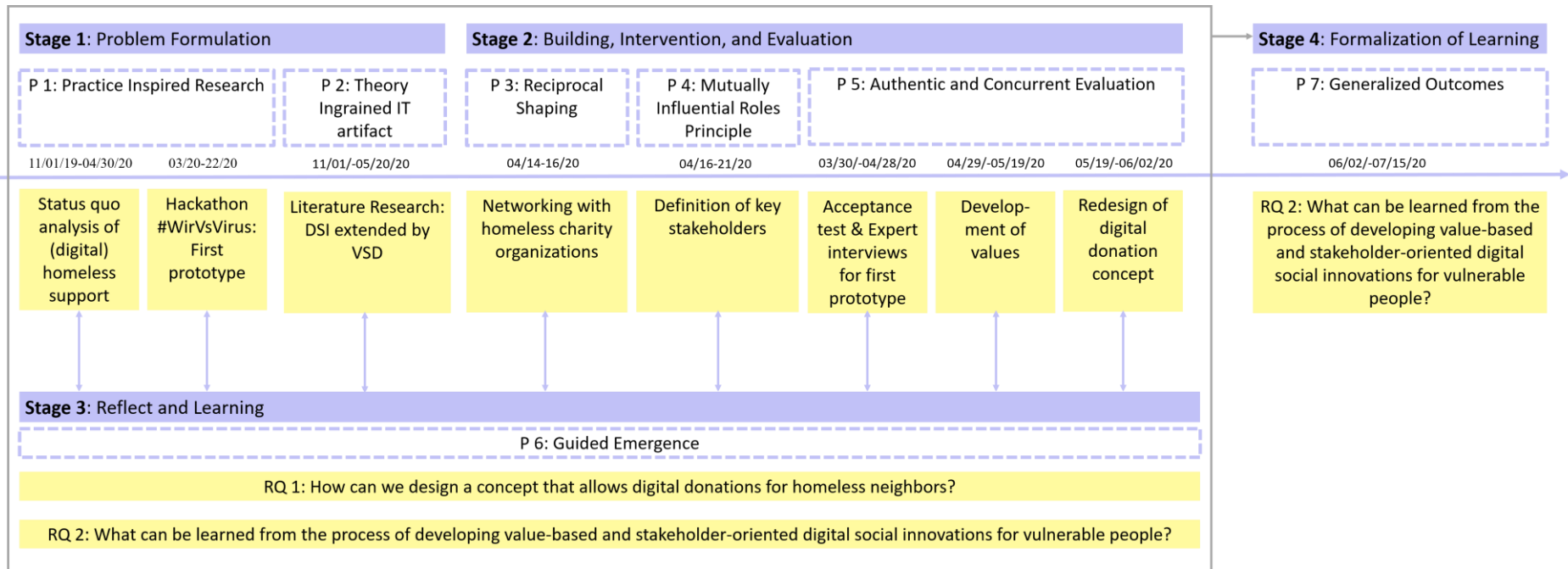
In **stage 2**, we identified key stakeholders (groups) for OpenStreetPay. We conducted an online-based acceptance test and 11 unstructured expert interviews (nine with volunteers and employees of homeless aid organizations, a group interview with four lawyers, an interview

with a money transferring company) to get initial feedback for the OpenStreetPay prototype. The questionnaire for the acceptance test was developed iteratively, and the understanding was tested with the OpenStreetPay team in each iteration. The role-specific questionnaire was structured by different stages of usage and included open and closed questions. Only fully completed questionnaires were considered. Our online survey had 98 participants (1.02% homeless neighbors, 88.78% donors, 9.18% employees of homeless aid organizations, and 4.18% others). For the quantitative analysis, we used standard descriptive statistical methods and Python. For the qualitative analysis, we paraphrased and coded the open questions. The purpose of the 11 expert interviews was to gain a deeper understanding of participants' assessment of the concept and especially to identify potential obstacles for its realization. Two members of the OpenStreetPay team conducted the interviews. We refrained from recording these interviews, since it was often the first contact with the organization, and the team intended to establish sustainable cooperation with them. The team considered the results of the acceptance test and expert interviews in developing the values for OpenStreetPay as well as reshaping the digital donation concept. In stage 2, the project group started a discussion about the values that should guide the process. The discussions were guided by the work on VSD by Friedman et al. (2008) and Keijzer-Broers and Reuver (2016). Friedman et al. approach highlight that values cannot be gathered empirically, but they are based on the interests and wishes of humans. To identify relevant values, Friedman et al. suggest conducting conceptual, empirical, and technical investigations. In the beginning, four members of the OpenStreetPay team thought individually about their five main values and what kind of impact they would have for each key stakeholder group, the team, the communication, and the technical development. These four people met online, discussed the values of each person, and searched for common ground among the different opinions. After the group found common ground, one member asked a professional to formulate these common values into simple language, ensuring that everyone could understand them. The group then presented and discussed the values in the weekly team call. The team deliberately decided to follow this procedure to avoid repeated discussion of basic issues. The values were then used to reshape and reflect our digital donation concept.

In **stage 3**, we reflected and discussed the development so far multiple times among the authors. We first analyzed the findings iteratively to identify the key learnings by paraphrasing the main messages and the learnings from the development process.

In **stage 4**, we developed design principles that summarized what we had learned from our process so far and how this could help to guide other DSI developments for vulnerable groups.

For the next design loop, the first artifacts will be tested in a pilot test. This will require proceeding with care since we work in a highly sensitive environment with people who often live in difficult circumstances. We plan to involve homeless neighbors when they agree to participate and when the circumstances permit.



**Figure 11.1. Overview of the Four Stages of ADR by Sein et al. (2011) Related to Our Activity**

## 11.4 Results

### 11.4.1 Initial Understanding of the Situation and the Focal Problem

Worldwide, more than 1.8 billion people experience homelessness (Guterres, 2020, April 23). Therefore, they do not have the possibility of practicing physical distancing or washing their hands regularly due to a lack of adequate access to water (Guterres, 2020, April 23). The living circumstances during the first COVID-19 lockdown became even worse for homeless neighbors (Guterres, 2020, April 23). During the lockdown, cash donations by individuals were dramatically reduced, as people stayed at home and did not meet their homeless neighbors. In the long run, COVID-19 can be seen as an additional driver for cashless payment (BR24, 2020). Hence, the motivation for this project was twofold: In the short run, the idea was to establish infrastructure to maintain the possibility of donating during a lockdown. In the long run, the team expects a reduced use of cash, which renders a digital donation concept also a relevant topic for the future.

With this initial understanding of the situation, we started to look for existing solutions by analyzing existing apps. Our analysis revealed that there are many different digital solutions available worldwide for supporting homeless neighbors. These solutions pursue different goals. We examined digital solutions in German and English-speaking countries and clustered them by purpose (cf. Table 11.1). The results of our analysis provided us with an overview of existing types of digital support. So far, most apps and websites focus on providing information or enabling digital donation support. The money is/was directly provided to the homeless neighbors in only two apps (*Samaritan* and *N=5\_Helping Heart*). Also, while screening the apps, we found design decisions that can be discussed critically when considering the value-based perspective of a solution. For example, the app *Samaritan* uses the stories and pictures of homeless neighbors in combination with their local position to generate higher amounts of donations. The positive aspect of this kind of marketing is that people can tell their stories on their own. The negative aspect is that stereotypes can be stabilized, donation recipients are dependent on the donor's arbitrariness, and sensitive data (position, name, etc.) of the donation recipient can be used against them (Sowa et al., 2020; Whittle et al., 2020). The *N=5\_Helping Heart* app has been discontinued.

As an additional source for framing our initial understanding of the situation, we used data gathered in the interviews we led prior to the COVID-19 crisis. In an interview, a homeless neighbor argued that apps that do not fulfill his needs would be uninstalled quickly.

Especially if the information was not up-to-date, it could have many negative implications for him and lead to mistrust [I0]. Further, the interviewee stressed the importance of good usability for people with disabilities [I0]. We also considered the perspective of a director of a large homeless aid organization app. He stated that many homeless neighbors do not have time to concentrate on whether an app works because they need to take care of fundamental issues in life [I1].

The analysis of the situation, the apps, and the interviews led us to the following conclusions. First, we found a lack of solutions for direct digital donations in our context (Germany). The lockdown aggravated the situation and dramatically increased the need for digital contactless support and clarified the need to develop a new solution. Second, we learned that even if there are good intentions behind the development of digital services for homeless neighbors, misuse can happen, or prejudice can be affirmed. Third, we realized that we had to embed our development within the social context to be able to consider the particular stakeholder needs that are relevant for the design. Finally, by also considering the theoretical foundations that we outlined in section 11.2, we realized that it is important to understand what it means to be responsible regarding the context.

**Table 11.1. Overview of Digital Support for Homeless Neighbors**

Purpose	App
Digital donation	Samaritan, N=5_Helping Heart, WeShelter, Homeless Donation Meter, Give&Go
Direct support	ActionHunger, OurCalling, Streetchange
Information platform	StreetLight Chicago, HelpFinder, Link-SF, Shelter Space, Homeless Resources—Strappd, Nextmeal.co.uk, Chalmers, Mokli, Kältehilfe Berlin, strassenhilfe-hamburg.de, AskLizzy
Mental health	Concrn
Security	Streetlink
Reconnection	Miracle Messages, Lease Up

#### 11.4.2 The Digital Donation Concept “OpenStreetPay”

In the following, we present the intermediate design of the **digital donation concept** in June 2020. Figure 11.2 illustrates the **digital donation concept** of OpenStreetPay. It consists of three main parts: the possibility to donate digitally, the SmallChangeCard, and the merchant



app. A homeless neighbor will receive the SmallChangeCard from OpenStreetPay's homeless aid organization partners (cf. Figure 11.3, V8). The employee/volunteer of the homeless aid organization informs the homeless neighbor about the code of conduct, where they can use the card (including providing a map of all store locations), and what kind of information is collected about them (cf. Figure 11.3, V5, 6, 7, 8). When they agree to these terms, the registration is completed, and the card is given to them. The SmallChangeCard is already loaded with €20, the monthly amount each cardholder will receive from the solidarity donation pot. Furthermore, the cardholder can individually collect money with the card up to €130 per month (this aspect needs to be checked due to financial regulations) (cf. Figure 11.3, V4). When there is money on the SmallChangeCard, the cardholder can buy the products they want at the selected shops (cf. Figure 11.3, V3). The SmallChangeCard can only be redeemed at OpenStreetPay's (initial) partners (cf. Figure 11.3, V8). In selecting the shops, the team made it a priority that the homeless neighbors would be treated well (cf. Figure 11.3, V8). The cardholder is not obligated to hand in the card after a certain period. The decision as to when a person in need has outgrown the conditions to receive a card is made in a joint discussion (cf. Figure 11.3, V3, 5). The donation shall be made in two different ways. The first option is a solidarity donation either via the website without downloading an app or registration or using the app for registered donors (cf. Figure 11.3, V6). The second option is donation on the street individually and directly to the homeless neighbors via the app or website. Further alternative forms of donations are currently under consideration, such as applying crowdfunding. To ensure appropriate security and trust, the team decided to work with a financial service provider that processed the transfer of money. It is essential to the team that this provider meets the values (cf. Figure 11.3, V8).

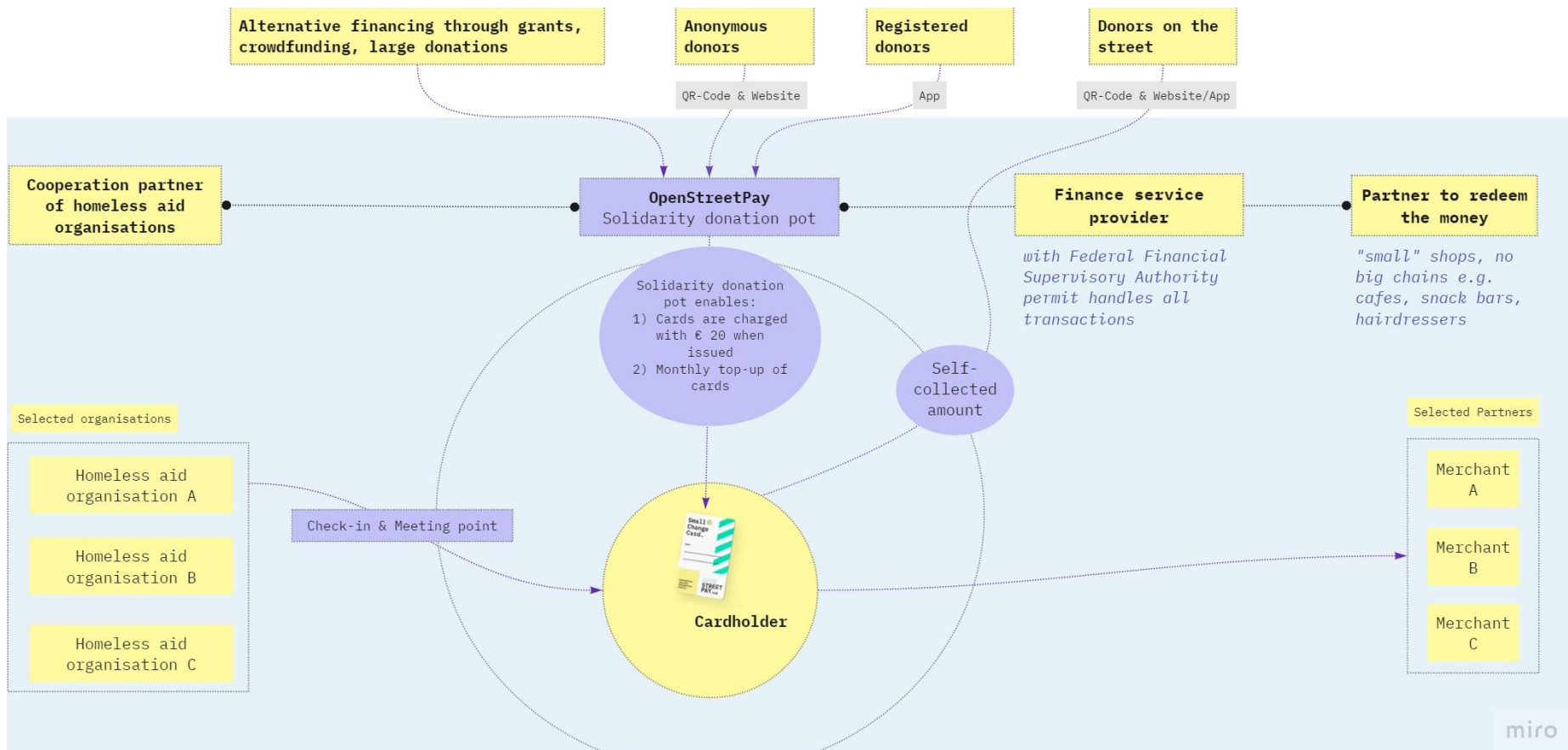


Figure 11.2. The Digital Donation Concept of OpenStreetPay

### 11.4.3 The Influence of Values on the Design

As OpenStreetPay tries to enable digital donation, it affects and transforms the usual donation interaction known and practiced over thousands of years. Thus, beyond the provision of technical components, the socio-technical transformation must be anticipated and the insights embedded into the artifacts. The main changes are (a) the donator and the recipient do not necessarily meet each other, (b) in order to make use of the received money, the recipient has to possess a card, (c) a network of stores is required and who accepts and processes the card for payment is communicated, and (d) secure financial support and compliance to legal requirements is additionally required. These changes raise many design decisions, for example, who should receive how much money, where can the homeless neighbors spend the donated money, or how to design the digital donation interaction? By addressing certain decisions during the design process stepwise, the team realized that general discussions about fundamental positions emerged and hindered the progress of the whole project. Hence, it became apparent that the implicit values that guide the design have to be made explicit. In the following, we describe the values that the team developed and refined over time. An overview of the values is provided in Figure 11.3. We also show the relationship between the values, the design decisions, and further influences.

**The first value** captures the topic of humanness (cf. Figure 11.3, V1): *“Be human. In everything we do: we do it out of humanity and with passion.”* The decision for this value covers the main motivation for becoming involved in this project to empower vulnerable people and is comparable to the value of *human welfare* from Friedman et al. (2008). Additionally, one of the main motivations for **donors** is to support humanness with a donation via OpenStreetPay. Also, from the perspective of **homeless aid organizations**, the participants of the survey see a good opportunity in OpenStreetPay, as the concept provides a low risk of infection during COVID-19, creates a high-quality infrastructure, and boosts solidarity. In the interviews, the team gained deeper insights regarding the questions of whom to help and how to help [I3, I5, I6, I7]. According to one interviewee, this is a highly emotional topic, and the team needs to decide what its core interest and position is [I8]. These insights helped the team to develop the following two values (cf. Figure 11.3, V2, 3), which are closely linked to supporting humanness.

**The second value** is *“Respect dignity. We treat each other, our partners, and each of our homeless neighbors with respect. Without exceptions”* (cf. Figure 11.3, V2). This has

multiple origins and addresses aspects that were raised in the quantitative analysis and expert interviews. It is similar to the values *courtesy*, *freedom from bias*, and *identity*, with a focus on the prevention of stigmatization and prejudice (Friedman et al., 2008). As previously explained, one of the most controversial aspects was who receives the money. Via the statements of **donors**, the team found that the identity of the recipients matters to some donors. One of the participants in the study wished explicitly for “no donation to addicts.” As explained previously, the team learned from the interviews with **homeless aid organizations** the meaning of this discussion and the different perspectives [I3, I5, I6, I7] and therefore developed their message [I8]. For the OpenStreetPay team, it is important to help everyone who needs help and to respect their circumstances and themselves, even if this might decrease the willingness to donate for some donors. Further discussions and design decisions influenced by V2 are: A donor raised the issue that scanning the homeless neighbor for donation is disrespectful.

This aspect was thoroughly discussed in the design of the user experience for enabling individual donation. Furthermore, the team learned more about how to avoid stigmatization and prejudices (e.g., not every person likes to beg). Due to the solidarity donation option of OpenStreetPay, begging can be avoided [I3].

**Value three** is closely connected to value two and emerged in the discussion about how the team wants to help from the start in order to serve *autonomy* (Friedman et al., 2008): “*Reach out. Small amounts of money make everyday life easier for our homeless neighbors. We enable self-responsible care*” (cf. Figure 11.3, V3). In the quantitative survey, the team gathered an understanding of the **donors’** wishes. For some of them, it is important to decide what can be bought by homeless neighbors with the donated money. According to V3, it is the team’s goal to give people back self-autonomy and responsibility with small amounts of money. Considering the opinion of the **homeless aid organizations**, this led to the design decision not to limit the range of products in the participating stores.

	Value (V)	Design Decision	Further Influences
V1	<b>Be human.</b> In everything we do: we do it out of humanity and with passion.	Motivation of team and donor, homeless aid organization, and team to participate	Branding, Selection of partners, Way of working as team
V2	<b>Respect dignity.</b> We treat each other, our partners, and each of our homeless neighbors with respect. Without exception.	Recipient of money, avoiding stereotypes and, disrespectful design aspects	Branding, Selection of partners, Recipients of SmallChangeCard
V3	<b>Reach out.</b> Small amounts of money make everyday life easier for our homeless neighbors. We enable self-responsible care.	Selection of products and, shops the SmallChangeCard can be used	Branding, Selection of partners
V4	<b>Enable solidarity and individuality.</b> We help with a monthly fixed amount and enable the collection of individual donations. We do not replace any help.	Donation forms, donation amount, alignment with legal aspects	Legal form, Back-end, Branding, Selection of partners/card, Concept of OpenStreetPay
V5	<b>Give perspectives.</b> Nobody should have to live permanently on the street. We try to pave homeless neighbors a sustainable way out of need.	Interaction with homeless neighbors, cherish social responsibility and, purpose	Strong connection to homeless aid organizations, Concept of OpenStreetPay
V6	<b>Be straightforward.</b> Help that reaches out to everyone is the best help. Therefore, OpenStreetPay shall be easy to use.	All user interfaces need to be inclusive, multilingual and, supported by illustrations	Communication with plain language and illustrations (e.g. code of conduct), UX Design
V7	<b>Show transparency.</b> We treat each other fairly and squarely and communicate in this way.	Communication in the regard of dignity	Branding, Communication
V8	<b>Joined forces.</b> We work together instead of against each other. With partners who share our values.	Purpose to be socially responsible, partner selection based on values	Partner selection and, diversity of shops, Concept of OpenStreetPay
V9	<b>Be secure.</b> The security of all data of our donors and homeless neighbors is important to us. That's why we protect them.	Secure the data of all stakeholders	Back-end, Selection of and, cooperation with money transfer partners, Data analysis only if needed
V10	<b>Take responsibility.</b> We are aware that our donors, partners and, homeless neighbors trust us. We question ourselves and OpenStreetPay.	Cherish social responsibility and purpose	Way of working as team, Continuous reshaping of values and concept, Measuring impact for social ecosystem

**Figure 11.3. The Values of OpenStreetPay**

**Value four** captures the form of donation and has the aim to: *“Enable solidarity and individuality. We help with a monthly fixed amount and enable the collection of individual donations. We do not replace any help”* (cf. Figure 11.3, V4). This donation-specific value and decision is an adaption to the insights from the **donors’** wishes, the feasibility assessment of the **homeless aid organizations**, and insights from the interview with the **lawyers**. It stems from a toggling between different options on the design path. The team started with the idea of an individual form of digital donations (without financial limit), changed it to a solidarity-based concept in the hackathon (€5 per day; €150 per month), and ended up with the design of a mixed concept (€20 per month on solidarity base, up to €130 collection on their own) after performing the acceptance test and expert interviews. There are multiple reasons for this. First, an important legal aspect is that the donation of money needs to be reported. Handing over cash is still unregulated, but in switching to a cashless digital donation, the regulations of additional earnings need to be met (a maximum of €150 a month if you receive basic financial support in Germany) [I3, I5, I9]. Therefore, it is important for the team that OpenStreetPay does not cause any deductions or replacement of other sources of financial help. Second, the team faced substantial uncertainty about whether the required monthly amount in the solidarity donation pot would be continuously reached for solidarity-based donations. If each homeless neighbor received €5 every day, this would make €150 a month per person and €286.500 a month just for Hamburg [I6, I8]. From the donors’ perspective, the data gathered presented the following picture: With anonymous donations through OpenStreetPay, the **donors** could plan the time of donation. The most preferred variances, based on our analysis, are weekly (23.47%), monthly (30.61%), or on an irregular basis (30.61%). The average donation amount is €6.52. The voices from **homeless aid organizations** regarding solidarity donation were also divided (seven for the concept, two against [I6, I7]). Hence, the team was reluctant to expect this constant high amount from the solidarity pot and decided to combine the two donation options [I6]. Third, it was also added that some homeless neighbors still need cash, and there is a risk that it might no longer be available. Therefore, it was important to the team that they did not want to replace any kind of donation. Changing to digital donations with both options makes donations individually explicit and analyzable. The team learned that it is vital to focus on existing regulations, like the additional earnings border, in case you receive financial aid from the government. Due to these aspects, the team started analyzing existing governmental regulations and talked to a **pay tech lawyer** [I11]. Normally, it is necessary to get an e-money license, but there are some exceptions that might fit for OpenStreetPay: Either the local area where the

SmallChangeCard operates needs to be reduced according to a specific postal code area, or OpenStreetPay needs to make sure that the transferred money is only used for social causes. An alternative would be to work with an organization with an e-money license [I11].

For **the fifth value**, the team discussed the impact of OpenStreetPay and how they wanted to offer more than financial support to support *freedom from bias* (Friedman et al., 2008): “*Give perspectives. Nobody should have to live permanently on the street. We try to pave homeless neighbors a sustainable way out of need*” (cf. Figure 11.3, V5). The **donors** highlighted that only offering money is not appropriate for vulnerable people; some donors mentioned that existing structures are important. Also, when someone donates with cash, there is always a direct interaction between the donor and the recipient. With a digital donation, this can change. Therefore, it was important for the team to understand the meaning for the donor (and the impact for the homeless neighbor). The donors’ opinions were mixed. Their opinions regarding the local donation relation were mixed as well, but it seems that this was more important for them. Members of the **homeless aid organizations** have expressed their concern that some homeless neighbors who benefit from personal contact might suffer from this decrease in human interaction. As the team is aware of this unintended effect, it is determined to find a solution tailored to both the donors’ and the homeless neighbors’ different stages of need for contact with each other. Additionally, contact with homeless aid organizations will be fostered by distributing (and managing) the SmallChangeCard (cf. Figure 11.3, V8).

To enable the use of OpenStreetPay for everyone, the team discussed **value six**, which shall support *universal usability* (Friedman et al., 2008): “*Be straightforward. Help that reaches out to everyone is the best help. Therefore, OpenStreetPay shall be easy to use*” (cf. Figure 11.3, V6). This means that donating shall be as easy as possible. Most **donors** (70.41%) would prefer to donate flexibly via smartphone or when they meet a homeless neighbor (52.04%). Also, rounding up in the supermarket (58.16%) or a proportionate donation when purchasing goods (57.14%) seems to be interesting. Initially, the team decided to focus on the mobile app. The team found that installing an app, creating an account, long registry processes, too many authentications, signing contracts, or only one payment method can harm the willingness to donate. Hence, the team added a second interface to the concept: a web-based variant for donation. The interviewees of the **homeless aid organizations** highlighted that language problems and the need for different languages should be considered, and some homeless neighbors might have access barriers (due to physical and

psychological restrictions) [I3, I5, I6, I7]. Therefore, it can be helpful to work with welfare worker to distribute the SmallChangeCard and use plain language and illustrations [I3, I5].

Transparency (**value seven**) was also an aspect the team discussed in terms of values. It is closely linked to *trust* (Friedman et al., 2008): “*Show transparency. We treat each other fairly and squarely and communicate in this way*” (cf. Figure 11.3, V7). Some **donors** want transparency of payment and donation processes (with little to no administration costs) as well as visibility of the number of beneficiaries in need. This is important for the team under the constraint of ensuring the dignity of the homeless neighbor (cf. Figure 11.3, V2).

It became clear during the discussions of other values that collaboration with others is irreplaceable. Hence, the team developed **value eight**: “*Joined forces. We work together instead of against each other. With partners who share our values*” (cf. Figure 11.3, V8). It is important for **donors** that existing homeless aid structures will not be ignored because of OpenStreetPay. Competition with other parties and the risk of losing contact with homeless neighbors should be avoided. One of the motivations to work with **homeless aid organizations** was the concern about decreased personal contact (cf. V5). Due to these aspects, the collaboration with homeless aid organizations became a core element of the concept. Furthermore, it was highlighted that it might be helpful to work with more prominent and trusted organizations, like large grocery stores or banks [I2]. Due to the high regulatory need, the team started contacting **money transferring organizations**. The team learned that there are many kinds of possibilities to develop a card, but they have different costs [I12]. During this process, the team became aware that the decision about which company to collaborate with was going to be a challenge, particularly regarding the size, values, and motivation of the corporations. Therefore, they are still working on the partner management and will start with smaller cafés and restaurants to ensure that they share the values, which has an impact on V3 and decreases the heterogeneity of products to buy with the card.

As the team is working in a very sensitive area, *privacy* (Friedman et al., 2008) is one of the core values (**value nine**): “*Be secure. The security of all data of our donors and homeless neighbors is important to us. That’s why we protect them*” (cf. Figure 11.3, V9). Participants of the **homeless aid organizations** stated that they feared the collected data might be misused to disperse homeless neighbors from their shelters. This could be the case, for instance, if location data were collected, or the approximate location could be determined via fitting



algorithms [I5, I9]. Therefore, all technical elements need to be secure. Also, the design decision was made to only collect and analyze data if necessary. However, registration of the homeless neighbors is necessary for compliance with laws [I2]. Thus, the team decided to use photos and names. This design decision could become challenging, as could other authentication techniques [I3, I7, I9]. Some homeless neighbors might not be willing to register [I5, I9]. For the **donors**, security and trust are especially important. The requirements start with a wish for additional information on our website, data protection, encrypted data transfer, and technology partners that are known, secure, and proven. While discussing this value, the team also discussed the required technology. Therefore, the team raised the question of whether a blockchain-based solution might be the right choice. However, the team decided that this solution was inappropriate because they are working with payment card providers and an existing infrastructure.

As mentioned above, the findings from the empirical research became part of the value discussion. However, **value ten** was not based on the empirical research, but it was derived from VSD. Values are evolving over time, so the team needs to question themselves and their values regularly (Friedman et al., 2008): *“Take responsibility. We are aware that our donors, partners, and homeless neighbors trust us. We question ourselves and OpenStreetPay”* (cf. Figure 11.3, V10). To operationalize the values, the team decided to develop a code of conduct for every stakeholder group.

#### **11.4.4 Reflection and Formalization of Learnings**

Regarding RQ1, we formalize our learnings as follows: (1) OpenStreetPay as one instance of a digital donation concept for homeless neighbors anticipates a very sensitive and difficult transformation of a social practice for vulnerable people that has persisted for thousands of years. It changes the method of donations and depends on the willingness of homeless neighbors to adopt and use it. (2) Developing a solution for this field requires a discussion of biases and prejudices to avoid a negative impact and a reinforcement of stigmatization. (3) The socio-technical complexity of the context requires a comprehensive concept that goes beyond software from the beginning onwards. It requires a lot of stakeholder knowledge and involvement, financial sustainability, and a stable, easy-to-use app. Many of the involved stakeholders suffer from high pressure due to limited resources, and wrong steps might not be forgiven. Therefore, understanding the stakeholders and their social ecosystem is crucial to avoid early failure (Burmeister et al., 2019). (4) The establishment of an ecosystem network

is essential to include expert knowledge about legal, security, and service provision aspects. While we assume that learning no. 1 to 4 can be generalized to other contexts, we also highlight that the development of a digital donation concept should consider the local particularities of the context due to the high relevance of the social context and stakeholders' perspectives.

The stakeholder-oriented and value-based process of developing a DSI for vulnerable people (RQ2) can be challenging, especially when prejudices and difficulties in accessing vulnerable people occur. To develop a DSI for vulnerable people, we formalize our learnings as follows: (1) It is important to understand the living circumstances of the vulnerable people, their social ecosystem, as well as the prejudices the vulnerable people meet while facing other stakeholders. (2) Our process showed that inscribing values into the design of a DSI is a good starting point to support vulnerable people and challenge biases and prejudices. The values are the basis for design decisions and planned collaboration patterns. (3) The discussion about the values also revealed unintentional ones of the DSI, which the team might not have encountered so quickly without a detailed discussion of them. (4) As described in section 11.3, the decision to develop values was based on recurring discussions, which are the foundation for the development. Once the team found common ground for the values, it was possible to focus on the transformation and to avoid failure due to unresolved tensions among underlying values. However, this also meant that certain requirements could not be considered in the design process in order to avoid contradicting the values.

## **11.5 Discussion and Conclusion**

Our study includes several contributions to IS research. First and related to RQ1, our study is one of the first studies describing the development of a digital donation concept and aiming to develop design knowledge for this field. Our study also advances research, as it includes a dedicated discussion of values, which was missing in prior studies (Whittle et al., 2020). The first steps of accompanying the OpenStreetPay project allowed us to reflect the design of a concept that allows digital donations to homeless neighbors. While we acknowledge context-specific factors influencing the design, we began to formalize our learnings (see section 11.4.4), which might be useful for others developing DSI for other vulnerable groups or those in different regions. In particular, the integration of the stakeholders in the design process allowed us to understand their needs and consider their value perspectives. Without anticipating these multilayered aspects from the empirical research, the extension of cash

donations by digital donations might fail. Failures in such contexts might have a significant impact and lead to mistrust and refusal of further activities.

During the process of developing a value-based and stakeholder-oriented DSI (RQ2), we learned how VSD influences the design of DSI for vulnerable people. The work of Friedman et al. (2008) served as a basis for integrating values into the design process. We provide another example of how their approach can support the design process, in our case, for a DSI for vulnerable groups. This could be leveraged for other DSI initiatives, as it exemplifies the idea of how to develop DSIs responsibly. Furthermore, the high relevance of values in the design process raised the question of how design goals and principles from ADR and values from VSD are related to each other. So far there is no clear answer to this question. Puroo and Wu (2013) do not see values as a design principle. We would agree with this assumption to a limited extent. If values have a strong influence on the design, as in the case of DSI, they could become part of them in an abstracted manner. This discussion points at this intersection as an interesting area for future research.

Our research results are limited due to the methods and the focus we chose. Our research focuses solely on the project OpenStreetPay and the context of Germany. In other countries like the USA, similar ideas and prototypes exist, which were also considered during the design process. Furthermore, we have not evaluated the idea with homeless neighbors to understand what will support them most. This will be our next step. An initial pilot test with homeless neighbors is planned, and the impact and success of OpenStreetPay in the social ecosystem will be measured.

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## 12 Paper 2: Human-Value-Oriented Digital Social Innovation: A Multilevel Design Framework

### *Abstract*

The field of digital social innovation (DSI) seeks to address societal challenges, including fighting poverty and inequality, strengthening justice, human rights, and gender equality, and addressing environmental issues affecting the planet and climate by leveraging digital technologies. In this article, we present a multilevel design framework for DSI. It originates from a reflection resulting from the learnings of an action design research project that aimed to develop a digital donation system for homeless neighbors. The framework draws upon the research stemming from DSI, value sensitive design, and service science spheres. It allows value-sensitive interaction in DSI projects to be captured, structured, and reflected from their overarching purposes to detailed design decisions and individual actions. We demonstrate the application of the presented framework by analyzing episodes of value election and inscription of the digital donation project.

**Keywords:** Digital social innovation, value sensitive design, multilevel framework, co-creation, ecosystems

### 12.1 Introduction

The COVID-19 pandemic has amplified the need to address existing societal challenges, including fighting poverty and inequality, strengthening justice, human rights, and gender equality as well as addressing environmental issues affecting the planet and climate (Guterres, 2020, April 23). These intertwined challenges are targeted by the Sustainable Development Goals (SDG) of the United Nations (United Nations, 2020). The research field of digital social innovation (DSI) aims to create digital solutions that address these societal challenges and to make progress regarding SGDs by leveraging digital technologies (Eckhardt et al., 2016; Qureshi et al., 2021). DSI draws on the idea of co-creating knowledge and solutions, which had been unimaginable “before the rise of the Internet” (Bria et al., 2015, p. 9). While utilizing digital technologies enables DSI to address societal challenges in new ways and with a broader scope, recent studies show that embedding DSI into the social context of its stakeholders and ecosystem is vital for maximizing societal impact, which needs active participation of all affected actors (Eckhardt et al., 2021; Qureshi et al., 2021).

Extending the DSI focus toward a broader social context through its different actors creates additional challenges for both practice and research because all stakeholders bring their own values and interpretations to the projects they are working on. Consequently, divergent values among the different actors can lead to ethical dilemmas and create barriers in the DSI design process (Gebken et al., 2021). Solving these ethical dilemmas and avoiding unintended negative implications for society or beneficiaries requires explicit discussions of human values<sup>15</sup> and their role in the DSI design process to take place. Thus, it is necessary to identify what the pluralistic values of the DSI ecosystem actors are and to negotiate the role of these values in a DSI project (Friedman, 1997; Gebken et al., 2021). Bringing the negotiation of values to the foreground assists in avoiding conflicts and positively impacts the attainment of a project's goals (Terstriep et al., 2020). Value Sensitive Design (VSD) is one approach that addresses the challenges of eliciting and implementing ethical concepts in heterogeneous groups. VSD provides the theoretical foundations and tools for including discussions on human values in design processes (Friedman and Hendry, 2019). While VSD, in its current state, is well suited for supporting DSI in the development of overall guiding ethical principles at a rather abstract level, it lacks a multilevel perspective that would support its analysis and design—from overarching values to detailed design decisions (Eckhardt et al., 2021; Qureshi et al., 2021; Winkler and Spiekermann, 2018).

To address this gap, we draw on results of service systems research because the understanding of co-creation processes is constitutive for service research (Storbacka et al., 2016; Vargo and Lusch, 2004). Recent research argues that co-creation should be conceptualized on the basis of different levels of abstraction, from the service ecosystem to the processes for engaging individual actors (Storbacka et al., 2016). Hence, the theory on co-creation from the domain of service systems research affords the opportunity for considering design decisions in DSI at different levels (Grotherr et al., 2018; Storbacka et al., 2016). By adopting this multilevel perspective for the DSI context, we seek to support the understanding of value inscription as well as the reflection on activities and decisions in relation to elicited values. However, the existing service systems research frameworks do not explicitly include the development of human values and DSI specifics. Therefore, this paper aims to adopt and extend existing frameworks for multilevel service system design (Storbacka et al., 2016) and related refinements (Grotherr et al., 2018; Grotherr et al., 2020) in DSI and to enrich it by

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<sup>15</sup> In accordance with Friedman and Hendry (2019, p. 24), we define values as “what is important to people in their lives, with a focus on ethics and morality.”

including human value-orientation in order to attain societal change. We expect this approach to strengthen both theoretical and practical guidance for integrating the identification and discussion of human values into DSI co-creation processes and its ecosystem as well as their impact on concrete design decisions. Thus, this article seeks to answer the following research question:

*How can the multilevel perspective of service systems research be adopted for DSI research in order to support the multilevel analysis of value inscription and reflection?*

The aim of this study is to understand the complex process of creating DSIs in their ecosystems while integrating the SDGs and project-specific values of DSI into their development processes. In doing so, this study combines the foundations of DSI, VSD, and service systems on the basis of formalizing the learnings from an Action Design Research (ADR) project, which is described in more detail in the “Methods” section. DSI provides the basic understanding of the direction that innovation should take in order to attain the SDGs. VSD establishes the foundation for understanding values and creates the possibility for discussing ethical dilemmas. The service systems’ lens serves as the basis from which co-creation can be investigated at multiple levels in terms of design. By combining the aforementioned approaches and reflecting on the findings of the ADR project, we develop an integrated framework that supports the analysis, design and reflection of value-sensitive DSI at multiple levels.

## **12.2 Theoretical Foundations**

The theoretical foundations for this study stem from three research streams. First, we include the DSI field, which focuses on addressing societal challenges by leveraging digital technologies. Second, we consider research from the VSD field in order to shed light on values and their impact on the DSI design process. Third, we draw upon service science frameworks, which focus on the co-creation of services and assist with understanding the multiple levels of the design process and their interaction.

### **12.2.1 Digital Social Innovation (DSI) Ecosystems and Co-Creation**

This study seeks to contribute to the DSI research area. DSI is an emerging field in Information Systems (IS) research (Qureshi et al., 2021) and Bria et al. (2015, p. 9) define it as “a type of social and collaborative innovation in which innovators, users, and communities collaborate using digital technologies to co-create knowledge and solutions for a wide range

of social needs and at a scale and speed that was unimaginable before the rise of the Internet.” The social needs addressed by DSI research can be derived from the United Nations’ SDGs (Eckhardt et al., 2016; Leong et al., 2020). These SDGs address the social and environmental issues affecting today’s society (United Nations, 2020).

Co-creation processes have been deemed to be a suitable approach for implementing DSIs, as the development of (digital) social innovations is constantly reflected on and revised within the social process of co-creation (Bria et al., 2015; Eckhardt et al., 2021). The resulting DSI ecosystems are not yet clearly defined, but Kumari et al. (2020, p. 4) describe them as being “characterized by complex interactions among a variety of stakeholders (actors) and their components, and the ecosystem aims to support technology development and innovation.” Hence, co-creation should lead to the provision of better solutions to social problems because all relevant actors participate in the innovation process (Eckhardt et al., 2021). In order to analyze co-creation in (D)SI and its ecosystems in detail, a corresponding framework has been published by Eckhardt et al. (2021). This framework includes the norms at a *macro level* and the structure of innovation at the *meso level*, while functions, actors, and roles are part of the *micro level*. The connection between *micro*, *meso* and *macro levels* and the inscription of values are not aspects considered by this model. The importance of values for DSI development, however, is highlighted in other papers. A case study on the vulnerable group of homeless neighbors, for example, shows the relevance of value consideration because the lack of shared values among the actors leads to project termination when the homeless aid organization starts to fear that the homeless neighbors’ security might be threatened (Whittle et al., 2020). If there is no consideration of values, then ethical dilemmas are not revealed, indirect inscription of values occurs, and potential downsides of DSI are not considered (Friedman and Hendry, 2019; Qureshi et al., 2021).

### **12.2.2 Value Sensitive Design (VSD) for Achieving Responsibility**

Whittle et al.’s study and the DSI project experiences guided us toward considering the literature from the VSD area (Gebken et al., 2021). VSD enables DSI initiatives to incorporate relevant contextual factors into their design process. In this context, Friedman and Hendry (2019, p. 3-4) define VSD as follows: “VSD seeks to guide the shape of being with technology. It positions researchers, designers, engineers, policy makers and anyone working at the intersection of technology and society to make insightful investigations into technology innovation in ways that foreground the well-being of human beings and the



natural world. Specifically, it provides theory, method, and practice to account for human values in a principled and systematic manner throughout the technical design process.” VSD is necessary because technologies spring from human imagination and have an impact on society. As a result of these human actions, technologies are, to some extent, reflections of human values and the two reciprocally influence one another. This means that moral and ethical aspects are inscribed in technology—regardless of whether they are directly considered or only indirectly inscribed (Friedman and Hendry, 2019).

The concepts of technology, human values, stakeholders, and design practices are at the core of the VSD theory. This article understands actors as stakeholders who are both directly and indirectly affected by DSI or integrated into the design process. Values refer to the concept of human values in the DSI context. The literature on values highlights the challenges of dealing with values in practice (Friedman and Hendry, 2019). The reason for this is that the consequences of the subsequent DSI adaptation cannot be predetermined—only attempts can be made to ensure that the use context is envisioned and included in the design process. For this purpose, a variety of methods is available from which teams can select the ones that are appropriate depending on their actual context. In this context, VSD is executed under the guiding principle of “Progress, not Perfection” (Friedman and Hendry, 2019, p. 55), as inscribing values is a major challenge. Engaging values in the technical design process can be daunting, especially when facing resource limitations and technical complexities. The VSD method attempts to make progress in this area. Using VSD is a demanding task for all actors that adds to project complexity. Their task is to align the innovation with the well-being of people and their environment to identify the “shortcomings” in a project and to include the social debates on relevant technologies. In doing so, new criteria for the quality of technologies emerge, that tries to take the named aspects to heart (Friedman and Hendry, 2019). Since co-creation processes in particular are shaped by the individual actions of individual actors, it is interesting to investigate what influence design decisions have on values and vice versa.

### **12.2.3 Service Systems and Co-Creation**

Understanding co-creation processes is constitutive for service systems research (Storbacka et al., 2016; Vargo and Lusch, 2004). The respective literature has contributed to our understanding of how multiple actors can form highly distributed and interconnected service systems (Maglio et al., 2009; Vargo et al., 2008). A service system can be characterized as a

network of actors and interactions that integrate resources for value co-creation (Ng et al., 2012; Vargo and Akaka, 2012). Following the example of digital services, service providers could involve diverse parties who would offer numerous possibilities in order to further develop and improve the individual benefit for the customer. In this context, different parties (Riedl et al., 2009; van Alstyne et al., 2016) could link together to offer a joint value proposition to customers (Vargo et al., 2008). Recent research argues that co-creation can be considered on the basis of different levels of abstraction—from service ecosystems, characterized as being relatively self-contained and self-adjusting systems of resource-integrating parties (Maglio et al., 2009; Vargo and Akaka, 2012), to processes of engaging individual actors (Storbacka et al., 2016).

The field of service system engineering addresses value co-creation in the design of service systems (Alter, 2008; Bullinger et al., 2003). The respective literature provides guidance to consider design decisions at different levels (Grotherr et al., 2018; Storbacka et al., 2016), which is important due to the reasons as DSIs need to be considered on different levels and DSIs often appear in the form of services. Existing analytical frameworks show how the relationship between service systems and value co-creation at *macro*, *meso* and *micro levels*, as well as institutional and engagement design, must be planned to co-create value (Grotherr et al., 2018; Grotherr et al., 2020; Storbacka et al., 2016). While systematic development of service systems has been the focus of previous study (Alter, 2008), the related research provides only limited guidance for systematically designing complex service ecosystems (Böhmman et al., 2014; Grotherr et al., 2018). This creates a problem of how the right configurations of actors and resources for value co-creation can be identified in such complex scenarios (Edvardsson et al., 2012), which will be a part of further study.

Furthermore, in contrast to value conceptualization in service systems research regarding value co-creation for a beneficiary, the term value in value-sensitive DSIs is understood to refer to the human value orientation of actions for the purpose of creating value for the benefit of a much broader group or society in general (like SDGs). Such difference in the understanding of the term represents a paradigm shift because both the focus group and the self-understanding of the actors deviate from traditional patterns and appears necessary in view of the numerous global and regional problems with which the global community is increasingly confronted (United Nations, 2020). This situation provides the motivation for adapting existing service science frameworks to a human-value-oriented approach, which—

as explained above—is to be implemented in the context of co-creation. As a result, this paper adopts and extends existing multilevel service system design frameworks for DSI.

### **12.3 Research Design**

The findings and results of this study were gathered as part of the reflection process on the learning phase of an ADR project (Sein et al., 2011). This ADR project is attached to the “OpenStreetPay” DSI project, which aims to support a vulnerable user group (homeless neighbors) by creating a digital donation solution (Gebken et al., 2021). The project addresses the challenge of supporting homeless neighbors in a society in which cash is becoming less prominent by enabling digital donations via digital payments through a new digital service (more details cf. Table 12.1, Figure 12.1). One of the co-authors is actively involved in the development process of this DSI project and realizes the link between “action” and “reflection” of the ADR and the DSI project. This DSI project profits from its link to research, adopting VSD ideas (Friedman, 1997) to develop a common understanding of values for DSI and its ecosystem. Over the course of the ADR project, we already developed design principles during Stage 4 *Formalization of Learning* of the first ADR Iteration (Gebken et al., 2021, p. 6418): “(1) It is important to understand the living circumstances of the vulnerable people, their social ecosystem, as well as the prejudices the vulnerable people meet while facing other stakeholders. (2) Our process showed that inscribing values into the design of a DSI is a good starting point to support vulnerable people and challenge biases and prejudices. The values are the basis for design decisions and planned collaboration patterns. (3) The discussion about the values also revealed unintentional ones of the DSI, which the team might not have encountered so quickly without a detailed discussion of them. (4) ...the decision to develop values was based on recurring discussions, which are the foundation for the development. Once the team found common ground for the values, it was possible to focus on the transformation and to avoid failure due to unresolved tensions among underlying values.”

These learnings were incorporated into the project during the second ADR iteration, where the concept and prototype were revised (cf. Figure 12.1; Figure 12.3, Development of 10 Values). During the second reflection and formalization process, DSI team members searched for ways in which to structure the discussion and inscription of values in DSI, its ecosystem, and co-creation. The observations were recorded and analyzed in a “decision log” which holds all major and minor decisions made during the project. The weekly meeting minutes of

the project team, the results from data collection and analysis (cf. Table 12.1), and the entire archive structure and documents of the team served as a basis for the analysis and log.

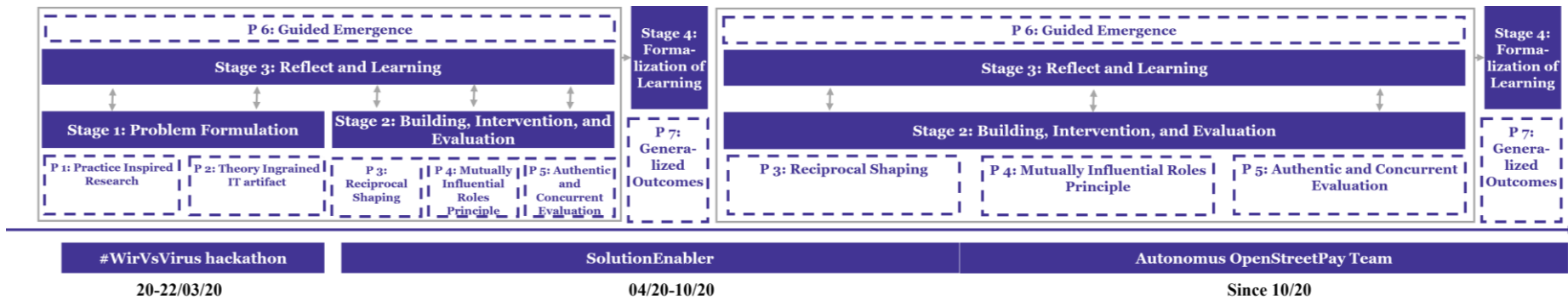


Figure 12.1. Timetable Covering the Two ADR Design Cycle (Sein et al., 2011)

When evaluating and reflecting on the findings in the decision log as part of the inductive *Formalization of Learnings* stage, we sought to find a structure that could guide our analysis to further understand the interaction between values, design decisions, and their impact on relevant actors as well as co-creation and society. As value inscription in DSI occurs at multiple levels and is reflected upon in recurring discussions by the OpenStreetPay project team in relation to design decisions, we sought to find frameworks that support the value discussion, reflection, and inscription at multiple levels. In the beginning, we initially developed architectural views based on the decision log. However, these views were unable to support the analysis of how values are broken down and how design decisions and individual actions are related to values. This was primarily due to the structure of the decision log, which was based on topics and not on different abstraction levels. As a next step, we adopted the model of Eckhardt et al. (2021). However, this model was too abstract and did not allow us to link values to single design decisions made during the project. Consequently, we adopted additional models from service system research because they take co-creation into consideration and support multilevel analysis for tracing the impact across different levels (Grotherr et al., 2018; Grotherr et al., 2020; Storbacka et al., 2016). Even though the models adopted from service system research lack an explicit consideration of values, they nevertheless informed our project reflection with insights that seemed to be both relevant and analogous in both areas—service science and DSI. In service science, they note that the influence of institutional logic or value proposition is not directly measurable but that the individual actions and commitment during the course of co-creation are (Grotherr et al., 2018). This corresponds to our own findings, which indicate that observing, recording, or planning the realization and concrete perception of values for DSI is challenging, whereas the individual activities of the actors involved in the development of DSI and its ecosystem are observable.

**Table 12.1. Overview of the Digital Donation ADR Project (Based on the Structure of Grotherr et al. (2020))**

<b>DSI as a Service System</b>	Digital donations to and payments for homeless neighbors, bringing together different actors guided by 10 values.
<b>Actors of the DSI Ecosystem</b>	Homeless neighbors, homeless aid organizations, donors/citizens, legal entities, social hubs, e-payment companies, (shopping possibilities), project team.
<b>Resources</b>	Infrastructure, money/donation, information, time.
<b>Value Proposition (Version 2— Revised)</b>	The digital donation concept “includes a digital donation and payment system to enable contactless donations to homeless neighbors. The donation can be made via the donor app or a webpage. The donation receipt and the store payment are processed via a card and the merchantApp. In addition, the concept includes collaboration aspects between homeless neighbors and aid organizations” (Gebken et al., 2021).
<b>Concept</b>	The digital donation concept “includes a digital donation and payment system to enable contactless donations to homeless neighbors. The donation can be made via the donor app or a webpage. The donation receipt and the store payment are processed via a card and the merchantApp. In addition, the concept includes collaboration aspects between homeless neighbors and aid organizations” (Gebken et al., 2021).
<b>DSI Platform</b>	SmallChangeCard, SmallChangeApp/webpage, merchant app.
<b>Tool Support</b>	Collaboration platforms (Slack, Miro, Google Drive, Zoom, Git, Figma), social media platforms (Facebook, Instagram, LinkedIn, Xing), app stores (Google Play & Apple Store).
<b>Research Approach</b>	Action Design Research
<b>Data Collection and Analysis</b>	Interviews, focus groups, decision logs based on weekly protocols of the project team, quantitative questionnaires, reports from homeless neighbors, evaluations of other apps for homeless neighbors, VSD (technical, conceptual, and empirical investigation).

In discussions among the researchers, we realized that tracing decisions at the *macro level* and understanding their influence at the *meso* and *micro levels* helps us systemize these decisions and the influence of values in relation to the project's results. Hence, we continued to apply Grotherr et al.'s (2018) model and developed it further based on the results of a stepwise application to the DSI project. In addition, we continued to develop the framework by including the results of Storbacka et al. (2016) and Grotherr et al. (2020), adapting these models for the DSI context. Furthermore, we continuously discussed and reflected on the ongoing DSI project and adapted the framework accordingly. Finally, we drew on the models of Eckhardt et al. (2021) and Friedman and Hendry (2019) to explicitly include the norms, structures, functions, and roles from DSI and value-based-inscription/-reflection of actions and decisions.

By reflecting the progress of the project based on the theoretical foundations of DSI, VSD, and service systems, we iteratively and abductively developed and refined our framework. The DSI project served as a valuable source of data and provided the starting point for our subsequent framework development. By combining the consideration of societal goals and human values with the multilevel structure of the models adopted from service system research, we developed a framework that aids the understanding of multifaceted value-based interaction in DSI projects. To this end, we used Coleman's (1994) basic bathtub model, which originates from sociology and considers human beings as *homo economicus*. The addition of the *meso level* to the *macro* and *micro levels* is borrowed from Storbacka et al. (2016), while the design cycles come from Grotherr et al. (2018) and (2020). When compared to the original models from the service system design sphere, the changes comprise, for example, the shifts from "value proposition" to "values, value proposition & societal goals" and from "value co-creation" to "value inscription in DSI ecosystems, value-creation". In particular, these examples show how the framework is expanded to include human values and societal goals—not representing individual benefits alone. Based on these refinements, further projects can make use of this new framework to guide them in developing value-sensitive DSI.

#### **12.4 Adaptation of a Multilevel Design Framework for Service Systems for the Human-Value-Oriented Digital Social Innovation (DSI) Ecosystem**

As a result of the formalization of knowledge activities, we present an adaptation of a Multilevel Design Framework for Service Systems that takes DSI value-orientation into



account in its ecosystem. The framework adaptation aims to describe the relationship of DSI, its ecosystem, and individual actions in the context of co-creation, focusing on values and societal influence. The existing framework (Grotherr et al., 2018; Grotherr et al., 2020; Storbacka et al., 2016) helps to conceptualize co-creation and actor engagement in the context of service systems and thus provides a level of detail that is needed for the analysis of value discussions and inscriptions. In this context, the adaptation of the framework aims to make the influence of values in DSI visible on the basis of individual actions and to clarify the significance of the co-creation activities of individuals for the project. Consequently, we understand DSI to constitute a special form of service system in this context. This DSI is developed by a DSI team whose work is embedded into a DSI ecosystem. This DSI ecosystem contains the DSI itself, the DSI team, and other actors and their infrastructures. The overall DSI ecosystem supports the DSI team in creating societal impact (Kumari et al., 2020). The understanding of “values” in service science and the frameworks in this field differs from the understanding of VSD (Friedman and Hendry, 2019). For purposes of adaption, we draw on the VSD value concept because DSIs often have a focus that is different than that of service systems, which are primarily directed toward generating economic value. The multi-layered nature of goals and the pluralistic values of actors have to be considered in DSI projects in order to attain the intended societal influence (e.g. SDGs) (Terstriep et al., 2020). The adapted framework enables the implementation of an analytical perspective that theorizes the dynamics of DSI development and evolution. Hence, the framework ultimately increases the understanding of values and their inscription in the co-creation of DSI and its ecosystem by analyzing design decisions at each level. It supports a derivation of design knowledge in a systematic manner for purposes of actor engagement, which cannot be planned deterministically (Grotherr et al., 2020). The adaption of the framework for DSI purposes and the expansion of its scope from individual to societal benefit, as well as the addition of the human-value-orientation of the project, provide extra value to both service systems and DSI research fields.

In the following section, all elements of the adopted framework (shown in Figure 12.2) are described. First, the three levels—*macro*, *meso*, and *micro*—are explained in detail in the “Overview” section, followed by the explanation of the mechanisms at work between these levels in the “Mechanisms” section, and the description of the design cycles of institutional and engagement design in the “Design Cycles” section.

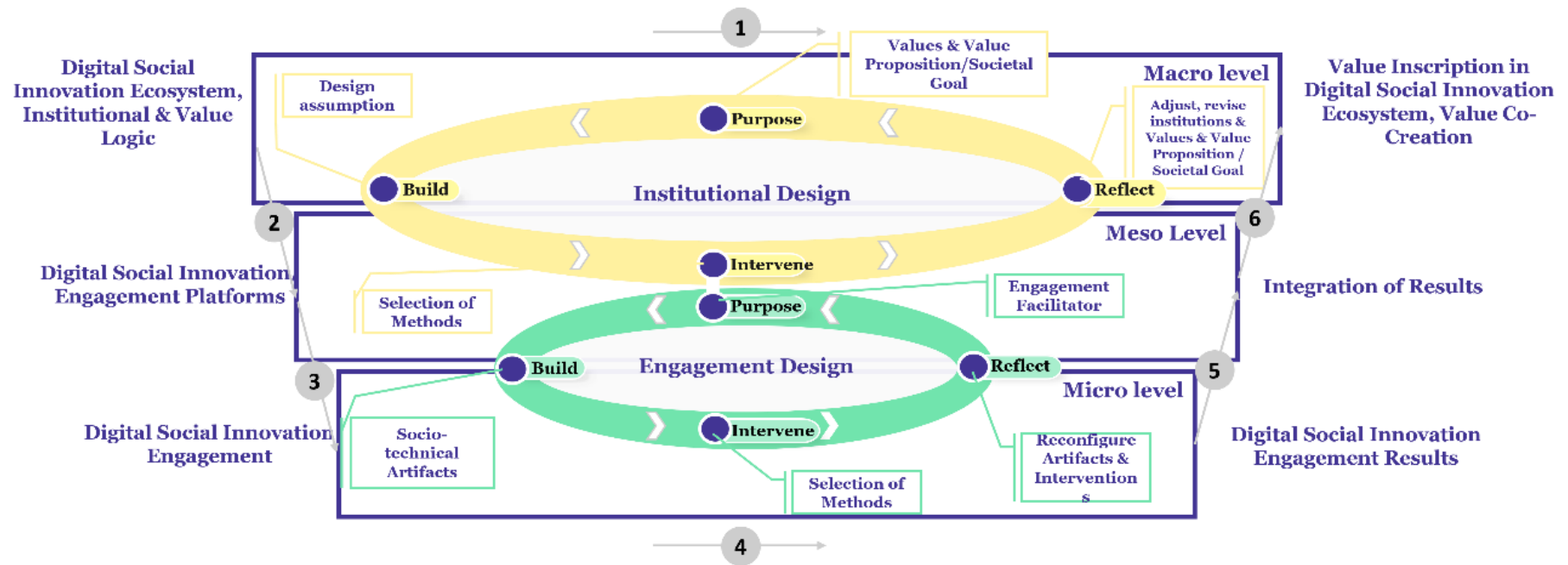


Figure 12.2. Multilevel Framework for Human-Value-Oriented DSI Ecosystem (Adopted from Grotherr et al. (2018); Grotherr et al. (2020); Storbacka et al. (2016))

### 12.4.1 Overview

The “bathtub model” consists of three levels—*macro*, *meso*, and *micro* (Storbacka et al., 2016)—and is based on the ideas of Coleman (1994). The *macro level* comprises institutions, governmental influences, cultural traditions, and values of DSI and its ecosystem. The *meso level* comprises a DSI team, its structure and culture, and DSI itself in the form of engagement platforms. The *micro level* summarizes the individuals who are co-creating DSI (Jeurissen, 1997; Storbacka et al., 2016). The *macro level* houses the norms—political, normative, and regulatory context; societal attitudes and framework conditions; culture of cooperation/collaboration; and culture of innovation—that influence and shape the values of DSI and its ecosystem (Eckhardt et al., 2021; Friedman and Hendry, 2019; Storbacka et al., 2016). Consequently, the societal challenges (SDGs) and values that need to be addressed are located at this level (United Nations, 2020). The *meso level* is influenced by various socio-economic, demographic, and technological parameters as well as by the regional scope of the DSI structure. The functions in the creation of DSI are also captured at the *meso level*. These include the stages of co-creation, stakeholder involvement, role of design, methods and tools, organization and management business models and governance, and scaling (Eckhardt et al., 2021; Storbacka et al., 2016). At the *meso level*, the values are inscribed into the DSI’s organizational and technological structure (Friedman and Hendry, 2019). The engagement of individual actors in DSI takes part at the *micro level*. This is where the active participation of actors in DSI development and use takes place and where the roles of the individuals involved in the process are defined. This level includes challenges, purposes and objectives, motivations, values, initial moment(s)/initiation phase(s) of individuals, and stakeholder landscape (Eckhardt et al., 2021; Friedman and Hendry, 2019; Storbacka et al., 2016). The societal challenges and influences, as well as the respective values at the *macro* and *meso levels*, influence the activities of the involved individuals. These individuals act either consciously or unconsciously in accordance with their perception of values or moral and ethical self-understanding, which is shaped by the abovementioned aspects (Friedman and Hendry, 2019). The actions of individuals are integrated at the *meso level* and lead to a value inscription into the DSI ecosystem at the *macro level*.

### 12.4.2 Mechanisms

In this section, we describe the mechanisms of the different levels as well as their relationships. Figure 12.2 highlights the *macro–macro* relationship in step (1). At the *macro*

*level*, the DSI ecosystem and its institutional and value logic lead to value co-creation for societal impact (SDGs) resulting from co-creation. The outcome of co-creation is a social impact within the context provided by the value inscription in the DSI ecosystem (Friedman and Hendry, 2019; Storbacka et al., 2016). The situational mechanism is covered in steps (2) and (3) of Figure 12.2, with (2) describing the relationship between the *macro level* and *meso level*. The institutional design, norms, and values of the DSI ecosystem form a context in which actors can engage with their resources during the DSI design and transformation processes. Hence, the VSD method is important for investigating and eliciting the DSI values and for integrating them into the engagement process as well as reflecting on their impact and values (Eckhardt et al., 2021; Friedman and Hendry, 2019; Storbacka et al., 2016). This leads to the relationship of the *meso* and *micro levels*, shown in step (3)—the context and value implications from the *meso level* form the conditions for action and influence the co-creating actors as well as the existing DSI tasks (and request a value commitment for participating). Consequently, another process becomes important in the case of co-creation—engagement design. Engagement design shapes the participation on engagement platforms (Friedman and Hendry, 2019; Grotherr et al., 2018; Grotherr et al., 2020; Storbacka et al., 2016). The action formation mechanisms illustrate the relationship at the *micro level* (4) and, combined with the actors' disposition, lead to engagement activities that can be characterized by observable engagement properties, which, in turn, yield information about the commitment and personal values of actors as well their individual goals (Eckhardt et al., 2021; Friedman and Hendry, 2019; Storbacka et al., 2016). Transformational mechanisms are covered in steps (5) and (6). As many actors engage in step (5), various results need to be integrated through resource integration patterns and there is also a need for reflection in relation to DSI values and purposes (Friedman and Hendry, 2019; Storbacka et al., 2016). One of the many possibilities is to use a decision log, which enables actors to document their decisions as well as to reflect on them in terms of DSI values. Furthermore, a decision log can serve as the empirical basis for future research. Resource integration at the *meso level*, in step (6), leads to the inscription of values into DSI, guiding value creation in relation to service systems toward an accordance with underlying human values (Eckhardt et al., 2021; Friedman and Hendry, 2019; Storbacka et al., 2016).

### 12.4.3 Design Cycles

#### 12.4.3.1 Institutional Design

The formation of institutional design is an iterative process. In service systems, the goal of service design is to realize the value proposition. In the context of this article, institutional design is understood as a “socially constructed, historical pattern of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality” (Thornton and Ocasio, 1999, p. 804). According to Grotherr (2018) and (2020), the institutional design cycle is composed of the steps: purpose, build, intervene, and reflect. In a first step the goal of the DSI needs to be set, typically in the form of a value proposition (purpose). This value proposition either consciously or unconsciously includes a value understanding of DSI (Friedman and Hendry, 2019). The building step then continues with a design assumption for implementing the value proposition. In the process, values are inscribed into the designed DSI. The result with the inscribed values is then used and realized through appropriate methods. VSD offers a broad range of methods for this purpose (Friedman and Hendry, 2019). This step in the design cycle represents the first opportunity for collecting relevant information in order to gain a value understanding of the DSI ecosystem. The insights collected through this step are then used to adjust or revise institutions (intervene), values, and value propositions. In doing so, the target direction of DSI and, thus, of the institutional design can be sharpened using appropriate VSD methods. This process can be repeated on a regular basis. Through the reflection process, information can be drawn about the understanding of the values of both direct and indirect actors in the ecosystem. It is the task of the DSI team to elicit the values appropriately for the DSI ecosystem, thus achieving the goal of value co-creation for societal impact in the long run (Eckhardt et al., 2021; Friedman and Hendry, 2019; Grotherr et al., 2018; Grotherr et al., 2020).

#### 12.4.3.2 Engagement Design

Engagement design is divided into the same four steps: *purpose*, *build*, *intervene*, and *reflect* (Grotherr et al., 2020). The *purpose* of engagement design is “to build and instantiate sociotechnical components in a context that enables actor engagement with various dispositions for resource mobilization, thereby facilitating the emergence of resource integration patterns” (Grotherr et al., 2018, p. 8). In engagement design, it is also important to

define what the goals of actor activation are and then to activate actors to engage. This is related to the institutional design intervention. Here, the norms, structures, and values—especially in value-oriented DSI—are inscribed into the DSI design (Eckhardt et al., 2021; Friedman and Hendry, 2019; Grotherr et al., 2018; Grotherr et al., 2020). The next step involves the actions of involved individuals. Here, various socio-technical artifacts can emerge or be used (*build*). To inscribe values into DSI, the basic understanding of individual actors is necessary. They additionally bring their own motivations and their own conscious or unconscious ethical/moral self-concepts (Friedman and Hendry, 2019). Using the results of individual actors, *interventions* are made. Subsequently, the team checks whether or not the results are appropriately designed (*reflect*). An appropriate VSD method must be selected for this purpose. The final step is to reconfigure the findings and interventions. Together, individual activities can enable active DSI implementation. Afterwards, the results obtained from the engagement process must also be fed back to the institutional level (Grotherr et al., 2018; Grotherr et al., 2020). These cycles show that (mis)use is possible in DSI as individuals can always behave differently from what is initially assumed or expected of them during the design process (Friedman and Hendry, 2019). However, it is possible to intervene at the *micro level* during the co-creation process with involved actors in order to influence outcomes (Eckhardt et al., 2021). This influence can be seen through the values passed on at the *meso level* and lead to the inscription of these values into DSI at the *macro level*. Co-creation, in this case, is intended to contribute to societal change and to the attainment of SDGs (Bria et al., 2015; Eckhardt et al., 2021; Friedman and Hendry, 2019).

## **12.5 Exemplary Application for Digital Social Innovation (DSI) Ecosystems**

The framework described in Figure 12.2 above is demonstrated using the digital donation project as an example. Figure 12.3 shows how values influenced DSI over the course of the project and what decisions and activities took place at the *macro*, *meso*, and *micro levels*. The *macro*, *meso*, and *micro levels* of the framework were used to structure the activities for the project within a one-year period. The institutional design is marked in yellow, while the engagement design is marked in green. Figure 12.3 also includes four focal examples, which serve as linking pins between the discussion of values and their concretization in the project. The structure of the demonstration draws on the structure of the framework given in the previous chapter. Subsequently, in the “Design Cycles” section, examples of value specification are discussed once again.

### 12.5.1 Overview

The digital donation ecosystem is shown at the *macro level* in Figure 12.2. It comprises homeless neighbors, homeless aid organizations, citizens who can become donors, partner stores, payment providers, legislative bodies, social hubs, and the project team. Involving all these stakeholders was necessary in order to enable sustainable digital donations to and payments for homeless neighbors. The digital donation project is initially only meant for use in Hamburg (Germany) and, therefore, only the German legal framework is considered for the project. The laws and regulations that affect the project include the eMoney license and the social welfare law (*Sozialhilfegesetz*)—as well as the constitution (*Grundgesetz*), which must be respected. The *macro level* also includes societal attitudes. Homeless neighbors in Germany face a variety of prejudices, such as the preconceived notion that living on the streets is their own fault or that homeless neighbors cannot handle their money responsibly and will only spend it on alcohol. At the same time, however, there are also many people who show solidarity with their homeless neighbors and are willing to donate money to them. Due to the diversity of the actor groups involved, there are different norms that need to be considered in relation to values. The value understanding of the DSI ecosystem developed by the project team also sits at the *macro level*, as part of the *digital donation institutional & value logic*. The digital donation team targets the following SDGs: “No Poverty,” “Reducing Inequalities,” and making “Human Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable” (United Nations, 2020).

At the center of Figure 12.2, the *meso level* summarizes the project’s *DSI* and *engagement platforms*. In the context of digital donations, there are several platforms: SmallChangeCard, SmallChangeApp/Webpage, merchantApp. The donations can be made through the donor app (SmallChangeApp) or a webpage. The donation receipt and store payment are processed via a card (SmallChangeCard) and the merchantApp. In addition, the concept includes various collaboration aspects between homeless neighbors and aid organizations. The goal of the digital donation team is to use the DSI platforms to make people’s everyday lives easier and to give people, that do not have access to a bank account, an opportunity to pay digitally. In addition, collaboration platforms, social media platforms, and app stores serve to enable DSI collaboration, drawing attention to it and making the platform available for participation.

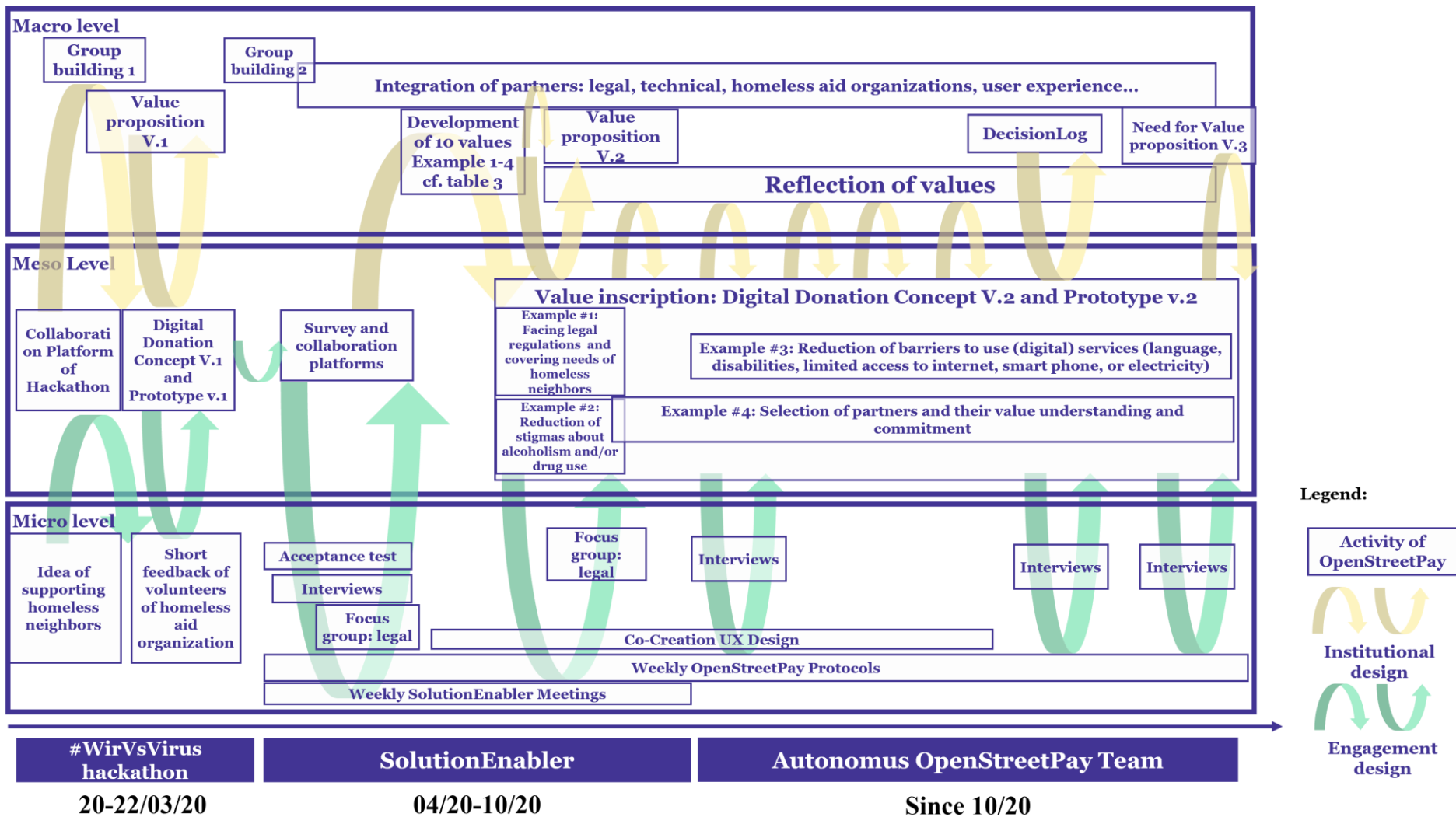


Figure 12.3. Timetable Outlining the Design Cycles and Value Discussion and Inscription Examples



The *micro level* captures the engagement of the individual actors involved in the digital donation project. Since the project in question is currently in development, the actual use of SmallChangeCard, SmallChangeApp, and merchantApp in practice has, thus far, only been simulated and discussions were held with relevant actors in order to query their willingness to collaborate and co-create this DSI. This was done through interviews and an acceptance test. The actors involved are homeless neighbors, employees, volunteers of homeless aid organizations, employees of partner stores, donors, and the project team itself. The project team asks for a value commitment at the beginning of the engagement (to demand institutional design at the engagement level). Whether behavior of the people involved is shaped in accordance to the DSI values, however, remains open to debate. This is because individuals act either consciously or unconsciously in accordance with their sense of values or moral and ethical self-understandings, which are shaped by the abovementioned aspects (Friedman and Hendry, 2019). Furthermore, engagement in the project also occurred during the creation of individual artifacts by an employee from a UX agency and from lawyers responsible for checking and improving the concept. However, these are but a few examples.

### **12.5.2 Mechanisms**

In this section, we describe the mechanisms given in Figure 12.2 using the digital donation DSI project as an example. The *macro level relationship* (1) is the one between the digital donation ecosystem and the societal impact that addresses the SDGs named above. The institutional and engagement design was implemented with the help of VSD and the 10 values that were developed further shaped the co-creation process. Within the *situational mechanism* (2), the values of the digital donation team, its DSI ecosystem, and the institutional design together shape the context in which the actors participate. By conducting technical and empirical investigations, various insights about values were collected at the micro level (3), guiding the DSI impact and ensuring that it is responsible and bias-free. The values are conveyed to each engaging actor when using the digital donation platforms and a value commitment is requested. The *action formation mechanism* (4) shows the actor activity itself. The actor roles are characterized by access to respective technical artifacts. SmallChangeCard holders can collect money with their cards, which they receive from employees or volunteers of the participating homeless aid organizations. They can receive donations from people through the SmallChangeApp. The merchantApp, on the other hand, will be available to the employees of partner stores for purchase processing purposes. Roles

may vary depending on context (sellers may be donors, etc.). In *transformational mechanisms* (5) and (6), the big picture of the digital donation DSI project is brought together. As (5) indicates the contributions must be integrated—which happens in the background or, in technical terms, in the backend. However, (5) also concerns the understanding of values and whether the values of the digital donation ecosystem are still adhered to. With the help of a decision log, the project team records all decisions, influences, and correlations with the established values. This serves as a basis on which to reflect on this DSI. As (6) indicates, if all actors contribute to and respect the values of the digital donation project, then the 10 values are inscribed into this DSI and the digital donations to and payments for homeless neighbors are enabled, thus improving their well-being and freedom from bias is enabled at least in this framework. In the “Examples of Value Discussions and Inscription” section, we revisit explicit examples in order to further clarify these mechanisms.

### **12.5.3 Design Cycles and Value Discussion and Inscription Examples**

#### *12.5.3.1 Institutional Design*

Unlike classical service system projects, the institutional design of the digital donation project emerged during the course of the *#wirvsvirus* hackathon of the German government at the beginning of the COVID-19 pandemic (Mair et al., 2021). The project team was formed by 15 hackathon participants who were interested in enabling cash donations for homeless neighbors despite the lockdown situation (Figure 12.3, Group Building 1). The project team developed the idea to enable digital donations for homeless neighbors and to make it possible for them to spend these donations in local stores (Figure 12.2, *Purpose*). During the first *build* phase, which already took place during the hackathon, the team identified the need for collaborating with aid organizations and partner stores and subsequently received short feedback from aid organizations. After brief research, the limit of monthly donations per person was set at €150 because this amount corresponds to the amount that is deductible for social welfare recipients in Germany. It quickly became clear to the team that they did not want to substitute existing aid but to provide help that was in addition to it. The first prototype was created together with the app and the website (Figure 12.3, Digital Donation Concept and Prototype v.1). After the hackathon ended, a part of the hackathon team decided to continue this project. Some successful projects of the hackathon received further support and were included in the *SolutionEnabler program* like OpenStreetPay (Figure 12.3, Group Building 2). At this point, it was important to check the correctness of the assumptions from

the hackathon as well as what additional aspects are important for advancing the DSI design (Figure 12.2, *Intervene*). For this purpose, the team began to develop an engagement design using videos. The team conducted surveys and interviews and discussed selected legal topics. The empirical results were used to *reflect* on the original goal of the DSI project and to improve the understanding of the actors in this digital donation DSI ecosystem as well as their interests and values. After analyzing and discussing the results, the team realized that the needs of the diverse stakeholders are very different and partly contradictory, and the collected insights were then used to reflect on the purpose and the inclusion of values. To address this, the team decided to employ a VSD method in order to elicit the values that had become an important element of the project's institutional design (Friedman, 1997). After intensive discussions over a four-week period, the project team decided to define 10 guiding values for the project. These 10 values were meant to help the project team balance the needs of all ecosystem actors while developing a clear direction and vision for the DSI project and reduce the bias against the focal group of vulnerable people (Figure 12.3, Development of 10 Values). Furthermore, the team revised the value proposition by taking care to ensure freedom from bias, self-responsible care, and well-being of homeless neighbors (Figure 12.2, *Purpose*; Figure 12.3, Value Proposition V.2; Table 12.2, *macro level*). After defining the values, the team noticed a reduction in recurring discussions on similar topics. In addition, after they defined the essential values, the following implementation steps could be used to refer to these values and to shape the concept accordingly (Figure 12.2, *Build*; Figure 12.3, Value Inscription: Digital Donation Concept V.2 and Prototype v.2; Table 12.2, *meso level*). Furthermore, the value discussions and the ongoing work on the concept revealed the need to conduct further interviews (Figure 12.2, *Intervene*). The goal of these interviews was to check whether the concept is feasible within the legal framework in Germany. Additionally, further data were acquired about the redesign assessment from aid organizations as well as about homeless neighbors. The concept was tested by funding agencies and constructively reviewed by an expert from the DSI field. In addition to these findings, the planning of an acceptance test is currently underway, which will test the values, feelings, needs, and the process itself with actors of the DSI (Table 12.1).

### 12.5.3.2 Engagement Design

Thus far, the engagement design of the project focused on the co-creation of the UX design and on the establishment of legal foundations (Figure 12.3, Co-Creation UX Design and Legal Focus Groups). Hence, the engagement at the *micro level* has thus far only been

conducted with end-user proxies through interviews, focus groups, and an acceptance test. Engagement design can often be interesting on many different levels of a project and, in this case, the proxies for homeless neighbors, homeless aid organizations, and donors are an example of how engagement design can become even more interesting at a *micro level*. The *purpose* of the co-creation was determined by the 10 values (Figure 12.2). Each of the 10 values had different implications for the *micro level*, while progress at this level raised new questions that had to be matched with the defined values (Figure 12.3, Examples 1–4). We illustrate this interaction at the *meso level* using four examples (Table 12.2, Examples 1–4).

The concept of the digital donation project was *built*, and *interventions* were used to test how the individual actors would contribute or would be willing to contribute to this DSI in the future (Figure 12.2). These findings were used to *reflect* on and *revise* the individual elements of digital donation. The examples of value discussions and inscription demonstrate the impact that the values from the *macro level* had on the *meso* and *micro levels*. For this purpose, exemplary design decisions from the project have been selected and are shown in Table 12.2. The examples given describe how values of the digital donation ecosystem are reflected and translated into design decisions at the *meso level* and how the values materialize at the *micro level* in engagement and co-creation activities. Table 12.2 additionally shows who the co-creators of these decisions are or who will be involved in co-creation in the future. The applied methods are also included in the table. Since the digital donation project values are supposed to serve as the basis of any action within the project, they are once again compared to the values of Friedman and Hendry (2019) in order to clearly carve out their ethical implications.

### 12.5.3.3 Value Discussion and Inscription Examples

In the following section, we draw on four examples from the project to illustrate how values were translated into design decisions. We chose these examples because they illustrate the differences in relation to value influence on design decision/inscription at *macro*, *meso*, and *micro levels* and also because it is possible to emphasize the controversies caused by different values of individual actors through them. Example no. 1 captures the discussions and decisions that were conducted in order to decide whether donations should be made individually or via a solidarity “pot.” Example no. 2 deals with the question of whether the use of the donated money should be restricted. Example no. 3 highlights the discussion results that evolved in relation to supporting low-entry barriers and multiple languages.

Example no. 4 demonstrates how the defined values shaped the discussions about which partners are welcome to join and support this DSI ecosystem.

Example no. 1: Individual vs. solidarity donations. The hackathon started with the idea to enable direct donations to homeless neighbors (Figure 12.2, *Purpose*). At the end of the hackathon, however, the result was transformed into a solidarity donation principle (all donations to be distributed equally among all registered people) in order to also offer help to people regardless of their location. In the V.2 concept, both direct and solidarity donations are possible (Table 12.2, Example #1, *meso level*). This donation format design refers to the value of taking care of the needs of homeless neighbors from the *macro level*. Hence, the *micro level* is shaped in a way that donations can be made and collected directly when donor and receiver meet in person as well as via a solidarity fund. The decision to support both types of donations puts donors in the position to decide what type of donation they prefer. This customization option should support their engagement in supporting the overall DSI concept. Donors who might not want to donate in solidarity due to prejudices can choose their preferred way of donating—to individuals, for example. Homeless neighbors can also decide for themselves whether they want to collect additional donations for the solidarity fund. This option allows people who want to remain anonymous and who normally do not want to ask anyone for a donation for themselves directly to also be able to receive donations through the solidarity fund. This example illustrates how the related value emerged from previous discussions and how it was translated at the *meso level*, shaping engagement at the *micro level* (Figure 12.2). Both options are now included in the current design of the SmallChangeApp and the SmallChangeCard (*meso level*), thus differing from the initial design after the hackathon (Figure 12.3 and Table 12.2, Example #1).

Example no. 2: Restrict the use of donated money? As indicated before, homeless neighbors in Germany are partly stigmatized in terms of drug and alcohol consumption. Through one intervention, the team learned that some donors would not make donations if alcohol and drugs could be bought with the donated money. However, in contrast, conversations with homeless aid organizations and homeless neighbors showed that the possibility of self-responsible care increases the value of the digital donation project. Consequently, it was necessary for the project team to define a clear position regarding the allowed use of the donated money. This decision would have an impact on value co-creation because it would affect the engagement of certain people and organizations (Figure 12.3 and Table 12.2, Example #2). According to the team's goal to help people with small amounts of money,

making their everyday lives easier while not reinforcing the stigmatization of this vulnerable group, the team decided that homeless neighbors should be able to buy items self-responsibly with the money in accordance with their needs (Figure 12.2, micro level). This decision shapes an important value at the macro level. With the inscription in V.2 concept, especially in relation to the SmallChangeCard and respective information on the webpage, the effect is at the meso level. At the micro level, it is planned for the homeless neighbors to use the SmallChangeCard in all participating partner stores, without any product limits. This decision also has an impact on the donors as well as on help organizations and shops. The project team accepts the fact that some donors, help organizations, and shops might refrain from participating as a result of this decision. The volunteers and employees of aid organizations and partner shops are to be briefed in accordance with the established values (micro level).

**Table 12.2. Value Discussion and Inscription Fields**

#	Macro Level	Addressed Value <sup>16</sup>	Meso Level	Micro Level	Co-Creator	Methods
1	Enable solidarity and individuality. We help with a monthly fixed amount and enable the collection of individual donations. We do not replace any help.	Autonomy, ownership and property	Inscription of legal regulations (social law, eMoney license in Germany), and covering the needs of homeless neighbors (form of donation and reliability)	<p>Cardholders can collect solidarity (20 € per month) and direct (max. 130 € per month) depending on their need.</p> <p>Donors can decide how to donate depending on their needs</p> <p>Individuals' willingness to donate may be partially limited due to the openness of the products.</p> <p>However, individual donations may make it possible to break down prejudices.</p> <p>Integrating both possibilities in the design by UX co-creation</p>	Homeless aid organization, homeless neighbors, lawyers, donors, employee of UX agency, project team	Document analysis, interviews, acceptance test
2	Reach out. Small amounts of money make everyday life easier for our homeless neighbors. We enable self-responsible care.	Freedom from bias, autonomy	No restriction on SmallChangeCard and information for donors to reduce stigmas about alcoholism and/or drug use	<p>No restrictions on the purchase of goods for homeless neighbors</p> <p>Willingness to donate despite autonomy for donors</p> <p>Briefing of volunteers and employees of homeless aid organizations</p> <p>Briefing of partner shop employees</p> <p>Open communication through all stakeholder groups via app/website, etc.</p>	Homeless aid organizations, donors, homeless neighbors, lawyers, project team	Acceptance test, interviews

<sup>16</sup> According to Friedman and Hendry (2019)Friedman and Hendry (2019).

#Macro Level	Addressed Value <sup>17</sup>	Meso Level	Micro Level	Co-Creator	Methods	
3	Be straight-forward. Help that reaches out to everyone is the best help. Therefore, OpenStreetPay shall be easy to use.	Freedom from bias, universal usability	Reduction of barriers to use (digital) services (language, disabilities, limited access to internet, smart phone, or electricity)	<p>Become multilingual as quickly as possible starting with German, then add another language for each person who joins that needs another language via a co-creation translation board</p> <p>Explanation of concept via video with subtitles</p> <p>User experience in the app/website with low/no barriers</p>	Employee of UX agency, Solution-Enabler, homeless aid organizations, homeless neighbors, project team	Document analysis, interviews, acceptance test, Solution Enabler, co-create UX design
4	Joined forces. We work together instead of against each other. With partners who share our values.	Informed consent	Selection of partners and their value understanding and commitment	<p>Value commitment in the engagement process</p> <p>Offers of help through homeless aid organizations as additional strengthening</p> <p>Selection of products and services limited to partner shops</p> <p>Briefing of partner shop employees</p> <p>User experience design creation according to values</p> <p>Decisions about funding (amount)</p> <p>Platform selection through project team</p>	Homeless neighbors, aid organizations, donors, lawyers, shops, project team, ePayment provider, UX agency, financier	Acceptance test, interviews, document analysis

<sup>17</sup> According to Friedman and Hendry (2019).



Example no. 3: Low entry barriers. Participation within the DSI ecosystem is only possible if existing barriers are reduced. The goal of the team is to develop a DSI that is as barrier-free as possible (Figure 12.2, *macro level*), thus enabling freedom from bias and universal usability for all users (Figure 12.3 and Table 12.2, Example #3). This means reducing barriers at the *meso level* within this DSI by covering needed languages, addressing disabilities during development, or considering limited access to internet, smart phones, or electricity. At the *micro level*, this means that, for example, users can view explanatory videos at the beginning of the engagement process. This removes several entry barriers at the same time. In the future, multi-language support will be included by adding different audio tracks or subtitles. Blind and deaf persons should also be enabled to use this system supported by Braille or sign language in the long term. In addition, the SmallChangeCard was designed in a way that allows it to be used without access to a smartphone, electricity, or the Internet. Thus, any homeless neighbor can become part of this digital donation project and there are no technical requirements for them. During the technical development, the team—together with a person from a user experience design agency—took care to ensure that the app has as few barriers as possible, and that good flow is allowed through it.

Example no. 4: Value-oriented selection of partners for the ecosystem. Since this DSI project is very large in scope and its services cannot be realized without partners, the project team also identified the need to establish a multi-actor ecosystem that creates the services very quickly in order to achieve the before-named SDGs (Figure 12.3 and Table 12.2, Example #4). However, each involved organization brings its own understanding of values to the *macro level* (Figure 12.2), whether they be directly defined or indirectly lived. In order not to threaten the digital donation project values by increasing cooperation or collaboration, the employees or the management members of organizations are expected to agree to the established values and to act in accordance with them during the engagement process (Figure 12.2, *micro level*). Hence, at the beginning of the engagement process, the project team expects a commitment to be made to the set values by each co-creator (*meso level*). However, the team has also identified limits to this rule. Social media platforms and app stores are also a part of the concept—but it cannot reasonably be expected for the DSI values to be met by these actors. Here, the team members differ in relation to influenceable collaboration relationships and non-influenceable cooperation ones. At the *micro level* this means that the members of the homeless aid organizations would assist in the issuing of the cards and in supporting the homeless neighbors. The choice of products and services available with the

SmallChangeCard depends on the partner shops. The project team has started with low-barrier shops, such as kiosks, as well as with small cafés, which are more conceivable as partners because the assumption is that the understanding of values is easier to establish there than in, for example, large supermarket chains.

The design of the digital donation concept is not yet finalized. The latest findings regarding the long-term objectives are currently being incorporated, advancing the concept and the prototype. For example, an interview with a DSI expert revealed that it is not enough to simply help with donations in the short term. Instead, long-term goals must be communicated. The impulse of the team is to support institutional solidarity to end homelessness—to “infect” people with this idea and with associated goals in order to mobilize them to drive an active change in society in the long term (Figure 12.2, *macro level*). The following statement was made by the team: “No one should have to live on the street! This should be the long-term goal of all decision-makers and organizations. We want to support under the current (political) conditions for homeless people in the short term.” The shape of value proposition will also be analyzed in the future.

## **12.6 Discussion**

This article embraces the idea of transferring frameworks from service science to DSI by integrating a social understanding of values and goals. For this reason, three iterations of modifying the Multilevel Design Framework for Service Systems served as a basis for adapting and extending it to include an understanding of DSI and to integrate a consideration of human values. The scientific contribution primarily targets the DSI field and aims to contribute to the understanding of co-creation and the integration of values into DSI projects by clarifying how values can have a concrete impact on design decisions. In addition, the study contributes to service science by showing that existing frameworks can be adapted to also include a consideration of human values and societal well-being. Furthermore, this article offers insights into the use of VSD in a DSI project through service science frameworks, providing a contribution to researchers in other fields in relation to how they could conceivably get started with using VSD (Friedman et al., 2021).

### **12.6.1 Implications for Research**

The understanding of values and the societal impact of human action is currently moving more and more toward the foreground. Established IS research fields also need to rethink

their orientation in order to meet this societal demand. COVID-19 has clearly shown what challenges our society is facing (Guterres, 2020, April 23). This article explored and deepened the understanding of institutional and engagement design in terms of the importance of values for DSI.

In this study, we adopted the Multilevel Design Framework for Service Systems (Grotherr et al., 2018; Grotherr et al., 2020; Storbacka et al., 2016) and extended it in multiple ways. First, we added human values to the framework in order to support our analysis of value development and value inscription at multiple DSI levels (Eckhardt et al., 2021; Friedman and Hendry, 2019). Second, we exemplified the processes of institutional design and value design through four examples from an ADR project, which support the understanding of the revised framework. Third, we highlighted the need to include the ecosystem in which a DSI is being developed into the revised framework (Eckhardt et al., 2021). This is necessary because DSI projects, like our ADR project, often require the integration of a multitude of stakeholders who, more or less strictly, all follow their own values. Consequently, DSI institutional design and engagement design both need to consider the interaction with the ecosystem and the potential value conflicts that might arise from cooperation with other actors. Finally, we shed light on the essential steps of interpreting values for making design decisions and for questions related to values that stem from past design decisions. Both activities are captured at the *meso level* of the framework. This work has shown how challenging and multidimensional the research on value-oriented design is. Not only does the interpretation and use of the value concept require tremendous effort in a concrete situation but so does the inscription of values into technology and into the creation of a value-oriented engagement design.

The VSD approach offers the opportunity to develop a clear understanding of values in innovation (Friedman and Hendry, 2019). In other research streams, such as service systems, a different understanding of values is present (Plé, 2017). This article encourages researchers from service science and DSI to practice the VSD while developing their innovations and services (Friedman et al., 2021). Thus far, the transfer of concepts from service science has only been demonstrated in one DSI project and further exemplary applications to ensure general validity are necessary. Even service systems that do not serve a social purpose can focus on the well-being of the society and can shift the understanding of value from individual value to the creation of societal value (Friedman and Hendry, 2019; Plé, 2017).

During the development of our model, its limits have become clear. For example, DSI values are represented at the *macro level* of the model but the influences from society and companies can also be found there. There exists a difficulty for the model to represent multiple value understandings—from the outside, from other companies, social structures, etc.—at the same time. The model mostly represents a perspective from the project outward into the ecosystem.

Finally, it should be emphasized that the framework adaptation is based on only one project which is available in just one country. The understanding of values is culturally influenced and is thus subject to the subjective perception of an individual. It would be particularly interesting to study the DSI solutions that are used in different cultural settings internationally (Friedman et al., 2021).

### **12.6.2 Implications for Practice**

As the United Nations' SDGs show, there are a multitude of societal challenges that need to be addressed through DSI (Leong et al., 2020). In order to have the ability to induce change, it is necessary to address specific challenges and set a clear focus. Not all societal challenges can be solved at once; in fact, it often takes longer than one lifetime for progress in any one are to be achieved (Friedman and Nathan, 2010). In line with current societal challenges, the digital donation project also began to address the challenge of enabling donations in a digital environment. The team is aware that the solution, as it stands, can only help homeless neighbors in the short and medium terms. In the long term, a societal rethinking of how to support homeless neighbors is required as well as actions by political actors.

In addition, when solutions are needed quickly, the inclusion of values is necessary because DSI should not have unintended negative side effects for stakeholders. Aligning with and integrating values takes time and slows down the process in part because actions are questioned much more frequently. Even in the VSD field, design systems based on values are considered to be challenging tasks (Friedman and Hendry, 2019). Nevertheless, critical engagement with this topic is required in order to reduce societal problems in the long term, and appropriate tools and information are needed to support these very discussions. Furthermore, it is necessary for DSI teams to know and accept the limits of value influence. In doing so, it is not necessary to discard all understanding of values but to estimate them to a realistic extent. It is possible to discuss values directly with collaboration partners at least. However, in larger ecosystems and with large tech companies, it is sometimes not possible to

intervene as a small group. This requires larger initiatives or state interventions (Bria et al., 2015).

Finally, it should be noted, especially for projects in practice, that values can be made explicit but that that does not mean that people will act in accordance with them. Actors bring their own interpretations into a project. This development needs to be regularly reviewed, which is now possible with the help of the developed framework presented in this article. If the clear direction of a DSI is no longer guaranteed, then the DSI's team needs to intervene (Friedman and Hendry, 2019). Value alignment should be regularly questioned using various methods. It should also be noted that both values and the understanding of them depend on cultural background. If a DSI is initially developed in one country but is later made available in another, then the adaptation to the new cultural background of the latter needs to be investigated (Friedman et al., 2021).

## **12.7 Conclusion and Outlook**

ICT can be used to address societal challenges, offering an opportunity for improving societal well-being (Bria et al., 2015). This article follows the call for action in the IS community and contributes to the DSI field (Leong et al., 2020). Models from service science were used to strengthen the existing understanding of how human values can be integrated into the co-creation process within DSI ecosystems. The framework presented in this paper was developed on the basis of the "OpenStreetPay" DSI project. The aim of this project is to support homeless neighbors through digital donations and payments, improving their well-being and freedom from bias. In future research, the framework presented in this paper can be used to understand and guide other DSI projects. In addition, research could strive to transfer the idea of considering human values not only to other DSI projects but also to projects that have a business background. In turn, these projects could endeavor to create positive social impact. During the project and evaluation, it became clear that existing methods are limited and that they should be enhanced in the future so that an understanding of value could also be integrated.

## **12.8 Acknowledgements**

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# **13 Paper 3: Selecting and Adapting Methods for Analysis and Design in Value-Sensitive Digital Social Innovation Projects: Toward Design Principles**

## *Abstract*

Digital Social Innovations (DSI) aim to address social challenges, such as poverty and inequality, with information and communication technologies. The development of such innovations requires a broad understanding of the DSI ecosystem and the pluralistic values of the involved actors to enable sustainable development and long-term anchoring. In value-sensitive DSI projects, actors need to combine methods from DSI and Value Sensitive Design (VSD) with methods applied by the IS community for developing digital services. In this article, we address the challenge of selecting, adapting and combining methods in DSI projects. Based on the reflection of an action design research project related to the development of a digital donation system for homeless neighbors and a literature analysis, we developed design principles (DP) for the selection and adaptation of methods for supporting value-sensitive DSI projects.

## **13.1 Introduction**

Several major societal challenges can be tied to knowledge and methods that have been developed by the IS community (Leong et al., 2020). Knowledge from the IS field can be used to address societal challenges such as fighting poverty and inequality, strengthening justice and human rights, as well as gender equality or facing environmental and climate issues (United Nations, n.d.). Information and communication technologies from the field of Digital Social Innovation (DSI) can address these societal issues (Bria et al., 2015) and contribute to societal change. Furthermore, a variety of (user-centered) methods to design and implement the DSI are available from the IS field. The selection and adaptation of these methods<sup>18</sup> remains challenging due to the high number and interrelatedness of the methods

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<sup>18</sup> In this article, we understand methods to be systematic approaches that enable the design and implementation of DSI by producing individual partial results

(Kumar, 2013). Many of the methods available for DSI projects have either been developed specifically for DSI or stem from other areas and have been adapted for use in DSI (Komatsu et al., 2016). DSIs are often large in scope and scale (Terstriep et al., 2020), as they seek to address societal challenges (Komatsu et al., 2016; Terstriep et al., 2020). Given this, a DSI very often emerges from a complex ecosystem with multiple stakeholders, whereby the DSI's potential is maximized through a transformation of the ecosystem (Eckhardt et al., 2021). However, the involvement of different actors within such an ecosystem can create additional challenges. Due to the pluralistic values of various actors, orientation toward a common DSI goal is difficult and has the potential to fail if there is no common understanding (Whittle et al., 2020). Moreover, despite shareholders' common desire for positive societal change, a lack of consideration of potential negative side effects and consequences of technologies can lead to negative outcomes (Friedman, 1997).

A theory that enables DSI initiatives to align their innovation with values is Value Sensitive Design (VSD) (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021). Values are the core of VSD and they are defined as “what is important to people in their lives, with a focus on ethics and morality” (Friedman and Hendry, 2019). A variety of methods is employed to perform value election, representation and analysis, as well as to prime long-term and multi-lifespan design thinking and envisioning (Friedman et al., 2017; Friedman and Hendry, 2019). Friedman and Hendry (2019) argue that value alignment can be very overwhelming for designers. Winkler and Spiekermann state that it is challenging to enter the field of VSD because there is still a lack of guidance on “how to accomplish certain tasks” (Winkler and Spiekermann, 2018). An initial literature overview of VSD methods with a corresponding indication of the goal is already available and supports projects to get started (Friedman et al., 2017; Friedman and Hendry, 2019).

In an overview study on DSI, Qureshi et al. (2021) summarize the status quo of DSI research and discuss their theoretical embedding. However, the internal perspective of DSI projects and their design and development processes are rarely investigated. We seek to open this “black box” and investigate how the selection and adaptation of methods can be supported. For this reason, we draw on the example of a DSI project aimed at developing a digital donation system to understand what must be considered in terms of method selection and

adaptation. Through this, we analyze the exemplary multi-layered tasks that can arise within a DSI and which methods can be used while taking into account responsibility and stakeholder values:

*Which principles can guide the selection and adaptation of methods in value-sensitive DSI projects?*

## 13.2 Related Research

DSI is a relatively new field in IS research (Qureshi et al., 2021) and is defined as “a type of social and collaborative innovation in which innovators, users, and communities collaborate using digital technologies to co-create knowledge and solutions for a wide range of social needs [...]” (Bria et al., 2015). These needs are multi-layered and linked goals that aim to address issues like supporting human rights and gender equality, environmental concerns and climate change, as well as reducing poverty and inequality (Eckhardt et al., 2016; Leong et al., 2020; United Nations, n.d.).

In the design and development, DSI initiatives are confronted with complex tasks (Eckhardt et al., 2021; Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021). DSI development may benefit from employing multi-layered methods that are typically applied by the IS community when developing digital services (Komatsu et al., 2016; Kumar, 2013; Leong et al., 2020), such as user-centric methods like personas<sup>19</sup> or service blueprints<sup>20</sup> (Komatsu et al., 2016). Komatsu et al. (2016) assembled a toolbox for the development and design of DSI, which shows the diversity of existing methods and extends existing methods with DSI aspects to ensure the social impact. However, a focus on the development of a DSI does not ensure its desired impact or success because values play an important role in developing DSI (Gebken, Kurtz et al., 2021). For example, a case study conducted among a group of

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<sup>19</sup> “Personas are fictional characters who embody the archetype of your customer, beneficiary or financing supporter. They are created through exhaustive observation of the customer segment and the drawing together of their shared characteristics, behaviors, motivations, interests etc.” Komatsu et al. (2016).

<sup>20</sup> “The Service Blueprint is an operational tool that gives an overview of the organization’s operations: key activities, products, services and points of interaction with the intended audience, stakeholders and beneficiaries” Komatsu et al. (2016).

homeless neighbors revealed the need for open discussion about shared values among the actors; neglecting this can lead to the termination of a project (Whittle et al., 2020).

One way of taking human values into account is through VSD. VSD enables DSI initiatives to incorporate relevant contextual factors into the design process. Friedman and Hendry (2019) define VSD as follows: “VSD seeks to guide the shape of being with technology. It positions [...] anyone working at the intersection of technology and society to make insightful investigations into technology innovation in ways that foreground the well-being of human beings and the natural world. Specifically, it provides theory, method, and practice to account for human values in a principled and systematic manner throughout the technical design process.” The consideration and incorporation of human values are necessary because technologies have an impact on society; in turn, these technologies are to some extent reflections of the underlying values of society, may they be explicitly or implicitly inscribed. Values and technologies reciprocally influence each other (Friedman and Hendry, 2019). The literature on values and their relation to actions highlights the challenges of dealing with values in application (Friedman and Hendry, 2019). An important dilemma in this context is that the consequences of the use and adaptation of the DSI cannot be predetermined (Friedman and Hendry, 2019; Gebken, Kurtz et al., 2021). A DSI can only attempt to ensure that the context of use is anticipated and included in the design process. DSI teams can choose from a variety of methods, selecting the appropriate methods for their individual contexts. VSD methods can e.g. help to guide through the value election, representation and analysis and prime long-term envisioning (Friedman et al., 2017; Friedman and Hendry, 2019). The methods can be categorized according to the following phases: conceptual investigations, empirical investigations and technical investigation (Friedman, 1997). In this study, VSD is executed under the guiding principle of “progress, not perfection” (Friedman and Hendry, 2019). While resource limitations and technical complexity can impede DSI, VSD methods try to make progress in the DSI area. It is the designers’ task to align the innovation with the well-being of people and the environment to ensure that the actions taken during a project are consistent with these overall goals. One way to do this is to have DSI teams engage in debates about their contexts, societies and the corresponding technologies being developed. Through this debates, a well-considered set of criteria for the quality of

socially responsive technologies emerges, moving away from perfection to progress with positive societal impact (Friedman and Hendry, 2019).

The selection of methods for arising tasks in the design and development is already considered challenging in the digital innovation field (Kumar, 2013). The multitude of different methods from IS, DSI and VSD, which partly overlap or complement one other, further complicates choice for DSI initiatives. Therefore, this work aims to support DSI initiatives by suggesting design principles (DP) for the selection and adaptation of methods.

### **13.3 Research Design**

As described in the introduction, a variety of methods are available for the development of value-sensitive DSI. Based on our analysis of a detailing an ongoing action design research (ADR) project that aims to develop a DSI, we analyze the method selection and adaptation in the ADR project (Sein et al., 2011). The ADR project underwent two iterations, illustrated in Figure 13.1 with stages and principles (P). During stage 1 (Problem Formulation) and stage 2 (Building, Intervention, & Evaluation) of both ADR iterations, method selection took place based on methods from the literature (Friedman et al., 2017; Friedman and Hendry, 2019; Komatsu et al., 2016) and the experience of project members. Stage 3 (Reflection & Learning) covered the reflection of how the methods were selected and adapted, especially regarding the methods' relation to values emerging in the digital donation project. In stage 4 (Formulation of Learning), we entailed three levels of conceptual categories, from the specific and unique to the generic and abstract (Sein et al., 2011): (1) “generalization of the problem instance” (Sein et al., 2011) – class of value-sensitive DSI; (2) “generalization of the solution instance” (Sein et al., 2011) – selection and adaptation of methods from DSI, IS and VSD; and (3) “inductive derivation of design principles from the design research outcomes” (Sein et al., 2011) – DP for selection and adaptation of methods for value-sensitive DSI.

Table 13.1 summarizes the DSI, the actors involved, the value proposition and the tools in the project. Furthermore, it outlines the research approach and the data collection. Over the period of 12 months, several concepts and research methods were applied to and included in the design of the digital donation project. In particular, the use of VSD according to Friedman (1997) had a great impact on the project. This insight has been used to develop a common

understanding of values for the DSI and its ecosystem early in the process (Gebken, Kurtz et al., 2021). The observations from the DSI project have been recorded and analyzed by creating a “decision log”. The log records all decisions made in the project e.g., who receives donations and how. The project team’s weekly meeting minutes and the entire document archive served as a basis for reflection and development of the log. In the course of the DSI development, various method toolboxes or existing templates from tools such as *miro* were used to provide support (Friedman et al., 2017; Friedman and Hendry, 2019; Komatsu et al., 2016). However, the team experienced a lack of guidance from in- and outside about which methods to select for which activity in the project. We used the example of the digital donation project to develop a better understanding of the diverse tasks and methods of a value-sensitive DSI. Figure 13.2 shows the applied methods (as an exemplary excerpt) with time reference and in relation to the respective research area. Reflecting on the two ADR cycles, the context of the methods was analyzed; if a method was supplemented or questioned with regard to values, it was marked with a (\*). Table 13.3 highlights the selection and adaptation of the relevant methods; these methods served as the basis for the derived DP for the method selection and adaption for value-sensitive DSI (see 13.4.3).

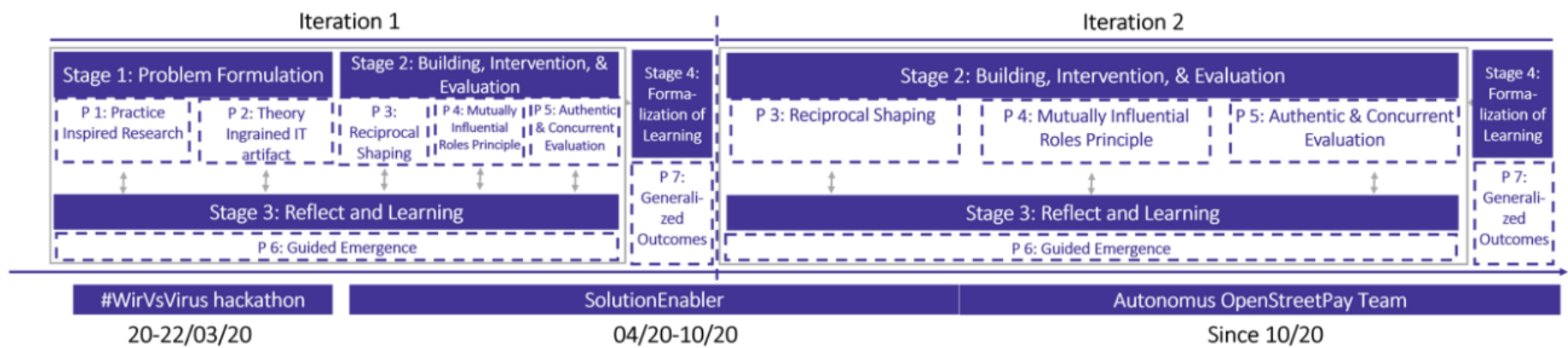


Figure 13.1. Timetable Covering the Two Design Cycles of the ADR Project (Sein et al., 2011)

## 13.4 Results

### 13.4.1 ADR Project Description

The core results of this study are based on the findings of an ADR project dealing with digital donations and payments for homeless people. In the course of the #WirVsVirus Hackathon in March 2020 initiated by the German Federal Government, the idea was born to help vulnerable groups (Gebken, Drews, Schirmer, 2021). The project seeks to address the challenge of taking care of homeless neighbors in a society that reduces the usage of cash by enabling digital donations and digital payments with a new digital service. In our first paper, we investigated the development of a digital donation concept and contributed to research by including a stakeholder and value-oriented perspective to ensure a holistic and sustainable perspective on a DSI (Friedman, 1997; Gebken, Drews, Schirmer, 2021). The digital donation concept “includes a digital donation and payment system to enable contactless donations to homeless neighbors. The donation can be made via the donor app or a webpage. The donation receipt and the store payment are processed via a card and the merchantApp. In addition, the concept includes collaboration aspects between homeless neighbors and aid organizations” (Gebken, Drews, Schirmer, 2021). The study shows that establishing the DSI is difficult as the project team sought to understand and address existing biases toward homeless neighbors, a vulnerable and marginalized group. An orientation on values was necessary to understand these biases and support the well-being of homeless neighbors, as well as to develop a clear orientation for future development of the DSI. For this reason, VSD was involved, and a common understanding of values was elicited in the form of 10 core values (see Table 13.2) (Gebken, Drews, Schirmer, 2021). Furthermore, the study revealed the need for establishing a suitable ecosystem that includes a variety of actors to support the co-creation of the DSI (Gebken, Kurtz et al., 2021). Based on the experiences from this project, we investigated the integration of the involved actors into the design process of a value-sensitive DSI and its ecosystem (Eckhardt et al., 2021). As this project focuses on values, the goals are different than those of typical IS projects that focus primarily on generating economic value. This study addresses the lack of an existing overview of methods indicating which methods can be used for particular tasks related to value-sensitive DSI. Figure 13.2 shows the six methods selected as examples over the time horizon of the DSI



project, as well as where the methods origin from (VSD, DSI/IS, Hybrid). In the project, the methods were selected heuristically for performing the respective necessary tasks. The applied methods differ with respect to their content dimension. The methods of design thinking<sup>21</sup> and VSD form the overarching frame and apply jointly and interrelatedly to the entire course of the project. This becomes clear in the second iteration, as classic design thinking becomes value-sensitive design thinking. The methods of personas/service blueprint, stakeholder analysis and value-oriented prototyping<sup>22</sup> were applied during individual steps within the overarching frame. For this purpose, the task-oriented selection of methods (13.4.2) is described first, followed by an explanation of the DP for selecting and adapting methods (13.4.3).

**Table 13.1. Overview of the Digital Donation ADR Project**

<b>Value Proposition</b>	Enable digital payment for homeless neighbors without access to digital payment options; donate money via digital payments to homeless neighbors to make their daily life easier, enable self-responsible care, well-being and freedom from bias.
<b>Actors</b>	Homeless neighbors, homeless aid organizations, donors/citizens, legal entities, social hubs, e-payment companies, shopping possibilities, project team
<b>Tools</b>	SmallChangeCard, SmallChangeApp/webpage, merchantApp, collaboration platforms (Slack, Miro, Google Drive, Zoom, Git, Figma, Trello), social media platforms (Facebook, Instagram, LinkedIn, Xing), app stores
<b>Data collection and analysis</b>	Interviews, focus groups, decision log based on weekly protocols of project team, quantitative questionnaire, reports form homeless neighbors, evaluation of other apps for homeless neighbors, VSD, content from collaboration boards

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<sup>21</sup> “Design thinking is a creative, individual-level process influenced by social-level factors (that is, high inspiration by others, high user-centricity, high prototyping, and low criticism by other), which includes attention, memory, and learning and leads to an aesthetically appealing object” Meinel et al. (2011).

<sup>22</sup> “Development, analysis, and co-design of [...] prototypes [...] to scaffold the investigation of value implications of yet-to-be-build or widely adopted technologies”. Friedman and Hendry (2019).

### 13.4.2 Task-Oriented Method Selection

As already described, the tasks in the DSI project were complex due to the high number of stakeholders and their perspectives. In the following, five exemplary tasks of the DSI project are described to outline the scope of the DSI project and which methods have been selected for supporting the activities. To demonstrate the diversity of tasks, the examples selected range from problem definition/idea generation to prototypical implementation. Table 13.3 shows which tasks were performed (column 2) and which methods (column 3) were selected for supporting these tasks. For each method, we explain why it was chosen for the task (column 4). We then summarize any necessary adaptations of each method, particularly as pertains to values (column 5) if values were not already a part of the method. For each method, the relationship to the values of the DSI is considered to classify the ethical perspective (column 6). The challenges of method selection and adaptation are included in column 7.

**Task no. 1: finding a solution for vulnerable group.** The first task is finding a solution for an existing problem. The task includes the determination of the DSI's objective with regard to the protection of the vulnerable user group and their needs/values. But it also needs to take organizational, legal, and technical requirements into account and consider them when building first prototypes. Therefore, we used the method of design thinking as an overarching framework (see Figure 13.2/Table 13.3 in green). The design thinking process can be broken down into individual steps, though each discrete stage differs depending on which process template or best practices are being followed. According to the Hasso Plattner Institute, the steps unfold as follows: *understand, observe, define point of view, ideate, prototype* and *test* (Plattner et al., 2012). This step can be seen as a superordinate task and method. For this reason, the following methods describe in which phase of the design thinking process the corresponding tasks occurred. During the hackathon, a first short iteration was already conducted, with the test following the hackathon. Since then, an iterative run of the design thinking has been undertaken. The interviews and acceptance test conducted shortly after the hackathon made clear that there was a need for a discussion of values, as there was recurring discussion about the responsibility of the solution. This led to task no. 2.

**Table 13.2. Values of OpenStreetPay (Gebken, Drews, Schirmer, 2021)**

#	Value
1	<b>Be human.</b> In everything we do: we do it out of humanity and with passion.
2	<b>Respect dignity.</b> We treat each other, our partners, and each of our homeless neighbors with respect. Without exception.
3	<b>Reach out.</b> Small amounts of money make everyday life easier for our homeless neighbors. We enable self-responsible care.
4	<b>Enable solidarity and individuality.</b> We help with a monthly fixed amount and enable the collection of individual donations. We do not replace any help.
5	<b>Give perspectives.</b> Nobody should have to live permanently on the street. We try to pave homeless neighbors a sustainable way out of need.
6	<b>Be straightforward.</b> Help that reaches out to everyone is the best help. Therefore, OpenStreetPay shall be easy to use.
7	<b>Show transparency.</b> We treat each other fairly and squarely and communicate in this way.
8	<b>Joined forces.</b> We work together instead of against each other. With partners who share our values.
9	<b>Be secure.</b> The security of all data of our donors and homeless neighbors is important to us. That's why we protect them.
10	<b>Take responsibility.</b> We are aware that our donors, partners and, homeless neighbors trust us. We question ourselves and OpenStreetPay.

**Task no. 2: finding common ground.** As a result of the *test* activities, the DSI team was confronted with the question of the ethical positioning of their DSI, as different stakeholders had different and conflicting needs (e.g., prejudice-free treatment vs. no card for drug addicts). This led to new tasks that had not previously been covered in the design thinking. The DSI team had the task of establishing a common understanding of values based on empirical data from the ecosystem on relevant issues; this was done to avoid recurring discussions. The common understanding was implemented with the help of VSD (see Figure 13.2/Table 13.3 in yellow). Since then, VSD has emerged as a framework beyond design thinking and has led to the consideration of values, turning design thinking into value-

sensitive design thinking. The empirical investigation (which was covered in the first paper) was carried out on the basis of the empirical results in order to subsequently discuss the conceptual and technical investigation on this basis, as well as to record the 10 core values of the project in a self-designed workshop (Friedman, 1997; Gebken, Drews, Schirmer, 2021). In this context, the definition of values can be seen under the *point of view* stage of design thinking.

**Task no. 3: understanding perspectives of user groups.** In order to tailor the solution in the development phase to the different user groups, it was necessary to carry out a value-sensitive elicitation of user requirements, taking into account different perspectives and the diversity of users in the second design thinking run (covering steps *understand*, *observe*, *point of view* and *ideate*). For this purpose, the user-centric methods, personas and service blueprints were employed at the beginning of the design thinking process (Komatsu et al., 2016) (see Figure 13.2/Table 13.3 in red).

**Task no. 4: developing the prototype of the DSI.** As a contribution to problem-solving strategies during the design thinking process, it was the task of the DSI team to develop prototypes over the course of the *prototyping* step. Throughout the hackathon, this was done without any reference to or guided discussion of values. However, emerging discussions after the hackathon led to the need for explicitly discussing values. The resulting prototypes were implemented with the help of value-oriented prototyping - a method that is already used in the VSD (Friedman and Hendry, 2019; Woelfer and Hendry, 2009) (see Figure 13.2/Table 13.3 in blue).

**Task no. 5: selection of partners and shaping the DSI ecosystem.** It became clear that the long-term sustainable anchoring of the DSI in the ecosystem was particularly important, and this was considered in the respective steps by applying the stakeholder analysis method (see Figure 13.2/Table 13.3 in orange). This selection task can be categorized as an extended form of design thinking in the steps *understand*, *observe* and *ideate* (Nathan et al., 2008; PMBOK, 2017). Stakeholder analysis was conducted several times and served as the basis for defining the user groups and supporting the selection of partners.

### 13.4.3 DP for Selecting and Adapting Methods for Analysis and Design Value-Sensitive DSI

The process of method selection and adaptation is complex. Selection is often guided by the experience of individuals or conducted heuristically based on participants' knowledge, which was also the case for the ADR project under discussion. By formalizing the learnings of the ADR project, we seek to provide support for the selection and adaptation of methods in future value-sensitive DSI projects. Based on analysis of the tasks and methods that were used to accomplish the selection and adaptation task (4.2), we continued to summarize the formalized learnings. The investigation of the method adaption and selection was concluded with the formation of corresponding DP, which arose through repeated discussions among the researchers. In the following sections, we assess the respective methods and their applications to determine the empirical grounding of the DP (cf. Table 13.3).

**DP 1: allow autonomy in method selection.** DSI often arise in interdisciplinary grassroots spaces (Bria et al., 2015; Eckhardt et al., 2021). Different methods stemming from different fields are applied and, accordingly, different people bring their own canon of method knowledge with them. These experts in their fields should be given the freedom to apply the methods they need and, if (method) knowledge is still missing, to explicitly search for people who could support the project with their knowledge.

In the digital donation project, the selection of user-centered methods was not conducted based on a formalized decision-making process, as many of the active and former team members in the hackathon have strong user-centered and solution-oriented backgrounds and are familiar with methods like design thinking, personas, service blueprints, prototyping and stakeholder analysis. The inclusion of VSD and related methods was based on findings from the literature and a team member's idea to explicitly consider values.

**DP 2: investigate and understand the interrelationships of the methods.** Given the multitude of available methods, DSI initiatives should keep track of how the applied methods are connected with one other. This can serve to save time and reduce redundant data from being produced.

For example, Figure 13.2 presents a first attempt at relating the applied methods to the DSI project. We considered that some methods were used in a superordinate way, while others served to fulfill smaller tasks. However, there remained a lack of overlap among the methods in terms of content. For example, the stakeholder analysis was the basis for personas and service blueprints; whereby, those again contain similar components.

**DP 3: select the right point in time for the value discussion (not too early, not too late).**

The timing of the discussion of values should be chosen carefully. If values are discussed too early, debate on principles could prevent the team from creating an idea and common ground. If values are discussed too late, considerable work might have already been done that would then need to be revised based on underlying values. A discussion of values would also be considered to be happening too late if the project members have already spent significant time participating in unstructured discussions of values.

Based on the experiences of the present ADR project, we found that it was helpful to begin the value discussion after the first results had been achieved; this helps ensure that team members do not get “lost” in fundamental discussions and are able to first develop a common understanding of the problem and potential solutions. When team members noticed that discussions were recurring, they determined this to be the optimal point in the process to discuss values.

**DP 4: address the diversity of tasks and responsibilities by selecting different IS, DSI and VSD methods.**

In addition to the tasks described in 13.4.2, DSIs require additional tasks. Eliciting a team’s values is simply a starting point; the values must then be inscribed in the DSI and its ecosystem, which is done using a variety of methods, as discussed above. However, there is a partial lack of concrete guidance for experts in the VSD field (Friedman et al., 2021; Winkler and Spiekermann, 2018). Experience from the project has shown that in order to produce results, a mix of methods from IS, DSI and VSD was necessary.

An example of this phenomenon would be a mixed form of stakeholder analysis, which is found in DSI, IS and VSD, aiming to identify stakeholders and understand their needs, values and interests in relation to the project (Friedman and Hendry, 2019; PMBOK, 2017). Adaptation of this method often occurs in projects to varying degrees.

**DP 5: evaluate methods based on their ethical properties.** The present project revealed that technologies and methods both reflect stakeholder values. This became particularly clear when using personas. Thus, DSI initiatives should question their methods with regard to their ethical properties.

Directly after the hackathon and before finding the common values, the team started to develop personas for the user groups of donators and homeless neighbors. For this, there were initial approaches to classify users in terms of their *personal characteristics, goals and abilities* (Cooper, 2004; Komatsu et al., 2016). After the discussion of the values and short development of the personas, it became clear that applying the persona method would bear the risk of capturing and perpetuating existing stereotypes. The danger of inscribing prejudices in the form of personas contradicts the approach of protecting the dignity of every person and thus one of the 10 values of the DSI (see Table 13.2, #2) (Friedman, 1997; Gebken, Drews, Schirmer, 2021). Personas should only be used if they do not represent fictional characters but are close to an individual with whom a team member has spoken. The method should be adapted accordingly. Through this experience, it became clear that methods also need to be examined in terms of values and that values can conflict with methods. If the method is adapted as described above, it is only tailored to people who are already part of the creation/process. Therefore, it is necessary to revise, update or extend the personas on a regular basis. This can be very time consuming for both the DSI team and the stakeholders involved. Service blueprints form a more prejudice-free method in this context, which can be used to support similar design tasks. Here, the DSI service is viewed from the perspective of different user groups (Komatsu et al., 2016); however, less attention is paid to the users individual characteristics and more to their use of the service.

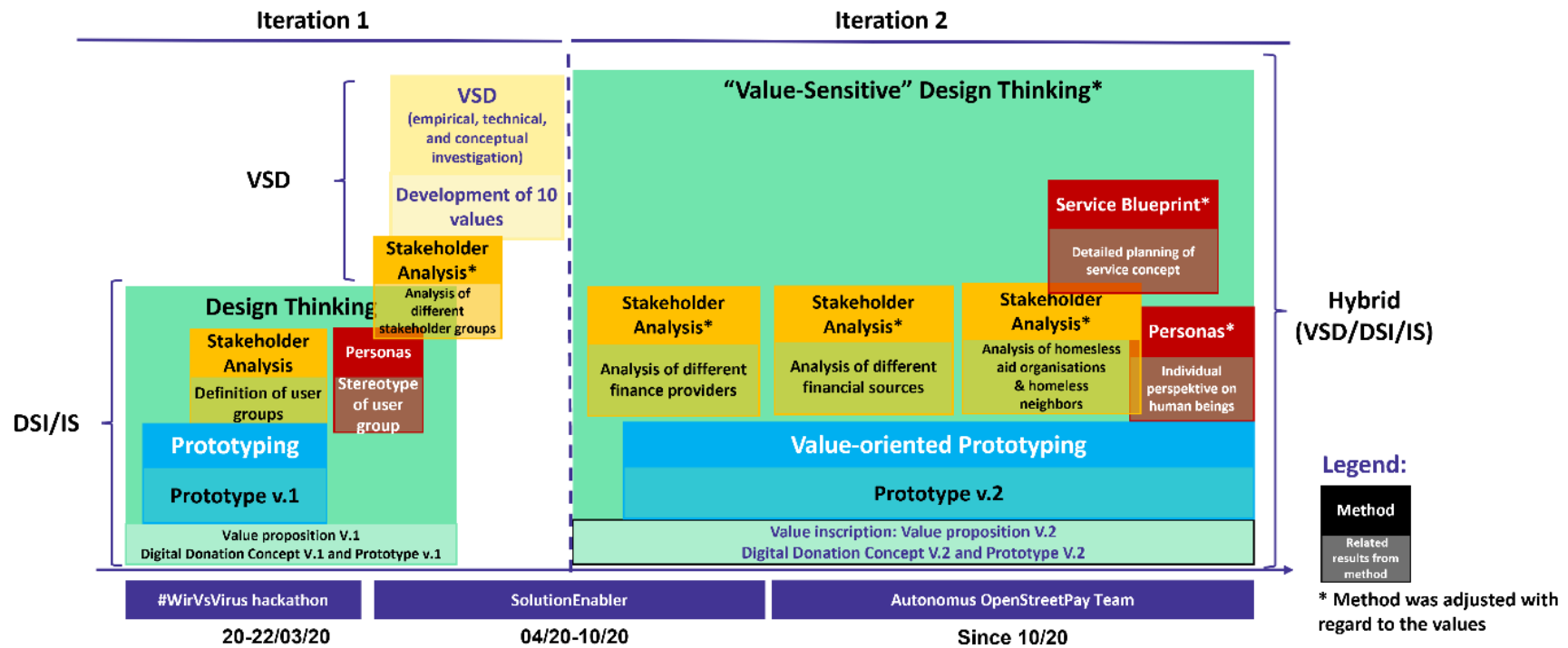


Figure 13.2. Methods of the Value-Sensitive ADR Project Over Time



**DP 6: integrate values into methods that do not capture any value perspective or choose VSD method alternatives instead.** In order to meet the responsibility toward society, it is possible to apply VSD methods and to consider values in the development process or to extend existing methods by including a value perspective (Friedman and Hendry, 2019).

As can be seen in Figure 13.2, the separate consideration of methods over time has become a hybrid use of DSI, IS and VSD methods. An example from the value-sensitive DSI project is the use of the service blueprint method. From the point of view of the SmallChangeCard owners, for example, considered in which *phase* they are, at which *action*, which *touchpoint* is relevant, which visible *actions* are performed by the DSI project (*frontline*) and which invisible actions (*backstage*) and supporting systems (*below ground systems*) are running or present during it. As values are inscribed in all elements, the team decided to make the *values* explicit in order to emphasize those that were most relevant in each phase. For this purpose and for DP 5, the team developed a test to better understand the emotions, needs and values of the users.

**DP 7: open higher-level “method frames” (such as design thinking) for VSD methods and make them value sensitive.** When developing a value-sensitive DSI, it is also necessary to extend higher-level methods (here called “method frames”) with respect to VSD methods. Furthermore, there are more than one VSD method (Friedman and Hendry, 2019) to be integrated into the method frame (like the design thinking process). Depending on the use case, it is necessary to find out which VSD method is best suited, which excludes the simple integration into design thinking and requires an examination of the methods (Friedman et al., 2021). This also creates challenges. Design thinking is often a chosen method because of its user-centric and agile design. The integration of VSD could limit the ease and speed of using the method; however, this integration is necessary in favor of the development team’s and app’s social responsibility and values.

In the DSI project, the relationship of design thinking to values is twofold. On the one hand the hackathon and the subsequent test brought about the discussion on values and on the other hand it was necessary for the team to include VSD methods in every step from the development of the values onwards.

**DP 8: repetitively discuss value inscription during intermediate versions of the prototype and challenge core values if necessary.** Despite the sacrifices of DP 7, including a discussion of values in favor of responsibility is key. In doing so, it is important for DSI initiatives to understand the significance of actions and design decisions in relation to values (Friedman and Hendry, 2019).

An example of this discussions would be the insights gained from prototyping. Over the course of the hackathon, an initial prototype was developed, about which values had not yet been explicitly discussed. After value identification, the list of values was used as a basis for the revision of the concept and the prototype. Over the course of team meetings, new results – for example in concept, UX design or implementation – were assessed on the basis of the list of values. Translating values into requirements can be both unclear and challenging, as the translation relies on subjective interpretation (Friedman et al., 2021). Furthermore, if team members are unable to grasp the meaning of decisions being made in terms of ethical influence, the working process is increasingly difficult. All of this taken together highlights the importance of continual communication of values among a development team.

**Table 13.3. Methods Selection and Adaptation for Analysis and Design in Value-Sensitive DSI Projects**

	<b>Task</b>	<b>Method</b>	<b>Reason for selection</b>	<b>Need for adaptation</b>	<b>Influence of values (and determination)</b>	<b>Challenges</b>
<b>1</b>	<p><b>Finding a solution for vulnerable group</b></p> <p>Determination of the DSI's objective with regard to the protection of the vulnerable user group and their needs/values, as well as taking into account organizational, legal and technical requirements and covering it in first prototypes.</p>	<p><b>Design thinking (Meinel et al., 2011)</b></p>	<ul style="list-style-type: none"> <li>- Team structure</li> <li>- Incorporation of a “needs-oriented” method</li> <li>- Problem solving is in the foreground</li> <li>- Integration of different stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- Integration of VSD methods on each step (Gebken, Drews, Schirmer, 2021; Sjøkvist and Kjørstad, 2019)</li> <li>- Consideration of the ecosystem and long-term anchoring</li> </ul>	<ul style="list-style-type: none"> <li>- Brought about discussion of values</li> <li>- Contains values in every step, just needs to be made visible</li> </ul>	<ul style="list-style-type: none"> <li>- Variety of VSD methods to be selected depending on the case makes integration difficult</li> <li>- Ease of design thinking could be limited or speed of innovation is reduced, but in favor of social responsibility</li> </ul>
<b>2</b>	<p><b>Finding common ground</b></p> <p>Establish a common understanding of values based on empirical data from the ecosystem on relevant issues</p>	<p><b>VSD – empirical technical and conceptual investigation (Friedman, 1997)</b></p>	<ul style="list-style-type: none"> <li>- Sensitive user group and sense of responsibility of the team</li> <li>- Repetitive discussions in the team regarding value alignment</li> </ul>	<ul style="list-style-type: none"> <li>- Completion of the investigation with own target direction</li> <li>- Own workshop design to suit purely digital collaboration</li> </ul>	<ul style="list-style-type: none"> <li>- Values were created based on this method</li> </ul>	<ul style="list-style-type: none"> <li>- Do justice to different people and groups of people especially with regard to value tensions</li> <li>- Implementation of values and inscription in DSI and its ecosystem</li> </ul>

	<b>Task</b>	<b>Method</b>	<b>Reason for selection</b>	<b>Need for adaptation</b>	<b>Influence of values (and determination)</b>	<b>Challenges</b>
<b>3</b>	<b>Understanding perspectives of user groups</b> Value-sensitive elicitation of user requirements taking into account different perspectives and diversity of users	<b>Service blueprint and personas (Komatsu et al., 2016)</b>	<ul style="list-style-type: none"> <li>- Understand relationship of user groups to DSI</li> <li>- Designing processes to suit user groups</li> </ul>	<ul style="list-style-type: none"> <li>- Personas only as a superordinate user group</li> <li>- Understanding of individuals in order not to perpetuate stereotypes and prejudices</li> <li>- Value influence in the service blueprint</li> </ul>	<ul style="list-style-type: none"> <li>- Personas were started before values and not continued because of values; a person can only be seen as a whole</li> <li>- Recognize possible prejudices against a user group and actively counteract them by inscribing values into the DSI</li> <li>- Values form the service blueprint and need to be mapped</li> <li>- Design a method to examine needs, emotions, and understanding of values in use</li> </ul>	<ul style="list-style-type: none"> <li>- DSI is only tailored to people who are already part of the creation/process</li> <li>- Need for regular revision</li> <li>- Time consuming for involved stakeholders</li> </ul>
<b>4</b>	<b>Developing the prototype of the DSI</b> Taking the values into account, the first prototypes of the later DSI are designed.	<b>Value-oriented prototyping (Friedman and Hendry, 2019; Woelfer and Hendry, 2009)</b>	<ul style="list-style-type: none"> <li>- Agile development of relevant content</li> <li>- Ability to gather feedback from users faster</li> </ul>	<ul style="list-style-type: none"> <li>- To take note of the values during development of the prototype</li> <li>- Inscription of the values in the prototypes</li> <li>- Prototype reflection based on the values</li> </ul>	<ul style="list-style-type: none"> <li>- Values are inscribed into the prototype</li> <li>- Values are discussed in the team on the basis of the mockup after it has been designed.</li> </ul>	<ul style="list-style-type: none"> <li>- Conversion of values into requirements</li> <li>- Verifiability of values not clearly realizable and dependent on interpretation</li> </ul>

	<b>Task</b>	<b>Method</b>	<b>Reason for selection</b>	<b>Need for adaptation</b>	<b>Influence of values (and determination)</b>	<b>Challenges</b>
5	<b>Selection of partners and shaping the DSI ecosystem</b> Selection of partners and definition user groups to establish a DSI ecosystem in compliance with the DSI values	<b>Stakeholder Analysis (Nathan et al., 2008; PMBOK, 2017)</b>	<ul style="list-style-type: none"> <li>- Understanding of the ecosystem and stakeholders of the DSI</li> <li>- Realization of DSI not possible without stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- Mixed variant: Collect stakeholders and understand their needs and values.</li> <li>- Do not make own assumptions, ask</li> <li>- Selection of partners driven by values</li> </ul>	<ul style="list-style-type: none"> <li>- Stakeholders shape the values</li> <li>- Selection of stakeholders/partners according to value alignment</li> </ul>	<ul style="list-style-type: none"> <li>- Green- and social-washing complicate the choice</li> <li>- Lack of detailed information</li> <li>- Takes a lot of time and is hardly affordable for volunteer projects</li> </ul>

**DP 9: include new tasks for ethical consideration of values into the DSI design process.**

The previous DP 8 has already indicated this DP. The integration of values into the design process necessitates that DSI initiatives include corresponding tasks in their development process.

During the project, the DP became apparent in various stages. It became clear that working with a sensitive user group requires a high level of responsibility (after the first design thinking iteration, Figure 13.2) and discussions about values were repeated. The project team decided to conduct a workshop on value understanding (Gebken, Drews, Schirmer, 2021). Classic design thinking does not include a consideration of values, as is also the case with many other user-centered methods.

**DP 10: include methods for analysis and understanding of the ecosystem for long-term anchoring.** DSI are rarely created as a single solution, so the solution under consideration is also created in a DSI ecosystem (Eckhardt et al., 2021; Gebken, Drews, Schirmer, 2021). In order to maximize the societal impact, the anchoring in the ecosystem is necessary (Eckhardt et al., 2021; Qureshi et al., 2021), which must be considered in the canon of methods.

In this DSI, the anchoring was implemented with the help of stakeholder analysis as part of the design thinking approach. Therefore, the stakeholder analysis was used to better understand the ecosystem and define different user groups and co-creating actors.

**DP 11: provide an integrated digital tool infrastructure for supporting the use of methods.** As DSI often start as grassroots projects, human and time resources are often scarce (Eckhardt et al., 2017); effective choice of tools is necessary to maximize resources.

In the DSI project, the selection of tools was based on (cost-free) availability for social projects, integrability with one other, as well as with the available templates. It would save time and avoid inconsistencies, for example, if linked methods (DP 2) could also be developed in an integrated manner and supported by integrated tools. However, we are not yet aware of any tool that makes it possible to link the use of these methods and their results.

**DP 12: apply methods according to achieve “progress, not perfection” (Friedman and Hendry, 2019).** Since various methods are available, it is necessary to balance the time spent and the knowledge gained in relation to the applied method. Especially in view of the limited

resources of DSI or grassroots organizations, methods are valuable supports even if they are not utilized to their full extent (Eckhardt et al., 2017).

Examples of methods used throughout the DSI project include stakeholder analysis and the selection of partners. Lack of information sources and non-transparent communications lead to high efforts for assessing companies. In addition, values have to be broken down into concrete criteria. Green- and social- washing complicate the selection of methods. It takes a lot of time to get valid data for deciding whether a potential partner complies with the values. For this reason, Friedman and Hendry's statement discussed above is relevant to reiterate here: "progress, not perfection" (Friedman and Hendry, 2019). DSI initiatives should not be discouraged from applying methods and incorporating values into their projects due to own exceeding expectations.

### **13.5 Discussion and conclusion**

Research on the selection and adaptation of methods for linking DSI, IS and VSD has only recently begun and remains sparse (Komatsu et al., 2016; Winkler and Spiekermann, 2018). In this article, we have shown examples of the tasks that can arise in a value-sensitive DSI project and the methods that can be used to employ them. Based on the experiences from such application, the selection and adaptation of methods for value-sensitive DSI were investigated in order to formalize the learnings as DP. During the process of developing DP, an analysis of the tasks of a value-sensitive DSI and the relevant applied methods informed the development of the DP. We highlighted the challenges related to jointly applying methods from

IS, DSI and VSD to help both researchers and practitioners in better understanding the selection and adaptation of methods. Furthermore, the results of the present study point to the need for making this method knowledge accessible and available for DSI initiatives by providing templates in common collaboration tools. In the context of DSI through the lens of VSD, it is important in both research and practice to further investigate methods with regard to their ethical properties.

This study is based on the abstraction of results from a single ADR project. Further methods and tasks should be considered and categorized in the context of different value-oriented projects to further extend the list of DP available for supporting the work of DSIs. This could ultimately lead to a meta-classification of the methods.

Since the young research field of DSI is growing and a multitude of DP are emerging, it would also be interesting to examine these DP in detail with regard to their theoretical foundation and to work out the similarities and differences in a meta-study. A first overview study on DSI has already been published and could serve as a starting point (Qureshi et al., 2021). It would be particularly interesting to take a closer look at the different embedding options – for example, with regard to VSD and emancipatory design (Young et al., 2021).

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## 14 Paper 4: Refining Design Principles for Value-Sensitive Digital Social Innovation to Support Homeless Neighbors

### *Abstract*

Homelessness is a major global challenge. It can have a negative impact on people's social, physical, and psychological well-being, which makes those experiencing homelessness a particularly vulnerable group in society. Digital social innovations (DSIs) try to address social issues such as homelessness with the help of digital solutions. Since homeless neighbors are vulnerable, DSIs need to be designed and developed to fit their values and needs. Prior research has contributed design principles (DPs) to be acted upon for the creation of value-sensitive DSIs. However, these DPs have only been abstracted based on one action design research project, implicating a low projectability level. By analyzing these DPs' fitness within currently available DSI applications to support homeless neighbors, we further codify, generalize, and refine them, inducing higher projectability. Researchers and practitioners can draw on our refined DPs to better understand value-sensitive DSI projects and simultaneously use this knowledge for instantiations.

**Keywords:** Digital social innovation, Homelessness, Value sensitive design, Vulnerable people, IS for good.

### 14.1 Introduction

Homelessness is a major global challenge. Although different statistics are used to show how many people experience homelessness, the UN reported that in 2020, 1.8 billion people faced the challenge of insufficient housing worldwide (Guterres, 2020, April 23).<sup>23</sup> Lack of housing is linked to an array of problems such as “a lack of [...] a sense of security, stability, privacy, safety and the ability to control living space” (Humphry, 2019, p. 9). Homelessness is a so-called wicked problem, which refers to a complex, layered social challenge that can only be overcome through broad societal and political effort (Brown et al., 2009; Caulier-Grice et al., 2012). Living in unstable conditions can have a negative impact on one or more of the social,

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<sup>23</sup> Different statistics are currently used to show how many people experience homelessness. This is due to a range of factors, such as different definitions of who is considered homeless and also the fact that people live in hidden homelessness (Busch-Geertsema et al., 2016; Pleace, 2016).

physical, and security domains (Busch-Geertsema et al., 2016; Casey and Stazen, 2021). Additionally, it has become clear that insufficient housing and poverty can lead to increased stress levels and mental health issues (Lima et al., 2020). It should however be noted that the relationship between homelessness and health should be viewed as complex (Ranmal et al., 2021). In addition to these constraints and difficult living conditions, in many countries there is also the stigmatization within society of homeless neighbors. Victim blaming is often an issue for them, as homelessness is seen as a personal fault rather than an institutional problem (Belcher and DeForge, 2012; Eisenmann and Origanti, 2021). This makes people experiencing homelessness a particularly vulnerable—and stigmatized—group (European Commission, 2020). The urgency to help has already been recognized by the EU, for example, and countries have set goals for ending homelessness by 2030 (Yakimova, 2020). In addition to the political efforts, there are many aid organizations and institutions that support people in this challenging situation. The assistance offered is multifaceted, ranging from Housing First approaches to acute emergency assistance and also digital assistance (Gebken, Drews, Schirmer, 2021; Ly and Latimer, 2015; Mackie et al., 2019). In this study, we focus on digital assistance to show how the information systems (IS) community can contribute.

Smartphones and digital solutions such as apps can help to improve the situation for this vulnerable group. They provide them, for example, with access to important information and services as well as a way of staying socially connected (Humphry, 2019). Digital solutions can also improve their sense of self-efficacy, giving homeless neighbors back the feeling of control over their lives (Johansson and Gulliksen, 2019). To provide help as fast as possible and especially to focus on the needs and issues of homeless neighbors, organizations not focused on profit such as charities and non-profit grassroots organizations often launch initiatives to develop digital solutions (Bria et al., 2015; Eckhardt et al., 2017). Solutions developed directly for supporting homeless neighbors in different forms can be called digital social innovations (DSI; Gebken, Drews, Schirmer, 2021). DSIs aim to impact social issues through novel digital solutions (Bria et al., 2015). These DSIs need to be developed with appropriate care to improve homeless neighbors' well-being, address their needs, and to avoid contributing to stigmatization (Burrows et al., 2019). Value-sensitive design (VSD) provides a interactional theory for integrating such (value) considerations into the design process (Friedman and Hendry, 2019).

Prior research has contributed design principles (DPs) to be acted upon by a class of value-sensitive DSIs (Gebken, Drews, Schirmer, 2021). However, these DPs have only been abstracted based on one action design research (ADR) project, implicating a low projectability level (Vom Brocke et al., 2020). By analyzing these DPs' fitness within currently available DSI applications that support homeless neighbors, we further codify, generalize, and refine them in this work, inducing higher projectability (Vom Brocke et al., 2020). Researchers and practitioners can draw on our refined DPs to better understand value-sensitive DSI projects (for homeless neighbors) and simultaneously use this knowledge for DSI creation and development in the future. The added value of the work lies especially in the DSI field making visible the different forms of DSI for a specific vulnerable user group. Additionally, the work points out important factors that should be considered when developing solutions for these vulnerable people. In this way, it strengthens the understanding of what kind of solutions are currently utilized, and how these might affect their users and society in general. The overall aim of the article is to provide DPs in the context of DSI and VSD that can inform future research and development of digital solutions supporting homeless neighbors. This article is a follow-up to our first article, in which DPs were already derived using the example of a DSI for homeless neighbors, which now need to be validated and made more precise (Gebken, Drews, Schirmer, 2021). Therefore, a total of 118 DSIs were identified and evaluated, and these were used as the basis for answering the research question. The main research question is: *What can be learned from the analysis of existing DSIs (from different countries) for the future design and development of value-sensitive DSIs for homeless neighbors?*

## **14.2 Theoretical Foundations**

### **14.2.1 Digital Social Innovation**

DSI is an emerging topic in IS (Buck et al., 2020; Qureshi et al., 2021). Bria et al. (2015, p. 9) proposed the following definition for DSI: “[A] type of social and a collaborative innovation in which innovators, users and communities collaborate using digital technologies to co-create knowledge and solutions for a wide range of social needs and at a scale and speed that was unimaginable before the rise of the Internet.” It combines the concepts of digital innovation (DI) and social innovation (SI). There are several definitions of DI to be found in related literature; for instance, Yoo et al. (2010, p. 725) defined it as “the carrying out of new

combinations of digital and physical components to produce novel products,” whereas Fichman et al. (2014, p. 330) broadened their definition to encompass not only a product but also a “process, or business model that is perceived as new, requires some significant changes on the part of adopters, and is embodied in or enabled by IT.” Both definitions state that DI must contain elements of IT. DI must also be at least perceived as a novelty of some kind, and Fichman et al. (2014) mentioned that users must somehow adapt to its usage, meaning that they have transformative power. SI is a relatively new concept. It started to develop towards the beginning of the twenty-first century as a means to tackle emerging problems in society such as poverty and climate change (Buck et al., 2020; Portales, 2019). Several different definitions have also been mentioned in related literature, among which Caulier-Grice et al. (2012, p. 18) proposed: “Social innovations are new solutions (products, services, models, markets, processes etc.) that simultaneously meet a social need (more effectively than existing solutions) and lead to new or improved capabilities and relationships and better use of assets and resources. In other words, social innovations are both good for society and enhance society’s capacity to act”. This means that SI follows both short- and long-term goals. In the short-term, SI should improve a current social need, whereas in the long-term, it should strengthen a society’s capacity to act while continuing to meet its needs (Portales, 2019). In this regard, the primary focus of many DSIs is to contribute to addressing societal challenges, using DI primarily as an tool to do so (Qureshi et al., 2021).

Homelessness is one social issue that can be impacted by DSI. There have been multiple studies examining homeless neighbors’ use of mobile phones. Humphry (2014) conducted a study researching mobile phone and Internet use patterns among homeless neighbors in the Australian cities of Melbourne and Sydney. Of the 95 participating homeless young people, adults, and families, 95% had a mobile phone and 77% owned a smartphone. A mobile phone was seen as a valued asset, enabling homeless neighbors to keep in touch with family and friends, contact emergency and supporting services, and call for medical assistance. Similar research was conducted by Rhoades et al. (2017) in the Los Angeles and Long Beach areas in the U. S. from August 2014 to October 2015. Of the interviewed 421 homeless adults, 94% owned mobile phones at the time of the interview, while 56% owned a smartphone. Further, 22% owned a computer or a tablet within the three months preceding the interview. Overall, daily internet use was reported by 39% of the study participants.

Precisely because a large percentage of homeless neighbors have access to mobile phones, smartphones, and other digital devices (Humphry, 2014; Rhoades et al., 2017), DSIs supporting their requirements are needed (Rhoades et al., 2017). One example of a DSI is the information app *Ask Izzy*, which enables users to easily find important information about existing homeless aid support services (Burrows et al., 2019). The living conditions of homeless neighbors must be taken into consideration while developing a DSI. First, homeless neighbors may often have to change their phone/phone number, since their devices may be broken or stolen. This “may impact long-term connectivity, as well as create difficulties for [those] who may be forced to frequently re-learn the basic functionality of new phones” (Rhoades et al., 2017, p. 75). Second, homelessness can have a negative impact on social, physical, and psychological well-being (Busch-Geertsema et al., 2016; Casey and Stazen, 2021). Therefore, DSIs should be designed to be as inclusive as possible, such as by focusing on accessibility. Third, Rhoades et al. (2017) found Android operating systems to be most common among homeless neighbors, which means that apps intended for them should provide an Android version to reach as many people as possible. Fourth, although many homeless neighbors have access to smartphones, reliable internet connectivity is still a problem for them. Free Wi-Fi access points around cities are a valuable way of supporting them, as is designing services to be accessible from the cache (Hegeman, 2019; Humphry, 2014; Humphry, 2019; Rhoades et al., 2017). Fifth, in our own interviews with homeless neighbors and aid organizations and during our literature analysis, we found that a lack of time and the stress caused by the living situation in particular mean that digital services should be as reliable as possible and quick and easy to use (Lima et al., 2020). Errors can have serious consequences; for example, if an information app indicates that an emergency shelter is open, but this does not correspond to reality (Gebken, Drews, Schirmer, 2021). Sixth, the safety of (data of) homeless neighbors should always be considered. A lack of consideration may lead to project termination (Whittle et al., 2020).

#### **14.2.2 Value Sensitive Design**

When developing DSIs intended to support homeless neighbors, the values and needs of this group cannot be ignored, even if they are only indirectly affected by the solution, since they are especially vulnerable (Gebken, Drews, Schirmer, 2021; Whittle et al., 2020). The focus of these DSIs should be on supporting homeless neighbors in their situation, which they can only do if the team behind them knows what is important to homeless neighbors (Gebken, Drews,

Schirmer, 2021; Gebken, Kurtz et al., 2021). Taking their values into account, along with the values of other stakeholders, may enable DSI solutions to support them and do more good than harm. Friedman et al. (1996; 2013) developed a value sensitive design (VSD) approach that ensures that stakeholder values are considered. VSD “is a theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process” (Friedman et al., 2013, p. 56). Here we understand “value” to be something that “is important to people in their lives, with focus on ethics and morality” (Friedman and Hendry, 2019, p. 24).

VSD is an iterative process aimed at proactively considering human values that are of significance to the different stakeholders involved in the design, development, and eventual use of the technology or artifact. Friedman et al. (2013) understood their approach to be an interactional theory, stating that although technologies are designed with certain values in mind, people can still apply them in any way that they see fit in order to reach their goals. This means that technology or DSIs should be iteratively redesigned based on user interactions.

There has been some previous research applying VSD in the context of homelessness, especially with regard to the values that are important to people experiencing it. Woelfer and Hendry (2009) identified human welfare, respect, trust, autonomy, and sustainability as some of the important values that should be emphasized when designing and developing technology for this vulnerable group. Safety is another important value in this context (Woelfer et al., 2011). In addition, our study on digital donations to and payments for homeless people identified other important values for the emerging ecosystem (Gebken, Drews, Schirmer, 2021). It is important to emphasize that the values in the respective DSI/VSD projects are to be elicited in their own ecosystem. This is because the default of *lists of values* can be generated so that only the values in the list are seen and essential ones relevant for the context/ecosystem are overlooked (Spiekermann, 2021). VSD thus strengthens the theoretical and methodological framework of how the values can be found and inscribed. However, it is important to select the appropriate methods and procedures for each context (Friedman and Hendry, 2019).

In our first study, DPs for value-sensitive DSIs for homeless neighbors have been derived based on an ADR project, as described in the introduction. These DPs refer to the developed

concept as well as to the procedure of stakeholder-oriented and value-based development (Table 14.1).



**Table 14.1. DPs from an ADR Project Creating a Value-Sensitive DSI for Homeless Neighbors (Gebken, Drews, Schirmer, 2021).**

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**DPs for a concept that allows digital donations for homeless neighbors**

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1.1 “OpenStreetPay as one instance of a digital donation concept for homeless neighbors anticipates a very sensitive and difficult transformation of a social practice for vulnerable people that has persisted for thousands of years. It changes the method of donations and depends on the willingness of homeless neighbors to adopt and use it.”

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1.2 “Developing a solution for this field requires a discussion of biases and prejudices to avoid a negative impact and a reinforcement of stigmatization.”

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1.3 “The socio-technical complexity of the context requires a comprehensive concept that goes beyond software from the beginning onwards. It requires a lot of stakeholder knowledge and involvement, financial sustainability, and a stable, easy-to-use app. Many of the involved stakeholders suffer from high pressure due to limited resources, and wrong steps might not be forgiven. Therefore, understanding the stakeholders and their social ecosystem is crucial to avoid early failure (Burmeister et al., 2019).”

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1.4 “The establishment of an ecosystem network is essential to include expert knowledge about legal, security, and service provision aspects. While we assume that learning no. 1 to 4 can be generalized to other contexts, we also highlight that the development of a digital donation concept should consider the local particularities of the context due to the high relevance of the social context and stakeholders’ perspectives.”

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**DPs for a stakeholder-oriented and value-based process of developing a DSI for vulnerable people**

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2.1 “It is important to understand the living circumstances of the vulnerable people, their social ecosystem, as well as the prejudices the vulnerable people meet while facing other stakeholders.”

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2.2 “Our process showed that inscribing values into the design of a DSI is a good starting point to support vulnerable people and challenge biases and prejudices. The values are the basis for design decisions and planned collaboration patterns.”

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2.3 “The discussion about the values also revealed unintentional ones of the DSI, which the team might not have encountered so quickly without a detailed discussion of them.”

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2.4 “The decision to develop values was based on recurring discussions, which are the foundation for the development. Once the team found common ground for the values, it was possible to focus on the transformation and to avoid failure due to unresolved tensions among the underlying values. However, this also meant that certain requirements could not be considered in the design process in order to avoid contradicting the values.”

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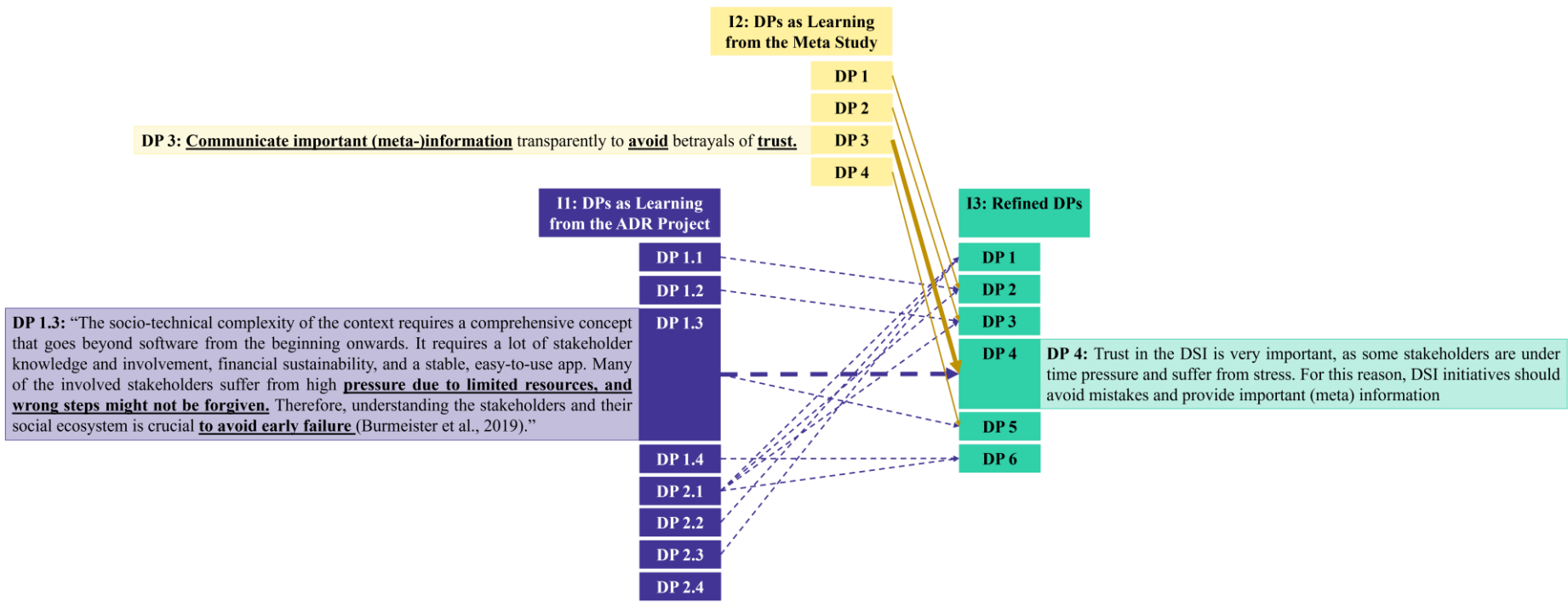
### 14.3 Research Design

We contributed eight DPs for the design and development of value-sensitive DSIs in prior research (Table 13.1; Gebken, Drews, Schirmer, 2021). DPs are considered  $\lambda$  knowledge chunks or design theories contributed to the human knowledge base that stand for knowledge actions, instantiations, or design processes in the traditional realm of design (science) research (Drechsler and Hevner, 2018; Gregor, 2007; Sein et al., 2011; Vom Brocke et al., 2020). The main aim of contributing design theories (such as DPs) in the form of nascent theories is to generate solution design knowledge to generalize and explicate its implicit knowledge for future design instantiations or adaptations to other problem domains (Drechsler and Hevner, 2018; Gregor and Hevner, 2013; Hevner et al., 2019). A profound knowledge base on how to develop design theories, is available in research (e.g., Chandra Kruse, 2018; Gregor et al., 2020) however, evidence on design knowledge accumulation and evolution is scarce, since “most contributions rather stand on their own feet than on the shoulders of giants” (Vom Brocke et al., 2020, p. 520), limiting the extent of broader impacts that can be achieved through design-oriented research (Vom Brocke et al., 2020). Therefore, following Vom Brocke et al.’s (2020) guidance on positioning design knowledge in the human knowledge base over time, we accumulate and utilize our prior work (Table 14.1). Among the means of validation, we strive to raise the DPs’ projectability into other problem contexts utilizing the movement archetype of generalization (Vom Brocke et al., 2020), as these DPs for value-sensitive DSIs have only been derived out of one specific problem context (Sein et al., 2011). We now broaden the originally targeted design problem by analyzing (currently available) digital solutions for homeless neighbors in regard to DSI and VSD specifics. In doing so, we aim to contribute to the phenomenon of (value-sensitive) DSI for homeless neighbors by validating the existing knowledge chunk (DPs) with further empirical data from other DSIs.

In the following, we show the broad lines of our approach, which are explored in more detail in the following paragraphs, to show how we merged and refined this pool of DPs into six coherent DPs being acted upon that may be used in a variety of problem contexts (Figure 14.1, Iteration (I)3: Refined DPs). To strengthen the DPs of the first iteration (Figure 14.1, I1), we first derived DPs using our meta study of 118 different DSIs to support our homeless neighbors (Figure 14.1, I2) and then contrasted the DPs of I1 and I2. Therefore, we searched for applications and literature that fitted our criteria for our meta study. The result from the

literature review can be found in Table 14.2. Using a questionnaire based on Table 14.2, we systematically analyzed and evaluated the applications and derived DPs for these 118 applications using a hybrid coding method (Mayring, 2004). The DPs (I1 and I2) were contrasted in an iterative procedure in which common correlations were first sought. In addition, the focus was on improving the existing DPs in terms of completeness of content (Gregor et al., 2020) and absence from overlap to obtain a generalized and refined version (I3). Using DP4 (I3) as an example, Figure 14.1 shows how we refined the DPs. In the following, we go into the details of our approach step by step.

To identify suitable DSIs for homeless neighbors, we searched for ones that were tailored to mobile use, included functionality, and supported user interactions to differentiate between websites and (web) apps. These solutions were restricted to content available in English or German. The apps were collected through a structured search in the Google Play Store and Apple's App Store using the search term "Homeless," as well as via Google Search using the search terms "help homeless app," "hilfe obdachlos app," and "web application homeless." We included apps in our final pool of analysis that focused on supporting homeless neighbors directly. Such apps enable donations to help homeless neighbors, provide access to resources such as shelter opening hours, or can be utilized to alert service providers so that they can take care of a person in need. We excluded apps that did not show any visible benefit for homeless neighbors or were actively promoting stigma. Among these were simulator games in which people could play the role of a person experiencing homelessness. These often promote stigma through images and language. We further excluded solutions that could be viewed as potentially beneficial to homeless neighbors, such as messenger apps, general charity apps, or even general health apps, as they were not specifically developed to help in the context of homelessness. On top of that, apps that are used by outreach workers and service providers for the coordination and organization of their work were also excluded. Although these apps are utilized to indirectly aid homeless neighbors by improving the work of organizations supporting them, they do not necessarily aim to support homeless neighbors directly. Applying these inclusion and exclusion criteria resulted in a final pool of 118 apps for analysis. The 118 DSIs were then examined qualitatively using a questionnaire based on the systematic literature review.



**Figure 14.1. Refining the DPs for Value-Sensitive DSI for Homeless Neighbors Including One Example How the DPs Were Refined.**

A systematic literature search was conducted to identify criteria from the research areas of DSI, VSD, and apps for homeless neighbors. The search, analysis, and synthesis were conducted following Brink (2013) and Vom Brocke et al. (2009) mainly from December 7–20, 2020. We searched the Google Scholar, IEEE Xplore, ProQuest ABI / INFORM Collection, ACM Digital Library, AIS Electronic Library (AISeL), JSTOR, and Web of Science databases using predefined search terms (e.g., ("digital social innovation") AND ("vulnerable group" OR "homeless" OR "homelessness"))<sup>24</sup>. After the articles were selected, a concept matrix was prepared to include criteria in the areas of VSD, DSI, and apps for homeless neighbors (Table 14.2). This resulted in 114 papers, which were then narrowed down to 32 relevant papers using a relevance scale. Papers were deemed highly relevant if their content could be directly applied to the development of the criteria. Specifically, they contained frameworks, criteria, categories, taxonomies, or other aspects directly related to DSI, VSD, or digital technologies for homeless neighbors—or combinations thereof.

The criteria shown in Table 14.2 were applied to analyze the different DSIs. After we obtained an overall picture of the DSIs, a brainstorming session (Briggs and De Vreede, 2009) extracted the most prominent lessons learned that were identified during the analysis of the results. The comments reflected memorable positive, negative, or surprising examples found during the analysis. These were then abstracted by finding overarching categories and formulated as four newly constructed DPs (Figure 14.1, I2). They were iteratively refined through discussions with one of the other authors.

Contrasting the DPs from I1 (Table 13.1; Gebken, Drews, Schirmer, 2021) with the four derived DPs from I2 resulted in a total of six refined DPs (I3). Figure 14.1 shows the form in which the respective DPs were incorporated. We uncovered the weaknesses of the respective DP formulations and rectified interwoven principles and added missing aspects. In addition, the DPs were improved along the lines of Gregor et al. (2020) so that they contained all the important contents of a DP (aim, implementer, user; context; mechanism; rationale). If a DP from I1 was not present in I2, the data from the meta study were used to verify the DP for I3.

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<sup>24</sup> For a detailed analysis of the literature review and the meta study, go to <https://bit.ly/3qyxwk4>.

**Table 14.2. Criteria for the Analysis of DSIs Supporting Homeless Neighbors (meta study)**

Field	Category	Question	Source
General Aspects	Identifier	What is the name of the app?	-
	Location	In which city was / is / will be the app available?	(Eckhardt et al., 2021; Kaletka et al., 2017)
	Acceptance	How many downloads has the app had?	(Kaletka et al., 2017)
	Activity status	Is the app currently active, has it been active, or has it never been active?	(Gebken, Drews, Schirmer, 2021)
Purpose and Goal	SDGs	Which SDG is tackled through the app?	(Buck et al., 2020; Wu et al., 2018)
	Goal	What was / is / will be the goal / purpose of the app?	(Alijani and Wintjes, 2017; Buck et al., 2020; Fu and Huang, 2015; Terstriep et al., 2016)
	Outcome / effects on society / social value	Into which category of the Potential Social Value Frame (PSVF) method (Faludi, 2020) does the app fall?	(Alijani and Wintjes, 2017; Faludi, 2020; Greeson et al., 2020)
Technical Aspects	Open Source	Is the source code of the app available on GitHub or Gitlab?	(Bria et al., 2015)
	Platform / tech. outcome	On which platforms was / is / will be the solution available?	(Alijani and Wintjes, 2017; Buccieri and Molleson, 2015; Buck et al., 2020; Figueira et al., 2014; Fu and Huang, 2015; Rhoades et al., 2017)
	Role of algorithm / technology	What role does the app play in overall DSI?	(Buck et al., 2020; Fu and Huang, 2015; Lee et al., 2017)
	Up-to-date information	Is the information up to date?	(Gebken, Drews, Schirmer, 2021)
	Service distribution	Is the solution distributed across multiple apps?	(Figueira et al., 2014; Kaletka et al., 2017)

Field	Category	Question	Source
Context of a DSI	Org. structure / type	What type of organization provides / provided the app?	(Alijani and Wintjes, 2017; Bria et al., 2015; Kaletka et al., 2017)
	Funding	How will / does / has the organization behind the app fund(ed) itself?	(Alijani and Wintjes, 2017; Bria et al., 2015; Kaletka et al., 2017)
	Partners	What kind of role will / do / did partners play in the development of the app?	(Alijani and Wintjes, 2017; Buccieri and Molleson, 2015; Buck et al., 2020; Eckhardt et al., 2017; Friedman and Hendry, 2019; Greeson et al., 2020; Kaletka et al., 2017)
		What role do / did partners play for the functionality of the app?	
		What role do / did / will homeless neighbors play in the app development process?	
	Innovation direction	From which direction was / is the innovation initiated?	(Alijani and Wintjes, 2017; Buck et al., 2020)
Drivers & barriers	What were the reasons for the app failing?	(Eckhardt et al., 2017)	
VSD	Stakeholders	Who are the (in)direct stakeholders of the application?	(Alijani and Wintjes, 2017; Eckhardt et al., 2016; Friedman et al., 2013; Friedman and Hendry, 2019; Fu and Huang, 2015; Glover et al., 2019; Kaletka et al., 2017; Woelfer and Hendry, 2011)
		At which gender is the app targeted?	
		At which age group is the app targeted?	
	Values	Which values are mentioned explicitly by the app providers?	(Friedman et al., 2013; Friedman and Hendry, 2019; Greeson et al., 2020; Lee et al., 2017; Woelfer et al., 2011)
Technical investigation: How does the app relate to each value with ethical import (Friedman, 2019)?		(Friedman et al., 2013; Friedman and Hendry, 2019; Shilton et al., 2014)	

## 14.4 Results

The following chapter describes the findings of the study in more detail. First, Section 14.4.1 provides an overview of the data basis and points out the special features of the DSIs. Section 14.4.2 contains the refined DPs. These DPs are intended to replace the existing ones by being clearer and more generalized by considering many different DSIs.

### 14.4.1 Overview of DSIs for Homeless Neighbors

Many interesting aspects were examined in the study. Unfortunately, due to lack of space, we focus only on part of the evaluation in this article. The DPs, however, provide a consolidated overview of the contents of the study. A total of 118 apps and (web) apps were analyzed. Of these, 65 are/were available in the U.S., 18 in the U.K., 9 in Germany, 8 in Australia, 3 in Canada, 2 each in Austria, India, Ireland and Malaysia, and 1 each in Lebanon and South Africa. In the case of 5 apps, no statement could be made.

The DSIs were also examined regarding their purpose. It was possible to find 35 apps that could be assigned to enable donations, 56 to serve information, 27 to connect to a service provider, and 8 to support mental health issues. In addition, 12 could be assigned to social connection and 1 to physical health. A further 24 apps could be assigned to the category “other” (e.g., 2 for creating awareness, 2 for offering street paper, 2 for enabling digital document storage) and 2 had no information because they were no longer available.

User numbers were unknown in 31 of the DSIs, and the majority (49) had fewer than 5000 users. Only 9 had more than 5000 downloads. Many of the apps were developed for young adults (18–25 years) and adults (>25 years); however, 28 focused explicitly on homeless adolescents (13–17 years). Only 5 apps really seemed to provide services for both youths and adults. No apps for children from age 0–12 were found. In 19 cases, it was not possible to obtain information on the age of the target group.

The majority of the DSIs do not target at any specific gender. Only the FemPal app focused on female homeless neighbors. Of the DSIs, 59 were aimed at all genders, including gender-neutral apps such as donation apps or apps that provided resources for female, male, and non-binary people. For 22 apps it was not completely clear if they excluded non-binary people, as they focused only on male and female. These apps could not be categorized as supporting all genders.



#### 14.4.2 Design Principles for DSIs for Homeless Neighbors

This section notes the DPs for DSIs designed to support homeless neighbors directly or indirectly. Here, the DPs are a refinement of the DPs from an ADR project to support homeless neighbors (Figure 14.1, I1) (Gebken, Drews, Schirmer, 2021) and the association with the DPs from the meta study (Figure 14.1, I2). The DPs are limited in essence to the externally perceivable features of a DSI and its team. In the following, the six identified DPs (Figure 14.1, I3) are presented. They are first described and then examples are given to show why these DPs were created and why their consideration and realization is important.

**DP 1: For DSI initiatives, it is important to include (an awareness of) values in the development process to make them explicit, consider the downsides directly, and design the solution according to the values.** As outlined in the introduction, people experiencing homelessness are a vulnerable group. Their living circumstances can have a negative impact on their physical, social, and psychological well-being (Busch-Geertsema et al., 2016). They are also marginalized by society, and apps that aim to support them should not widen this gap or enhance existing stigma (Belcher and DeForge, 2012; Eisenmann and Origanti, 2021). In our first study, we found out that the active election and inscription of values is a good starting point to support vulnerable people and specially to reduce the bias and prejudices towards them. In addition, it was helpful to actively discuss values, as this revealed unintentional ones (Gebken, Drews, Schirmer, 2021). VSD therefore offers an approach through a variety of different methods. The methods should be selected depending on the team and the project (Friedman and Hendry, 2019; Gebken et al., 2022). The meta study itself identified explicit values that were considered important across DSIs, such as privacy, freedom from bias, human welfare, and autonomy (Friedman and Hendry, 2019; Gebken, Drews, Schirmer, 2021; Woelfer et al., 2011; Woelfer and Hendry, 2009). From I1, DPs 2.1, 2.2, and 2.3 were merged to improve the absence of overlap. In I2, this DP was not directly revealed, but the dataset from I2 was consulted to validate the DP deductively. An example is described below that illustrates why it is important for DSI initiatives to have value awareness in the development process. The narrowing-down to an awareness of values was done because it is not clear to what depth the individual DSIs discussed values.

In our search, we found one app (Map the Homeless) that actively hindered the value, human welfare, and privacy of homeless neighbors. It is used to identify “hotspots” of homeless neighbors and report them to the authorities, thereby disregarding that people experiencing

homelessness are humans and just want to leave their neighborhood—which, in the view of the developers, would improve the app users’ welfare. The app allows people to take pictures of homeless neighbors and post them along with their location and a description (such as hashtags) to a map with the goal of helping law enforcement. “These photos are automatically pinned to a Google Map of New York City so that other users of the app can click on and view them. In addition to the name of the user who took the photo and the date on which the photo was taken, users can add descriptive hashtags, such as: #AggressiveBegging, #Threat, #Man, #Woman, #NeedsMedicalAid, #Sleeping, #Smoking, #Crack, #Encampment, and so on.” (Woodvine, 2016). This app is no longer available; the reason for this is not known.

**DP 2: Because DSIs for homeless neighbors are a very sensitive transformation of social practice, it is important for DSI initiatives to include vulnerable people in the design and development process to create solutions that fit their requirements and support their willingness to use the DSI.** DP 1 and the corresponding example already indicate that the involvement of homeless neighbors in the development process is necessary. This is since homeless neighbors are among the main (in)direct stakeholder groups of apps that aim to support them or ease their situation. Therefore, homeless neighbors should be included in the design and development of DSIs. This corresponds to the basic idea of VSD as well as DSI ecosystems (Eckhardt et al., 2021; Friedman and Hendry, 2019), making it possible to include their values and needs (Gebken, Drews, Schirmer, 2021). A collection of methods is available for stakeholder involvement that includes, for example, envisioning cards, co-evolution of technology, and social structure or value scenarios (Friedman et al., 2017; Friedman and Hendry, 2019). This DP expands on our initial idea that deployment through the ADR project would be a “very sensitive and difficult transformation of a social practice for vulnerable people that has persisted for thousands of years” (Gebken, Drews, Schirmer, 2021) and draws on the willingness of homeless neighbors to use the DSI (I1, DP 1.1). By involving them, this is more likely to happen and trust can be strengthened (Hegeman, 2019). Furthermore, it supports the assumption of understanding the life ties for developing solutions that are needed and functional for the people that use them (I1, DP 2.1; I2, DP 1). The DPs from I1 and I2 were combined to focus particularly on the added value of stakeholder engagement. The meta study highlighted several examples where the involvement of homeless neighbors would have been beneficial or where they have been included, which led to a positive influence due to the consideration of the individual situation.

Some DSIs engaged homeless neighbors as information partners involved beforehand, evaluation partners involved afterwards, or co-creators involved throughout the process. DSIs that included the opinions, needs, and values of homeless neighbors were usually considered to provide more sustainable solutions and were more focused on improving their situation in a way that supported and respected them. Two examples of this are Mokli and DreamKit. Mokli is an app that provides resources for homeless youths across Germany, such as information on shelters and food banks. It has also developed a digital currency that is currently being tested among a small group of partnering service providers in Berlin Kreuzberg. The idea for Mokli originated from a group of young people who had been homeless themselves and wanted to help others in the same situation. With the help of partners, they pursued their idea and created Mokli (Karuna eG Sozialgenossenschaft mit Familiensinn). The app focuses especially on privacy and has a clear and thought-out design and easy usability. It is also available in multiple languages. However, the up-to-datedness of the information is a challenge. New mechanisms should be developed to ensure this. It became clear in discussions with information app developers that the lack of funding for the provision of such details is the reason why the information is no longer up to date. The DreamKit app aims to teach life skills to homeless youths while rewarding them with vouchers for every completed lesson. It also allows them to build a resumé and connect to employers. DreamKit employs so-called youth specialists, who are young people who have experienced homelessness or were at risk of becoming homeless at some point and whose experiences help to shape the app to fit the needs of its users (DreamKit, n.d.).

**DP 3: To counter stigmatization, DSI teams should always be careful to see humans as such and represent them as humans in their solution. Both direct and indirect stakeholders should be considered equally, and the understanding of their living circumstances is important.** Many apps want to help homeless neighbors, but some focus on animating people to help by fostering a kind of good-deed mentality such that they seem to lose sight of the values and needs of homeless neighbors (Gebken, Drews, Schirmer, 2021). For example, such apps often display stigmatizing images of homeless neighbors to inspire compassion and encourage donations. This enforces the negative perception of people experiencing homelessness by “labelling them as victims, helpless and in need of charity” (Speak and Tipple, 2006). There are many ways in which this DP can be realized in a DSI (Gebken, Kurtz et al., 2021). Some features that support this DP are, for example, directly addressing the user in the app and sharing some kind and encouraging words with them.

Some apps are also considerate to the stressful situations homeless neighbors are in and guide them carefully to resources that might be helpful for their situation (Burrows et al., 2019). Functionalities that enable users to share their experiences with others, such as rating functions, also promote autonomy and dignity. Emergency exits, which enable users to switch quickly to an inconspicuous website, are also a feature that helps ensure the privacy of users, especially in situations in which they do not feel safe or comfortable having the DSI open. From I1, DP 1.2 and 2.1, as well as DP 2 identified in I2, were combined in terms of content to focus on the topic of stigmatization and dealing with stigmatization.

There are, of course, positive examples of apps that treat homeless neighbors with respect and dignity. For instance, the previously mentioned DreamKit app enables homeless youths to aspire and work towards a better future and helps them overcome their current situation through education (DreamKit, n.d.). Its goal is to ensure that these youths are not left behind by society. Researchers have shed light on the emotions triggered when using the Ask Izzy app. The option of a quick exit button that redirects to a weather page is a feature that is intended to increase people's privacy (Burrows et al., 2019).

**DP 4: Trust in the DSI is very important, as some stakeholders are under time pressure and suffer from stress. For this reason, DSI initiatives should avoid mistakes and provide important (meta) information.** Users need to trust DSIs before they can use them accordingly. Even during the development of the original DP, we realized that the DSIs go beyond software (Gebken, Drews, Schirmer, 2021). In particular, the aspect that “many of the involved stakeholders suffer from high pressure due to limited resources, and wrong steps might not be forgiven” (Gebken, Drews, Schirmer, 2021) should be considered (I1, DP 1.3). Existing studies from the psychological field indicate that stress and mental issues can be triggered by homelessness (Lima et al., 2020). One seemingly quite simple feature that can greatly increase trust is (meta) information (I2, DP 3). DSI teams should offer (meta) information, such as when the information was last updated.

This DP refers to adding information to detail when a resource was last updated, to increase an app's credibility. By providing such additional information, users can better assess the situation and plan their next steps, such as by verifying the information before using it. If this information is not provided, or users assume that it is up to date when it might not be, this can have severe negative consequences. For example, if a user trusts a shelter to be open during the hours communicated in an app and goes there assuming they will have a place to stay

overnight, but the shelter is permanently closed. This consumes the user's valuable time and energy, which could have been saved if they had been cautioned about the validity of the information (Hegeman, 2019). Currently, only two apps provide such information. One app, strassenhilfe-hamburg.de, highlights data updated during the previous six days. The other, GoGetta, informs its users how much time has passed since a resource was last updated.

**DP 5: DSIs are solutions that go beyond software to make them accessible to all users, DSI initiatives should analyze barriers to use, especially by considering potential physical and psychological issues.** Homeless neighbors “use digital media and personal digital technology in ordinary ways, for many purposes, but they do so under extraordinary conditions” (Friedman and Hendry, 2019, p. 141). Homelessness can have a negative impact on physical, psychological, or social well-being (Busch-Geertsema et al., 2016). To provide everyone with the opportunity to use a DSI, special attention must be paid to its access and design. This makes a focus on accessibility essential for DSIs. However, inclusive design is not only important in this area, but in all parts of society (Clarkson et al., 2003). This could already be determined in our first study (I1, DP 1.3; Gebken, Drews, Schirmer, 2021). The meta study also suggested this through design, such as enabling voice-over functionality and large icons as ways to break down barriers (I2, DP 4). Generally, the layout of a DSI should be as clear as possible and guide the user where necessary, so that it is easy to understand. High contrast and a large, legible font are also essential so that as many people as possible can successfully use the app (Egorina, 2017). Other features that support people with physical and psychological impairments include large buttons with supporting icons and text labels. Of course, these are only a few suggestions for how to improve issues that were noticed during the evaluation. There are many more ways to make an app accessible (Clarkson et al., 2003). Accessibility testing should be a part of the app development process to identify contrast errors or errors in the HTML that could impact voice-over. The need for accessibility (I1, DP 1.3) was confirmed in I2 DP 4 and clarified by some examples.

In general, usability and accessibility were not greatly considered in most apps. Only one app (SCUG) provided integrated voice-over functionality, allowing users with impaired eyesight to use the app successfully (LAWPP). Another app (Ask Izzy) had a very clean layout and supported its functions with large buttons and high contrast (Burrows et al., 2019). These apps can be seen as positive examples of accessibility (Burrows et al., 2019; LAWPP).

**DP 6: It is important for DSI teams to consider the local and cultural context within the DSI to incorporate life circumstances, shared understanding of values, and legal frameworks, where applicable, to adapt the solution to the context.** Recent research has shown that it is important to adapt icons to the cultural context (Bekele et al., 2019). However, this applies not only to icons but also to the DSI itself (I1, DP 1.4, 2.1). Both the development and the evaluation should take place against the respective cultural background and thus exhibit cultural sensitivity (Friedman et al., 2021). Here, the limits of the VSD become clear: “VSD builds from the psychological proposition that certain values are universally held, although how such values play out in a particular culture at a particular point in time can vary considerably” (Friedman et al., 2006). Ethnographic approaches can help for understanding and appreciation of these very differences (Friedman et al., 2021). If an initiative intends to offer its solution cross-culturally, it is recommended that appropriate ways are found to take cultural differences into account. While developing our refined DPs, it became clear that the cultural imprint of the researchers should be considered when evaluating the DSIs regarding the values. Since this was also deductively apparent in the data set, we supplemented the DP in I3.

A significant difference that we noticed during the study is that apps from the U.S. show pictures of homeless neighbors more often than, for example, in Germany. The omission of pictures has already become clear from the ADR project in Germany (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021). The Samaritan app from Seattle, for example, provides profiles of homeless neighbors through which they tell their story and generate donations (GiveSafe Apps). The profiles are displayed on the donor’s screen when they walk past a person in need of help. The people seeking help are equipped with tokens to make this work. In contrast, hardly any of the German DSIs used pictures of people in need of help. Because the basic understanding is different, this was also incorporated into DP 2 (I3). Also, in an exchange with researchers from the U.S. who also had the goal of developing a DSI for homeless neighbors, this difference could be perceived. This and many other differences need to be investigated.

## **14.5 Discussion**

This study examined DSIs in German and English that aimed to support homeless neighbors with respect to DSI and VSD. This was done to improve the existing DPs from a previous study. A total of 118 apps were collected. These were analyzed using a self-developed

questionnaire with respect to DSI and VSD. The lessons learned from the analysis in terms of designing and developing DSIs that aim to support homeless neighbors were then extracted into DPs and compared with those that already existed. This comparison helped the refinement of the DPs. The DPs generalize the findings and can be used to guide future design efforts to help homeless neighbors.

### **14.5.1 Implications for Research**

This study took a first step towards exploring different DSI solutions that aim to support homeless neighbors. As already mentioned, 118 different apps were analyzed, even though only German and English-language apps could be considered. Since even minor linguistic subtleties can have a different interpretation for the discussion of values, the apps were limited to the languages that the researchers speak fluently. However, that should not be the end of the analysis but an open call for other researchers who wish to contribute with their expertise and language skills. Cultural aspects, as noted in DP 6, have an influence on design; thus, it would be of great interest to expand this study and discuss it with researchers from the point of view of their respective cultures and knowledge skills. This study additionally showed us how sensitively one must deal with the respective cultural differences in order to prevent cultural imprints from distorting the objective picture. Here, exchanges with other researchers and a corresponding change of perspective have helped.

DSIs aim to address social challenges and help people. Our study has shown that worldwide efforts are being made to help homeless neighbors in a digital manner. Our DPs should help new initiatives and researchers in this field to have a first overview of what types of solutions have already been devised, what needs to be considered, and where the boundaries are regarding ethics and morality. The design principles reflect this. If you want to develop a solution to help homeless neighbors, or any other vulnerable group for that matter, their values, needs, and other requirements should be kept in mind and prioritized. Otherwise, solutions might be developed that intend to improve the situation of humans but turn out to be more harmful than supporting, or which simply have no use because they are not needed.

Within our study, we were able to identify one app that does not contribute to the well-being of homeless neighbors. It remains unknown why this app is offline. The purpose of pointing out the app in this article is to ensure that similar apps are not developed in the future, as it degrades the dignity of homeless neighbors. According to the philosopher Albert Camus, “the evil that is in the world always comes of ignorance, and good intentions may do as much

harm as malevolence, if they lack understanding.” DSIs should be studied more closely by researchers to make people aware of their dangers and social consequences.

We can confirm from our investigation that the VSD view on the different applications in particular helped to develop the DPs and analyze the different DSIs. The influence of values and how they exactly inscribe themselves into the design is to be investigated still more closely for individual examples with appropriate tools (Gebken, Kurtz et al., 2021).

Homeless neighbors find themselves in a difficult living situation that can affect their social, physical, and psychological well-being (Busch-Geertsema et al., 2016). Therefore, it is the duty of society not to look away but to support them. DSIs can contribute. However, it should be clearly emphasized once again that it is necessary to improve the living situation for people on a social and political level. At the same time, we should not lose sight of the major goal of ensuring that people can lead their life in dignity. Technologies will not solve this situation by themselves, but they can be used to accompany humans along the way. The goal can and should be institutional solidarity. There is a lack of studies on the impact that these DSIs for homeless neighbors have on society. However, there are studies that show the impact of Housing First (Ly and Latimer, 2015). Moreover, it was noticeable in the study that countries that have a higher number of homeless neighbors also have a significantly higher number of DSIs for them. It would be interesting to investigate the exact reasons for this.

At the beginning, we described that the development of DSIs for homeless neighbors can be helpful, especially for immediate support, in acute life situations. For example, a lack of time can lead to a situation whereby it is not possible to gather the necessary information in a calm manner. In some cases, however, existing digital solutions also exclude homeless neighbors (even if they are not officially allowed to do so under law), for example by refusing them to have a bank account for making digital payments (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021). In doing so, additional solutions can of course lead to stigmatization being reinforced. If existing service providers are unwilling to act, however, what would be the consequence? Homeless neighbors would be left alone with their challenges since only the basic usability for all would be invoked leaving out their needs and issues. In doing so, the reach of the DSI can be used to put pressure on different actors and thus enable institutional assistance in the long term. Similar arguments exist in the non-digital space; therefore, the way of working with “progress, not perfection” by Friedman and Hendry (2019) should also



be applied here. Solutions should break down existing stigmas, not contribute to more, and hopefully one day no one will have to live on the streets.

### **14.5.2 Implications for Practice**

We were able to uncover many DSIs that exist around the world to date. These could serve as a source of inspiration, if not collaboration. It is notable that in some regions there were several DSIs that serve the same purpose. Here, it would make sense to combine the synergies of the projects and work together on solutions. It was not obvious why several DSIs were developed for the same purpose in the same region. However, discussions have already been held in Germany and various reasons have emerged: dissatisfaction with existing solutions, a lack of willingness on the part of individuals to collaborate, or even that new innovative solutions are only being promoted, and not the maintenance of existing ones.

The DPs are intended to assist in the development of DSIs and to guide DSI teams on how to get started and what to look for. However, this does not equally mean that once one of the DPs has been heeded, the challenges tangential to the DPs have been solved entirely. Our further studies show that a regular questioning of DSIs is necessary (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021).

In this context, it should be emphasized that homelessness, as described in the introduction, is a wicked problem (Brown et al., 2009; Caulier-Grice et al., 2012). It is not enough to develop a DSI and assume that it will solve all problems or that everyone will be fine (Morozov, 2014). The DSIs considered here are often short- and medium-term solutions that are there to compensate for institutional action.

## **14.6 Conclusion and Outlook**

In this article, we aimed to refine the DPs from an ADR project dealing with the support of homeless neighbors. We did this with the help of a meta study and a comparison of the findings. Six DPs could be derived that clarify the existing ones and make them usable beyond the example of the ADR project. Generalization assists in covering a broader problem context; however, it also lowers the confidence level. Thus, further evaluation is needed that validates the refined DPs.

The study revealed many research gaps for the future. For example, the impact of DSIs on society requires investigation. Here, it is particularly important to analyze ways of measuring

the impact of DSIs. In addition, the cultural impact of values for DSIs should be examined more closely.

## 14.7 References

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## **15 Paper 5: Interim Evaluation of Value-Sensitive Digital Social Innovation – Lessons Learned from a Project to Support Humans Experiencing Homelessness**

### *Abstract*

Digital social innovations aim to address social challenges. However, little empirical research has been done to determine whether digital social innovation adequately addresses social challenges and how the respective target groups evaluate them during the development process. Using the example of a digital social innovation to support humans experiencing homelessness, an evaluation of the concept is undertaken. The project is accompanied by action design research. On the one hand, we will show which criteria can be used for the evaluation, and on the other hand, which initial content-related and methodological findings could be drawn from this evaluation.

**Keywords:** Digital Social Innovation, Value Sensitive Design, Evaluation, Homelessness

### **15.1 Introduction**

Digital social innovation (DSI) initiatives aim to use information and communication technologies to help meet social challenges such as poverty or human rights violations (Leong et al., 2020; Qureshi et al., 2021; United Nations, n.d.). The development of DSI is multifaceted and brings about various challenges. One of them is that ethical issues are not adequately addressed or are overlooked (Palazzo et al., 2012; Qureshi et al., 2021). To avoid causing more harm than good when developing a DSI, the consideration of human values is essential (Friedman and Hendry, 2019). This can be achieved by applying value sensitive design (VSD) (Friedman and Hendry, 2019).

In this article, we want to focus on the interim evaluation of DSI. Burrows et al. (2019) and Keijzer-Broers and Reuver (2016) already outline first approaches for the evaluation of DSI. However, there is still a research gap regarding what to be aware of when working with marginalized people. Therefore, we will address the question in this article:

*What lessons can be learned from the evaluation with marginalized people in terms of the design of the DSI and the value-sensitive methodological approach?*

We will take a closer look at this question using the example of an action design research (ADR) project. The ADR project accompanies a value-sensitive DSI called “OpenStreetPay”. The project has been in progress for more than two years and aims to establish a digital donation system to make digital payments possible for humans experiencing homelessness.

## **15.2 Related Research**

### **15.2.1 Digital Social Innovation**

DSI is an emerging field of research that is catching on in IS research, among others (Qureshi et al., 2021). Thereby, Bria et al. (2015, p. 9) offer the following definition for DSI: “[A] type of social and a collaborative innovation in which innovators, users and communities collaborate using digital technologies to co-create knowledge and solutions for a wide range of social needs and at a scale and speed that was unimaginable before the rise of the Internet.” In this context, social needs are very often related with the sustainable development goals (Qureshi et al., 2021; United Nations, n.d.).

In order to review whether the DSI fulfills its objective and is designed in the interest of the people concerned during the development and operation process, the DSI team has to carry out regular evaluations of the quality of the DSI (Keijzer-Broers and Reuver, 2016). Using a DSI as an example, Burrows et al. (2019) show how the assessment of an application can be evaluated after development. Here, they evaluate with affected individuals (humans experiencing homelessness) and the developers how they felt about using or developing the information overview for humans experiencing homelessness (e.g., do individuals feel empowered?).

Overall, DSIs should improve the living situation of affected individuals (Eckhardt et al., 2018; Eckhardt et al., 2021). In this context, the example of Burrows et al. (2019) represents how evaluation can take place on an emotional level. However, other perspectives for evaluation could be interesting and we consider them in more detail in this article. We will pay particular attention to how DSI teams can design interim evaluations to proactively influence design in the build, intervention and evaluation process of ADR (Sein et al., 2011).



### **15.2.2 Context of Homelessness**

Homelessness is one social issue that can be impacted by DSI. Lack of housing is a significant global challenge. There are a variety of different statistics that show how many people are affected by homelessness. One of them is that of the United Nations and this shows that in 2020, 1.8 billion people worldwide were facing inadequate housing (Guterres, 2020, April 23).

Homelessness comes with several problems, like “a lack of [...] a sense of security, stability, privacy, safety and the ability to control living space” (Humphry, 2019, p. 9). Homelessness represents a “wicked problem,” meaning a complex, multi-faceted social problem that requires a significant societal and political effort to overcome (Brown et al., 2009; Caulier-Grice et al., 2012). Living in an unstable environment may negatively impact one or more of the social, physical, and security dimensions (Busch-Geertsema et al., 2016; Casey and Stazen, 2021). In addition, inadequate housing and poverty appear to lead to increased levels of stress (Lima et al., 2020). On top of these challenging living conditions, in many countries humans experiencing homelessness are socially stigmatized. They are often victims of blame, as homelessness is seen as a more personal fault than an institutional issue (Belcher and DeForge, 2012; Eisenmann and Origanti, 2021)). This makes individuals facing homelessness a marginalized - and stigmatized - group (European Commission, 2020).

The urgency to provide help has already been realized by the EU, for example, and countries set goals for ending homelessness by 2030 (Yakimova, 2020). Besides the political efforts, numerous aid organizations and institutions are engaged in supporting people in this difficult situation. The offer of help is wide-ranging and extends from Housing First approaches to urgent emergency aid to digital support (Kempfert et al., 2022; Ly and Latimer, 2015; Mackie et al., 2019). In this article, we focus on digital support to show how DSI can contribute and be evaluated. It should be noted directly that DSIs do not solve the homelessness but can contribute to mitigating sub-problems (e. g. provide money for food).

### **15.2.3 Value Sensitive Design**

Humans experiencing homelessness “use digital media and personal digital technology in ordinary ways, for many purposes, but they do so under extraordinary conditions” (Friedman and Hendry, 2019, p. 141). In which it was additionally emphasized that these special life

circumstances needed to be considered during development of an innovation (Friedman and Hendry, 2019).

To design DSI to have a positive impact on the life situations of humans experiencing homelessness, VSD can be utilized (Friedman and Hendry, 2019). VSD “is a theoretically grounded approach to the design of technology that accounts for human values in a [...] comprehensive manner throughout the design process” (Friedman et al., 2013, p. 56). Following Friedman and Hendry (2019, p. 24), this article defines “values” as something that is “is important to people in their lives, with focus on ethics and morality”.

Considering the values of humans experiencing homelessness, as well as the values of other stakeholders, can lead to DSI solutions that support the realization of these values and, thereby, cause more benefit than harm (Friedman, 1996; Friedman et al., 2013). The three phases of action - conceptual, empirical, and technical investigations - enable VSD practitioners to systematically account for human values in (technical) design processes (Friedman and Hendry, 2019).

However, whether a DSI promotes the realization of a value cannot be directly measured (Friedman and Hendry, 2019). In order to evaluate the impact of the DSI accordingly, other measurable parameters and requirements are needed. One possibility are emotions but also perceptions of people which teams for example can collect via questionnaires or interviews (Perera, 2019; Thew and Sutcliffe, 2018).

## **15.3 Research Approach**

### **15.3.1 Project Description “OpenStreetPay”**

As previously described, in this article we focus on a DSI accompanied with ADR. One thing to note is that team members of the DSI are aware of the limitations of their impact on solving homelessness as such. However, as the past years have shown that political efforts have not solved homelessness and the related problems for humans experiencing homelessness either, the OpenStreetPay initiative tries to support people who have fallen through the cracks of the social assistance system in Germany, thus paving the way back to institutional solidarity. The aim of OpenStreetPay is to make daily life better for humans

experiencing homelessness through a digital donation and payment system and not to exclude them in the digital world (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021).

After multiple iterations, the concept involves the ability for donors to donate digitally (SmallChangeApp) and the ability for humans experiencing homelessness to pay digitally (SmallChangeCard). The SmallChangeCard is pre-loaded with 20 €, the monthly amount that each cardholder receives from the solidarity donation pot. Moreover, the cardholder can collect money individually with the card up to 130 € per month (the amounts are adjusted to the needs of social welfare recipients). Once there is money on the SmallChangeCard, the cardholders can purchase the products they want in the stores they prefer. Before the evaluation, an app for retailers was still being considered. This app should enable SmallChangeCard billing at the time of purchase. The project also serves to raise awareness about the circumstances of humans experiencing homelessness and to encourage individuals to become active advocates for them.

The OpenStreetPay team (composed of between three and fifteen members) works mostly on a voluntary basis since 2020. In the course of the DSI development, it became clear that values are important. The team settled on a selection of specific values (cf. Table 15.1, Appendix) and their operationalizations through a variety of methods. The OpenStreetPay process considered the positions of humans experiencing homelessness, homeless service organizations, purchasing opportunities, funders, and legal experts. However, the focus of this article is on the evaluation of the DSI concept and learning for the proceeding evaluations with marginalized people. This evaluation in form of a proof-of-concept is funded since early 2022 from a cross-university innovation program. We derived our lessons learned from this evaluation.

### **15.3.2 Interim Evaluation Design**

There are a lot of ADR applications and method papers that describe on an abstract level how to evaluate. However, there is a lack of knowledge on how to evaluate, especially with marginalized people, without causing harm during the research. This article presents the findings from the procedure and evaluation of the OpenStreetPay project, which is accompanied by ADR. This is the third iteration of the ADR process. Two of the authors of this article are actively involved in the development of OpenStreetPay. The evaluation was

conducted during the building, intervention, & evaluation phase of ADR. The findings described here are excerpts from the reflection and learning phase. The formalization and generalization of the findings is intended as a core outcome of the formalization of learning phase (Sein et al., 2011).

The core of the evaluation was to test the concept described in section *Project description* “OpenStreetPay” with humans experiencing homelessness and to strengthen their perspective in the development. For this purpose, a proof of concept was developed by the OpenStreetPay team. Figure 15.1 (cf. Appendix) shows the procedure for evaluation. The preparation is shown in yellow, the execution in green and the processing and evaluation in purple.

To develop the questionnaires for the survey, the team (of 4 people) collected questions in an open process. In doing so, the questions should serve to ensure that the team does not make any false assumptions or stereotyping occurs. The second step was to establish categories for the questions. This resulted in the three themes of needs (McLeod, 2007), values (Friedman and Hendry, 2019), and emotions (Burrows et al., 2019), which were supplemented by sociodemographic content and midterm and final polls. The three themes were established with the help of the literature (from VSD, computer-supported cooperative work and psychology) and other researchers from psychology and homeless assistance.<sup>25</sup> In the third step, these questions were then systematically categorized and completed corresponding to the themes and revised in several iterations. In the fourth step, testing was done by different entities. Therefore, a new team member checked the questions, questioned their meaning, and additionally translated them from German into English to avoid exclusion due to language skills. Subsequently, the questionnaire in combination with the test design was sent to the ethics committee of the university's computer science department for review. This resulted in further changes for the test and the handling of the data. The third reviewing body were the humans experiencing homelessness themselves. They gave feedback on the comprehensibility of the questions and on missing questions (e.g., could you use the money wisely for yourself?).

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<sup>25</sup> The provision of the documents in the peer review process prevents the anonymity of the authors. However, we will make this available beforehand upon request if the track chairs agree.

The proof of concept test was carried out at two different locations with two different aid organizations. These aid organizations differed in format but also in the low-threshold nature of the assistance. The test involved following up with humans experiencing homelessness for 3 weeks in the form of a survey and the issuance of the SmallChangeCard. After a preliminary conversation, 10 humans experiencing homelessness were willing and prepared to answer various questions over a period of 3 weeks. Participation was always voluntary, and it was made clear to them that filling out the questionnaire was not necessary for getting the SmallChangeCard. To simulate the SmallChangeCard, the humans experiencing homelessness were given a voucher worth 35 € every week and were supported by the SmallChangeCard in the total amount of 105 €. The team developed the procedure in consultation with the ethics commission and aid organizations.

In the following section we show the lessons learned for the OpenStreetPay concept especially with reference to values but also for the process of evaluation in relation to marginalized people.

## **15.4 Results**

### **15.4.1 Lessons Learned for the DSI Design in Relation to Values and VSD**

Firstly, we found out the need to adapt the basic concept of the OpenStreetPay so that humans experiencing homelessness can check for themselves how much money is still on the SmallChangeCard. This is since without the possibility to check the balance, they do not know what they can afford or they have to document a lot. This need made it clear to us that the value of autonomy (Friedman and Hendry, 2019) of the person concerned should be respected when developing a DSI. It also points to a need for security instead of pure trust in the OpenStreetPay team (Friedman and Hendry, 2019).

Secondly, there is a need for customization of the card in form of a PIN for security. Over the course of the 3 weeks, one of the participants got a card stolen. With a PIN, the card would not have been valuable to the person who stole it. This need is also due to the value of security (Friedman and Hendry, 2019).

Third, it was important for those involved not to stand out in the purchasing process. Some participants do not want to be identified as homeless directly by vendor via the

SmallChangeCard. It became clear in the second week that this was too conspicuous for the participants and some of them had removed the OpenStreetPay branding. Additionally, participants noted that even if the company management agrees with the values and thus prescribes open and friendly interaction with all people, this will probably not be conceivable in everyday life, e.g., at the checkout in the supermarket. Therefore, the card with eye-catching design or another type of payment may contribute to stigmatization. Therefore, the value of freedom from bias (Friedman and Hendry, 2019) should be a higher priority than eye-catching design.

Fourth, the concept needs to consider the diversity of the aid organizations and their low-threshold and basic process. The DSI team was first in a café for humans experiencing homelessness and second in a food distribution that took place directly on the street. It was quieter in the café to work with the participants. In the second organization it was more difficult to get calm in the stressful everyday life on the street. In addition, the language barrier was much higher on the street. These differences need to be addressed appropriately. If DSIs want to help marginalized people, they should adapt to their circumstances. Social justice can only be supported if help is offered to all people equally without barriers (Friedman and Hendry, 2019).

Fifths, even though the time lapse was short, it was made clear to the team once again that only money is not enough. The participants found it positive that they were noticed and that their concerns were taken seriously. The expectation that the specific “sub-problem” can be alleviated by supporting people financially has been shown. However, as previously noted, it has not made a significant contribution to ending homelessness. In order to be able to help in the long term, more than a donation system is needed. It needs a systemic change dedicated to incisive approaches such as Housing First (Ly and Latimer, 2015) and people who are mindful of themselves and their surroundings.

#### **15.4.2 Lessons Learned on How to Conduct Evaluations with Marginalized People**

Through our test, we could clearly see that the prejudice of the donors mentioned in previous tests, that homeless people are not able to deal with technology, is not true. In the study, digital and paper-based questionnaires were used for the surveys. The use of the digital devices went smoothly and the participants also reported technological experience in

conversations. Friedman and Hendry's (2019) statement that people experiencing homelessness use technology like everyone else, only in special circumstances, is also evident in our case.

When selecting the questions, attention should be paid which contents are covered. For example, teams should rather ask about values indirectly, because the question about values seems too abstract (Friedman and Hendry, 2019). One respondent said that the discussion of values was something for donors, another took it very positively to discuss them, but emphasize the need to see values in action.

Additionally, the experience at the personal level of the team was very multifaceted. In one case, it became clear that preparation for psychological emergencies on probationers would be very useful. Even though the joint appointments were perceived as very positive, participants were confronted with difficult life circumstances throughout the week. Therefore, the team should know emergency numbers and experts for queries. From perspective of a member of a charity, it was noted that these numbers would not really help people experiencing homelessness.

During the evaluation, some of the team members reached their limits of their emotional capacity. It is important to check how capable the team members are of setting boundaries and to include supervision if needed. This can also support psychological well-being of the team. Finding the right balance between helpfulness and distance is a major challenge.

In the survey, it became clear that the diversity of the subjects also brings challenges. In this context, it occurred in one case that a person expressed discriminatory statements. Ignoring discriminatory statements could in the long run lead to an indirect inscription (Brey, 2010; Simon et al., 2020).

## **15.5 Discussion and Outlook**

The study has shown that people experiencing homelessness clearly articulated what kind of help would be useful for them, what gaps a proposed concept still has and how the evaluation could have been better designed. Thereby, no two life stories were alike.

From the perspective of the OpenStreetPay team after the evaluation, a digital donation system is necessary. While the DSI does not solve the complex social problem of

homelessness, from the team's point of view it can help to address challenges that people experiencing homelessness face until society looks at the problem in its entirety and addresses it more holistically. To summarize, technologies or DSIs cannot solve a complex societal problem like homelessness, but they can contribute in a difficult life situation (Island and Willermark, 2022).

With our work we contribute to the field of DSI as a field of application and demonstration of how DSI team can use for the evaluation of a DSI designed for marginalized people and what is important in the evaluation design for marginalized people.

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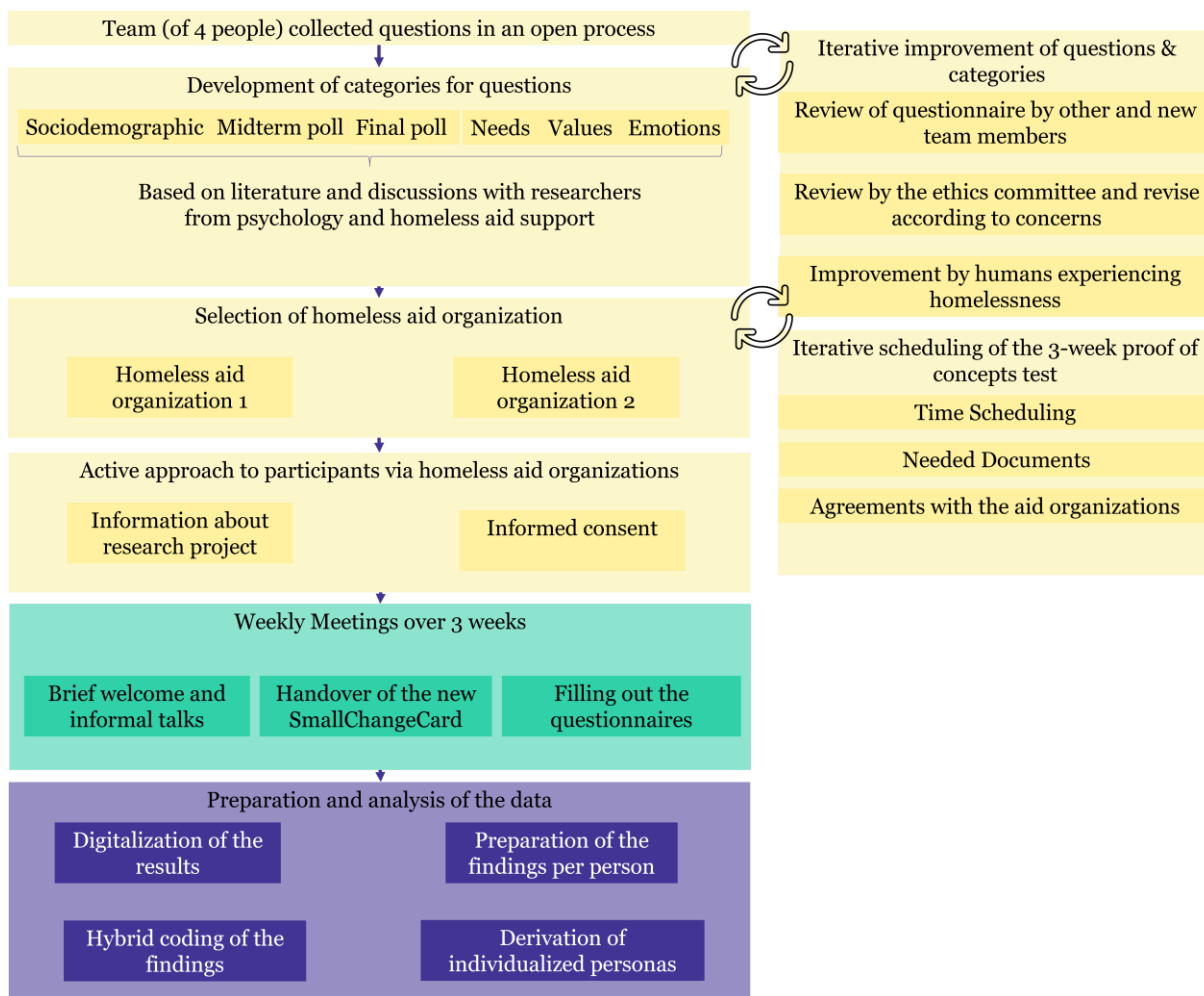
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## 15.7 Appendix

**Table 15.1. Values of OpenStreetPay**

As values are considered as a foundation for the work of the team, here we show the values of OpenStreetPay:

- Be human. In everything we do: we do it out of humanity and with passion.
- Respect dignity. We treat each other, our partners, and each of our humans experiencing homelessness with respect. Without exception.
- Reach out. Small amounts of money make everyday life easier for our humans experiencing homelessness. We enable self-responsible care.
- Enable solidarity and individuality. We help with a monthly fixed amount and enable the collection of individual donations. We do not replace any help.
- Give perspectives. Nobody should have to live permanently on the street. We try to pave humans experiencing homelessness a sustainable way out of need.
- Be straightforward. Help that reaches out to everyone is the best help. Therefore, OpenStreetPay shall be easy to use.
- Show transparency. We treat each other fairly and squarely and communicate in this way.
- Joined forces. We work together instead of against each other. With partners who share our values.
- Be secure. The security of all data of our donors and humans experiencing homelessness is important to us. That's why we protect them.
- Take responsibility. We are aware that our donors, partners, and humans experiencing homelessness trust us. We question ourselves and OpenStreetPay.



**Figure 15.1. Procedure of the Evaluation**

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## A Appendix

### A.1 Paper 6: Value-sensitive digital social innovations for marginalized individuals: Towards a research agenda

#### *Abstract*

In this paper, we introduce *Value-Sensitive Digital Social Innovation* (VSDSI) as a new research field. Integrating insights, goals and methods from Digital Social Innovations (DSI), Value Sensitive Design (VSD), Participatory Design and Research Ethics guidelines, we propose a new research agenda for a more ethically and socially responsible research, design and development of novel technologies. We argue that VSDSI can improve research and design processes in general, but is particularly needed when developing technologies for and with marginalized groups and individuals.

**Keywords:** Digital social innovation; value sensitive design; marginalized individuals; social impact; ethical issues; responsibility

#### A.1.1 Introduction

Societies face a multitude of social and environmental challenges that need to be overcome to ensure fairly distributed and sustainable living standards for current and future generations (Leong et al., 2020; Qureshi et al., 2021; United Nations, n.d.). To address these challenges, the United Nations formulated the sustainable development goals (SDGs) (Guterres, 2020, April 23; United Nations, n.d.).

DSI<sup>26</sup> can be one way of addressing these SDGs (Eckhardt et al., 2016; Qureshi et al., 2021). For this purpose, novel ways of collaboration are being pursued with the help of information and communication technologies (ICT; Bria et al., 2015; Qureshi et al., 2021).

However, as DSI can have profound impacts on the living conditions of individuals and their environment, their development comes with great responsibility. As a consequence, it is necessary to address and deal with ethical questions arising in the context of developing or deploying such technologies (Gebken, Kurtz et al., 2021; Qureshi et al., 2021). Certain ethical

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<sup>26</sup> We see DSI as complementary to necessary social change, rather than as a solution to societal challenges (Tracey and Stott, 2017).

issues can arise from ethical dilemmas<sup>27</sup> or value conflicts during the DSI development, e. g. through conflicting perspectives of stakeholders (Gebken, Drews, Schirmer, 2021; Qureshi et al., 2021; Terstriep et al., 2020). If there are conflicting requirements or demands by different stakeholders which cannot be satisfied at once, different design options must be weighed and compared and decisions must be made that may require giving up certain values or negatively affecting certain groups or individuals. How such decisions are being made thus is not merely a technical decision, but also an ethical and political one and thus requires careful attention. As a consequence, DSI teams must be aware of and address these ethical issues in order to fulfil their responsibilities as developers (Gebken, Kurtz et al., 2021; Qureshi et al., 2021; Simon, 2016). While such a comprehensive and reflective analysis of conflicting demands is always important, it is of particular importance when developing DSI for marginalized individuals in order to support their needs while simultaneously avoiding potential stigmatization or discrimination by others (Gebken, Kurtz et al., 2021; Hota et al., 2023).

As ethical issues are not yet sufficiently taken into account in DSI research (Qureshi et al., 2021), the research field of VSD can remedy this (Friedman and Hendry, 2019). VSD provides methods to account for the values<sup>28</sup> of different direct and indirect stakeholders (Friedman and Hendry, 2019). In particular, the entanglement between stakeholders and values makes needs to be addressed, so that ethical dilemmas or value conflicts can be detected, addressed, and hopefully even resolved.

Hence, in this paper we propose a new research field and make suggestions about its research agenda. For this purpose, we first develop in a first step the notion of VS DSI and argue for its particular importance for research and development involving marginalized individuals. The guiding question is:

*Why and how should DSI for marginalized individuals be designed in a value-sensitive way?*

To address this question and shape the term VS DSI, we draw on extensive literature from the DSI and VSD research field, and from Research Ethics and Participatory Design while

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<sup>27</sup> By an ethical dilemma we mean the following: “In each case, an agent regards herself as having moral reasons to do each of two actions, but doing both actions is not possible. Ethicists have called situations like these moral dilemmas. The crucial features of a moral dilemma are these: the agent is required to do each of two (or more) actions; the agent can do each of the actions; but the agent cannot do both (or all) of the actions. The agent thus seems condemned to moral failure; no matter what she does, she will do something wrong (or fail to do something that she ought to do).” (McConnell, 2022).

<sup>28</sup> Here, our understanding of value is something that “is important to people in their lives, with focus on ethics and morality” (Friedman and Hendry, 2019).

reflecting on our own experiences of a longstanding VSDSI project supporting marginalized people.

In order to support future researcher as well as developer of VSDSI we use in a second step the gained knowledge in order to arrange a research agenda for the newly framed theme. Apart from proposing the fruitful and suitable combination of perspectives and contributions of the mentioned research fields we also identify existing gaps within and between these fields out of which we draw further open topics for research. The overall subject is to harness the strengths of different research areas to encourage and support DSI researchers to proactively address societal challenges faced by marginalized individuals by developing DSI in a responsible and user-focused way. Our aim is to support researchers who are actively involved in the development of VSDSI and who are working in teams on related issues by addressing practical issues in their research. In turn, we hope that encouraging research results will directly support the development work of DSI teams. In the following we therefore often address both groups at once, DSI researchers and developers.

### **A.1.2 Research Insights from Our Ongoing Value-Sensitive Digital Social Innovation Project for Marginalized Individuals**

This research agenda is based on the experience of a longstanding and ongoing action design research (ADR) project accompanying a VSDSI project. ADR is an established research method in the field of Information Systems (Sein et al., 2011). The aim of ADR is to have an active influence on the real world and to enable the development of artefacts with the help of design-oriented approaches. ADR projects must be anchored in both theory and practice (Sein et al., 2011).

The aim of our VSDSI project is to support individuals experiencing homelessness in an increasingly digital society through digital donations (Gebken, Drews, Schirmer, 2021). During project development, ethical issues arose within the VSDSI ecosystem, e.g., on the question of who receives aid (Gebken, Drews, Schirmer, 2021).

We used a variety of different empirical research methods (interviews, focus groups, quantitative analyses, document analyses) to guide our design in a responsible and value-sensitive manner. Within the first months of the project, it became clear that there are a variety of different values among the different stakeholders as well as prejudices towards the individuals experiencing homelessness (Gebken, Drews, Schirmer, 2021). The prejudices of some (indirect) stakeholders mean, for example, that they do not want to help individuals who

are affected by homelessness or only offer help to selected individuals of the affected group. The individuals who participated in our study and experienced homelessness want their anonymity. As a team, we have chosen to prioritize privacy and lose some potential donors if necessary. In addition, if a person experiencing homelessness finds their individual donation more important than their privacy, we will accommodate them with different forms of donation.

In order to proactively work against prejudices and to consciously and proactively inscribe values into the technology, we added VSD as a theoretical and methodological approach (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021). In addition, we used insights from Participatory Design and ethical guidelines from Research Ethics for the mindful involvement of marginalized individuals within the research and development process (Gebken, Cankaya, Jacobs, 2023; Gebken, Drews, Schirmer, 2021). The knowledge base for VSDSI design has been gathered through systematic literature analysis. In addition, researchers from different research fields (Information Systems, Psychology, Ethics, etc.) were involved to improve and reflect on our approach.

### **A.1.3 Related Research**

As we will show, the focus of DSI is on addressing societal challenges, while VSD contributes to understanding what values are and how they influence technologies, and what methods are available for developing and reflecting on technology. Ethical guidelines from Research Ethics and Participatory Design extend the understanding of what is particularly important when working with marginalized individuals.

#### **A.1.3.1 Digital Social Innovation**

The research field of DSI is an interdisciplinary research field (Qureshi et al., 2021).

In their article, Rodrigo et al. (2019) examine the phenomenon of DSI and analyze different definitions. Most definitions start from the social innovation field. They state the goal of making a social difference and addressing social phenomena or problems is the core of DSI (Qureshi et al., 2021; Rodrigo et al., 2019). The form of innovation to address this goal can be very diverse, for example a process, solution, product, service etc. (Rodrigo et al., 2019). The digital component (ICT) is often seen as a means of contributing to societal challenges (Rodrigo et al., 2019).



In the following, we draw on the definition of Bria et al. (2015) according to which a DSI is “a type of social and a collaborative innovation in which innovators, users and communities collaborate using digital technologies to co-create knowledge and solutions for a wide range of social needs and at a scale and speed that was unimaginable before the rise of the Internet.”

The aim of DSI is to address societal challenges. These societal challenges have been defined by the United Nations in the form of the SDGs (United Nations, n.d.). The SDGs are often referred to in the DSI literature to describe the diversity of the different topics (Eckhardt et al., 2016; Leong et al., 2020). Examples of DSI are applications that aggregate information important to individuals experiencing homelessness or enable blind/blind-deaf individuals to participate in public transport (Azenkot et al., 2011; Burrows et al., 2019).

Even if DSI aim to contribute to the SDGs and improve well-being, there is a risk of neglecting ethical issues by assuming that the goal is always to be pro-social (Bhatt, 2021; Qureshi et al., 2021). Value conflicts can occur, for example, due to different needs of the stakeholders (Whittle et al., 2020).

The importance of considering ethical issues is particularly evident in DSI designed for marginalized individuals to support them with their needs (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021; Hota et al., 2023). Ignoring ethical issues can, for example, lead to security risks for the marginalized persons by making them liable to trackable due to lack of privacy protection. These safety risks may be so serious for the marginalized that they decide not to collaborate in the long run (Whittle et al., 2020). Furthermore, ignoring these ethical issues may have a negative impact on the DSI users or contribute to discrimination (Kempfert et al., 2022).

Therefore, there is a need for reflection on ethical issues and proactive engagement with ethical issues in the DSI development process (Friedman and Hendry, 2019; Simon, 2016). To enable this, VSD knowledge can complement DSI knowledge by making clear (a) what values are, (b) how to deal with value issues and (c) what methods can be used to account for values and ethical issues while designing and reflecting a technology (Friedman, 1996; Friedman and Hendry, 2019). Therefore, we have made it our mission with the research agenda and with our previous research to integrate VSD into DSI.

To enable future researchers to consider the specifics of working with marginalized individuals, we additionally focus on principles of Research Ethics and Participatory Design.

In the long term, this may help to consciously counteract discrimination (Gebken, Kurtz et al., 2021; Salazar and Abrams, 2005).

### **A.1.3.2 Value Sensitive Design**

VSD can be used in any socio-technical context (Friedman and Hendry, 2019) as a way of accounting for values in the design of technology. For this purpose, the values of the different stakeholders are systematically considered. This can reveal ethical issues. VSD represents an approach which focuses in particular on ethical issues (Friedman and Hendry, 2019).

In the context of this research, the term VSD is used in the following sense: “VSD seeks to guide the shape of being with technology. It positions researchers, engineers, policy makers, and anyone working at the intersection of technology and society to make insightful investigations into technology innovation in ways that foreground the well-being of human beings and the natural world. Specifically, it provides theory, method, and practice to account for human values in a principled and systematic manner throughout the technical design process.” (Friedman and Hendry, 2019).

The previously missing consideration of ethical issues in the DSI field can be complemented by VSD (Gebken, Drews, Schirmer, 2021; Schuppan and Köhl, 2017). From a VSD perspective, values are implicitly inscribed in technologies. To proactively address ethical issues, values should be considered as explicitly as possible in the design process (Friedman and Hendry, 2019). This enables DSI teams to proactively shape technology for a better future (Friedman and Hendry, 2019).

To adequately account for values, VSD offers a meta method in form of the conceptual, technical, and empirical investigations (Friedman, 1996). The content of the respective investigation phase is intentionally open, and the methodological approach is to be chosen according to the context (Friedman et al., 2017; Friedman and Hendry, 2019). The methods are multifaceted, they aim to be pragmatic and applicable to different forms of investigation and stakeholder or purposes (Friedman et al., 2017; Friedman and Hendry, 2019). VSD is open to also include methods from other fields (Friedman and Hendry, 2019). However, the careful selection and adaptation of methods is important to obtain an adequate understanding of the problem and the inscription of values (Gebken et al., 2022).

Having said this, and emphasizing the very useful contributions of the VSD field, we also see some overall limitations in our context. While VSD is applicable and applied in different contexts, it currently lacks specific focus on DSI. Furthermore, there is still a great need for

research, especially in the field of technical investigations, in order to implement the well-founded knowledge from the empirical and conceptual investigations in a meaningful way (Gerdes and Frandsen, 2023). Hence, our research agenda serves not only to enrich DSI knowledge, but also to inform VSD research by raising further research questions and combining both into tailored open topics.

### **A.1.3.3 Focusing on Marginalized Individuals**

The focus of our paper is VSDSI for marginalized individuals. From many years of experience in Research Ethics, it is known that these individuals have a higher likelihood to be wronged or further harmed (World Medical Association, 2022). To enable the field of DSI research to improve living conditions of marginalized individuals, we want to emphasize that it is important to offer marginalized individuals special protection in research and DSI development (World Medical Association, 2022). Their dignity needs to be respected, and the diversity of individuals needs to be considered (German Informatics Society, 2018).

Therefore, we first address what marginalization and discrimination mean and second what principles from Participatory Design can meet the demands of Research Ethics for future VSDSI projects.

In the following, the term marginalized individuals are defined as follows. “Different groups of individuals within a given culture, context and history at risk of being subjected to multiple discrimination due to the interplay of different personal characteristics or grounds, such as sex, gender, age, ethnicity, religion or belief, health status, disability, sexual orientation, gender identity, education or income, or living in various geographic localities.” (European Institute for Gender Equality, 2016)

According to the definition of marginalized individuals, they are discriminated against by the majority society and prejudice is shown towards them based on personal characteristics or grounds (European Institute for Gender Equality, 2016). Therefore, in the following we want to make clear what discrimination affects marginalized persons. Discrimination means the relative disadvantage of a person based on personal characteristics or grounds. This discrimination can occur in three ways: direct, indirect or organizational, institutional and structural (Altman, 2020).

To prevent discrimination in research or development of VSDSI, we illustrate here our findings from the literature analysis in relation to working with marginalized individuals.

Researchers and VSDSI teams should not contribute to discrimination (Aldridge, 2019; Belcher and DeForge, 2012; Gebken, Drews, Schirmer, 2021). Furthermore, discrimination can be proactively counter with the development of the VSDSI and research (Kempfert et al., 2022).

To make this possible, researchers and teams can ensure that the needs and voices of marginalized individuals are heard in the development of the VSDSI and are implemented into the design (Aldridge, 2019; Kempfert et al., 2022). For this, researchers need to actively involve marginalized individuals in the processes and, while doing so, they need be treated with the same respect as all other stakeholders (Chowdhury, 2022).

Different forms of participation will need to be considered in order to reflect the different needs of individuals in both research and VSDSI development (Egorina, 2017; Kempfert et al., 2022; Salazar and Abrams, 2005). This is important in order not to exclude individuals due to certain personal characteristics (Salazar and Abrams, 2005). By using different and appropriate forms of participation, even marginalized individuals that might be assumed to be difficult to reach can be reached (O'Neill et al., 2002).

Furthermore, researchers and teams need to be aware that victim blaming<sup>29</sup> by stakeholders can occur. This means that individuals blame those who are marginalized or discriminated against for their situation in life, even though there are institutional problems or institutional discrimination (Belcher and DeForge, 2012; Eisenmann and Origanti, 2021). Therefore, researchers and teams need to consider the full complexity of the overall situation and critically question aspects such as victim blaming. This can help to really understand the root of the problem rather than providing simple answers for complex questions.

## **A.1.4 Value-Sensitive Digital Social Innovation for Marginalized Individuals**

### **A.1.4.1 Definition of Value-Sensitive Digital Social Innovation**

Considering the potential problems described in the previous sections, there is a need for a research field that (a) addresses the empowerment of users and their needs and values, (b) considers the potentials and risks of the technologies, and (c) proactively addresses ethical issues with values in the design. Our approach is for DSI researchers and teams to apply VSD

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<sup>29</sup> Victim blaming means that individuals are blamed personally for their situation instead of seeing the problem on a societal or institutional level (Belcher and DeForge, 2012; Eisenmann and Origanti, 2021).

research and DSI thus become VSDDSI. To adequately focus on the interests of marginalized individuals, Participatory Design and Research Ethics are needed for the responsible research and development of VSDDSI. To achieve this, we combine the strengths of the approaches while actively filling respective blind spots. Accordingly, we define VSDDSI as:

*VSDDSI are digital-based ways of addressing societal challenges. In order to improve the well-being of living beings in the long term and to gradually make the world a better place, they must be designed responsibly through the collaboration of many actors, taking into account stakeholders, values and value conflicts - especially those of the most vulnerable. Collaboration is characterized by the constant alignment of (shared) values, technology, and stakeholders according to the resources available in the design process.*<sup>30</sup>

#### **A.1.4.2 Research Agenda for VSDDSI for Marginalized Individuals**

To create VSDDSI for marginalized individuals, we will make our knowledge from our VSDDSI research project and insights from literature available as a research agenda for future researchers.

We address the following dimensions: (1) reflective value-sensitive goal-setting, (2) extended research method and shaping of research conditions, (3) consideration of stakeholder values and possible discrimination, and (4) VSDDSI development. The integration and consideration of the marginalized individuals are an integral part of all dimensions.

##### **(1) Reflective value-sensitive goal-setting**

###### **(a) Recurringly reflecting VSDDSI-goal**

As described above, DSI aim to address societal challenges (Bria et al., 2015). Therefore, DSI considers “a wide range of social needs” (Bria et al., 2015).

However, not all social problems can be solved by technology (Morozov, 2014; Tracey and Stott, 2017). To avoid solutionism while setting goals, researchers (and teams) need to question for each unique case which social challenge they want to address, to what extent this is possible on a technological level, and why a certain solution is pursued and helpful in a repetitive manner (Table A.1.1, 1(a); Schön, 1983). Researchers can use and introduce VSD methods to reflect on what solutions make sense and what implications they may have for the future (Friedman and Hendry, 2019; Gebken, Kurtz et al., 2021). In terms of Research Ethics,

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<sup>30</sup> The definition is adapted from Friedman and Hendry (2019) and Bria et al. (2015).

VSDSI for marginalized individuals should ensure that the goals and all research is designed in their interest (German Informatics Society, 2018; World Medical Association, 2022).

(b) Questioning motivations of participating stakeholders

It is important to consider that stakeholders with different interests and values want to participate in the research and development of the VSDSI (Yetim, 2016). It is important to question their motivation and to proactively prevent possible value conflicts (Table A.1.1, 1(b)). Social and green washing in this area is a challenge that the researchers (and teams) must face (Gebken, Drews, Schirmer, 2021). This is particularly important that the life stories of marginalized individuals are not instrumentalized. The voices of marginalized individuals need to be heard and this should be one of the core interests of VSDSI research and teams (Aldridge, 2019; Chowdhury, 2022; Cibangu, 2020; Deng et al., 2016).

(c) Measuring value-related impact

When setting goals, researchers should think about how they want to measure their success and develop an impact logic (Table A.1.1, 1(c)). VSD can support the DSI by weighing the positive and negative sides of VSDSI through a variety of methods (Friedman et al., 2017; Friedman and Hendry, 2019; Winkler and Spiekermann, 2018). These can complement existing evaluation approaches for DSI (Milwood and Roehl, 2019; Terstriep et al., 2020; van Rijn et al., 2021) by adding a value perspective. As there is a variety of challenges to achieving the formulated goals, "progress, not perfection" can be seen as a principle of progress in order to keep teams motivated and to tackle problems step-by-step (Friedman and Hendry, 2019). In the context of marginalized individuals, they themselves may help determine the metrics to measure whether the VSDSI is supportive (Gebken, Jacobs et al., 2023).

(2) Extended research method and shaping of research conditions

(a) Extending research methods to include value-sensitivity

DSI research is interdisciplinary, and the approaches of the individual research papers differ depending on the research environment from which the researchers come. There is a large body of work that examines, evaluates, or assesses DSI from an external perspective (Qureshi et al., 2021). However, there are also researchers who take a formative and active role (Keijzer-Broers, 2016; Keijzer-Broers and Reuver, 2016; Ye et al., 2021). This perspective is still underrepresented in research. In her dissertation in the DSI field, Keijzer-Broers states that more researchers should become social entrepreneurs to have a positive impact on the world. In our view, this is a promising direction for research to be able to nudge change in society.

In the VSD research field, both external and proactive perspectives are taken. In particular, the proactive perspective aims to ensure that the technology is designed in such a way that it contributes to a better future. To take this approach into account, it is important to question how value-sensitivity can be integrated into the research process and which methods from DSI research are suitable (Table A.1.1, 2(a)). In our case, we have extended the ADR to include VSD ideas (Gebken, Jacobs et al., 2023). The need for this and initial approaches have already been implemented in other papers (Keijzer-Broers and Reuver, 2016; Yetim, 2011, 2016). Broadening research approaches can help researchers, for example by ensuring that they do justice to marginalized individuals. Particularly through the focus of VSD, values can be used to proactively address the needs of marginalized individuals (Deng et al., 2016; Friedman and Hendry, 2019; Kempfert et al., 2022).

(b) Reflecting and framing of sustainable research conditions

Furthermore, researchers need to ask themselves how their projects can have an added value for society (Table A.1.1, 2(b)). The inspiration for this question came from Keijzer-Broers' push for more researchers to become social entrepreneurs (Keijzer-Broers, 2016). As the crises of our time require proactive action by everyone, it is no longer enough to observe from the sidelines as researchers, but to actively contribute one's own knowledge (Taylor, 2023). However, the impact on the society should also last in the long-term and thus be sustainable. Structures must be created so that the VSDSI project does not end when, for example, the research funding comes to an end. Otherwise, the projects will collapse and the hope of the stakeholders for change will be dampened (Vogel, 2021). Due to lack of sustainability of research conditions, it can lead to giving hope to (marginalized) individuals, and they can get lost due to the end of research.

(c) Continuously reexamining research to assure positive effects on marginalized individuals

In section A.1.3.3, we have introduced that from the perspective of Research Ethics, research needs to be designed in favor of marginalized individuals. Accordingly, we encourage researchers to question how they enable this and ask themselves how they avoid negative effects for affected persons and even more make the voices of the marginalized individuals be heard (Table A.1.1, 2(c), World Medical Association, 2022). Aldridge (2019), Chowdhury (2022) and Salazar and Abrams (2005) provide valuable guidance on how research can be mindful towards marginalized individuals. Thereby, it remains open to researchers how to concretely implement or reflect on the guidance.

**Table A.1.1. Research Agenda**

<b>Dimension</b>	<b>Research Themes</b>	<b>Research Question</b>	<b>Source</b>
	(a) Recurringly reflecting VSDSI-goal	Which social challenges can be adequately addressed with a VSDSI?	(Buck et al., 2020; Friedman and Hendry, 2019; Gebken, Jacobs et al., 2023; Morozov, 2014; Qureshi et al., 2021; Tracey and Stott, 2017)
(1) Reflective value-sensitive goal-setting	(b) Questioning motivations of participating stakeholders	What are the motivations of individual stakeholders to participate in the VSDSI and research?	(Aldridge, 2019; Chowdhury, 2022; Cibangu, 2020; Deng et al., 2016; Gebken, Drews, Schirmer, 2021; Yetim, 2016)
	(c) Measuring value-related impact	What is the measure whether the societal challenges have been adequately addressed by the VSDSI?	(Friedman and Hendry, 2019; Hota et al., 2023; Milwood and Roehl, 2019; Terstriep et al., 2020; van Rijn et al., 2021)
	(a) Extending research methods to include value-sensitivity	How the research approach (apart from VSD itself) be extended to make it value-sensitive?	(Gebken, Jacobs et al., 2023; Keijzer-Broers and Reuver, 2016; Yetim, 2011, 2016)
(2) Extended research method and shaping of research conditions	(b) Reflecting and framing of sustainable research conditions	How can the research process be designed in such a way that the findings influence the real world in a sustainable manner?	(Keijzer-Broers, 2016; Keijzer-Broers and Reuver, 2016; Taylor, 2023; Vogel, 2021)
	(c) Continuously reexamining research to assure positive effects on marginalized individuals	How can positives effects on the marginalized individuals concerned be assured through the research and development of the VSDSI?	(Aldridge, 2019; Chowdhury, 2022; Salazar and Abrams, 2005; World Medical Association, 2022)



<b>Dimension</b>	<b>Research Themes</b>	<b>Research Questions</b>	<b>Source</b>
(3) Consideration of stakeholder values and possible discrimination	(a) Identifying and selecting stakeholders	Which stakeholder groups are relevant to the VSDSI?	(Eckhardt et al., 2021; Friedman and Hendry, 2019; Gebken, Kurtz et al., 2021; Terstriep et al., 2020)
	(b) Balancing conflicting values among stakeholders	What values do stakeholders have in mind for the development of the VSDSI and how should they be balanced against each other?	(Friedman et al., 2017; Friedman and Hendry, 2019; Gebken, Drews, Schirmer, 2021)
	(c) Addressing potential discrimination	What influence should (indirect) stakeholders have if they have a discriminatory opinion towards the marginalized group concerned?	(Gebken, Drews, Schirmer, 2021; Gebken, Jacobs et al., 2023; Gebken, Kurtz et al., 2021)
(4) VSDSI development	(a) Considering the impact of values	What is the impact of the considered values on the VSDSI?	(Eckhardt et al., 2021; Friedman and Hendry, 2019; Gebken, Kurtz et al., 2021)
	(b) Guiding, reflecting and evaluating value inscription	How can the inscription of values into the VSDSI be reflected and evaluated?	(Friedman and Hendry, 2019; Gebken, Jacobs et al., 2023; Gebken, Kurtz et al., 2021; Spila et al., 2016; Yoo et al., 2013)
	(c) Selecting and adopting methods	What needs to be considered for a providing a suitable method pool for VSDSI together with approaches for selecting and adapting them?	(Friedman et al., 2017; Friedman and Hendry, 2019; Gebken et al., 2022; Komatsu et al., 2016)

### (3) Consideration of stakeholder values and possible discrimination

#### (a) Identifying and selecting stakeholders

Stakeholder engagement is often considered in the DSI field. So-called ecosystems are often formed in order to bundle the strengths of the different stakeholders and the stakeholders take on different tasks or roles (e.g., user, non-user, marginalized concerned group) in order to shape the DSI or make it come to life (Eckhardt et al., 2021; Terstriep et al., 2020).

We recommend VSDSI teams to ask themselves which stakeholders are relevant for the development (Table A.1.1, 3(a)). The VSD research can expand the DSI perspective by the type of roles of stakeholders but also by indirect stakeholders (Friedman and Hendry, 2019; Gebken, Kurtz et al., 2021).

#### (b) Balancing conflicting values among stakeholders

To prepare for ethical issues as a VSDSI team, researchers can use VSD to first learn about and reflect on the values of different stakeholders (Table A.1.1, 3(b)). In addition, VSD methods can be used to build consensus among stakeholders as well as inscribe the values into the technology (Friedman et al., 2017; Friedman and Hendry, 2019). If it is not possible to achieve consensus among stakeholders, researchers should weigh the values and needs against each other to identify the critical decisions and requirements. Particularly in the case of marginalized individuals, it is important to ensure that the trade-offs are in their best interest (Gebken, Drews, Schirmer, 2021).

#### (c) Addressing potential discrimination

An example for the absence of a consensus is that discrimination can take place when many stakeholders are involved. Discrimination can take different forms, including prejudice and victim blaming. As of now, no universal approach on how researchers and teams should deal with that could be identified in the available DSI research literature. Therefore, future researchers can consult the knowledge from Participatory Design and Research Ethics for initial guidance. However, there are still aspects that remain unsolved. Our previous research, for example, showed that (in)direct stakeholders have prejudices against the marginalized individuals for example that humans experiencing homelessness are not able to decide for themselves what they want to buy (Gebken, Drews, Schirmer, 2021; Gebken, Jacobs et al., 2023; Gebken, Kurtz et al., 2021). This raised the question of the extent to which indirect stakeholders should be involved if they have biases against the marginalized individuals (Table A.1.1, 3(c)).

Our assumption is that an understanding of the biases or the form of discrimination is useful in terms of taking active steps to counteract the discrimination or the biases. However, this needs to be investigated further and researchers should be mindful of whether they encounter discrimination during their work.

#### (4) VSDSI development

##### (a) Considering the impact of values

DSI researchers often highlight the positive effects of their technologies, enabling, for example, the empowerment of marginalized individuals (Avelino et al., 2019; Keijzer-Broers, 2016). They focus on the strengths of the technologies and less on the ethical issues that arise in technology development and use (Qureshi et al., 2021). By focusing mainly on the positive aspects, they run the risk of overlooking the ethical issues of a technology and failing to discuss them adequately (Bhatt, 2021; Gebken, Kurtz et al., 2021; Qureshi et al., 2021; Whittle et al., 2020). This can lead to DSI researchers and teams acting unethically without knowing it (Palazzo et al., 2012).

In contrast, VSD focusses on proactively engaging with the shaping of values and their inscription in technology (Friedman and Hendry, 2019). The entanglement of values and stakeholders for inscription in the technology is considered a fundamental goal (Friedman and Hendry, 2019). The strengths of VSD could be used in the DSI approach to avoid ethical blindness and move closer to the goal of positive change.

After VSDSI teams have developed their values (Table A.1.1, 3(b)), we encourage the researchers to ask what this means for their technology design to inscribe the values (Table A.1.1, 4(a)). In our opinion it is not enough to just formulate the values. They must be considered in all steps of the development to achieve the realization of the values in the VSDSI (Gebken et al., 2022). For example, inscription can be implemented using the mapping of values into requirements on the concept (Gebken, Drews, Schirmer, 2021; Gebken, Kurtz et al., 2021).

##### (b) Guiding, reflecting and evaluating value inscription

In order to inform future researcher and teams about positive value inscription approaches we propose to gather examples within and across projects - which requires their documentation (Gebken, Jacobs et al., 2023). On this basis, researchers could develop and provide a pattern catalog for different themes of value inscription and impact – examples would be how to enable the value of usability for (marginalized) individuals in user experience design, or how to consider the value of freedom from bias in the concept of VSDSI (Gebken, Jacobs et al.,

2023; Gebken, Kurtz et al., 2021; Schön, 1983). The idea is inspired by pattern catalog for enterprise architecture from the information systems field (Khosroshahi et al., 2015).

Further we want to motivate VSDSI researchers to regularly reflect on whether and to what extent they have managed to inscribe the values (Table A.1.1, 4(b)). This enables a critical development and research process. A variety of different models are available for this purpose e.g., Yoo et al. (2013) or Gebken et al. (2021a).

This reflection should take place hand in hand with the evaluation with stakeholders. It can help VSDSI researchers to find out how different stakeholders perceive their development. In this context, the intention the teams had with the values may be good, but the reality of implementation may fail. A case in point may be an app that aimed to increase the safety and well-being of people in American cities by enabling to report issues back to the city administration which required attention. However, people used the app not only to report broken streetlights, they also posted pictures of shelters of humans experiencing homelessness. This not only endangered their safety, but also objectified them and may have increased discrimination (Kempfert et al., 2022).

#### (c) Selecting and adopting methods

The two questions described before (Table A.1.1, 4 (a-b)) can be addressed with careful method selection and adaptation. Therefore, care is required to carefully select and adapt the methods as this leads to the explicit design of the VSDSI (Table A.1.1, 4(c)). Here, the term method means concrete methods from the innovation field (e.g., service blueprints; Komatsu et al., 2016) or the VSD field (e.g. envision cards; Friedman and Hendry, 2019). So far, there are first overviews of existing methods and their purpose for the DSI field (Gebken et al., 2022; Komatsu et al., 2016). These overviews should be supplemented by the experiences from the respective DSI projects and expanded with regard to VSD, Participatory Design and other research fields that are useful (Friedman et al., 2017; Friedman and Hendry, 2019; Gebken et al., 2022). This requires collective action by researchers on an appropriate platform for collaboration (Gebken et al., 2022).

This leads, in the long-term, to the question of how best to build a multidisciplinary community and develop a common platform on which methods and further insights, can be presented, and made usable, discussable and shareable, as well as podcasts, articles, teaching materials and other ongoing research results.

### A.1.5 Conclusion

As a fundamental proposition, we have called for all DSI to be value-sensitive to responsibly design technologies that are intended to serve society, especially those for marginalized individuals. For this purpose, we have developed a definition for VSDSI. In addition, we have created a research agenda which hopefully guide researchers facing the development process to live up the claim of a VSDSI. This is intended to contribute towards ensuring that solutions are appropriately designed, especially for marginalized individuals. So far, we managed to include knowledge from DSI, VSD, Participatory Design and research ethics. Our goal for future research is to systematically integrate findings from further related research fields such as socio-informatics or human computer interaction research (Giménez Ciciolli et al., 2022; Wulf et al., 2018).

The need to contribute to society with DSI has become very clear in recent years (Leong et al., 2020; Pan and Zhang, 2020). It is now time for researchers to take on an active role and to shape the world in which we want to live (Pee et al., 2021). In doing so, however, we would like to remind researchers to carefully explore the potential of new technologies with the stakeholders in the respective contexts, and to critically question technologies in order to avoid the attempt at solutionism (Tracey and Stott, 2017). Technologies do not generally solve complex social challenges, but they can contribute if they have been developed in an appropriately value-sensitive manner.

### A.1.6 References

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## **A.2 Paper 7: Value-Sensitive Action Design Research: Improving the Consideration and Traceability of Values in Design Decisions**

### *Abstract*

Design-oriented research in general and especially action design research aims to impact the real world in a way that has demonstrably positive outcomes for organizations or society. However, the current methodological guidance for action design research currently lacks a way to proactively incorporate the consideration of values into the resulting designs and interventions. Values are often a crucial aspect in the responsible design of technologies to achieve sustainably positive organizational or societal effects, and the value sensitive design approach is seen as a promising way to achieve this. In this paper, we propose an extension of the action design research tasks with value sensitive design considerations and introduce the value-sensitive decision log method to trace how values underpinned and influenced design decisions. Both contributions were developed based on reflections and method enhancement in an action design research project aiming at developing a digital social innovation for supporting humans experiencing homelessness. Researchers and other participants in action design research projects can draw on our approach to conduct value-sensitive decisions in the design process.

**Keywords:** action design research, value sensitive design, decision-making, value-sensitive decision log, traceability, digital social innovation.

### **A.2.1 Introduction**

Design-oriented research has the aim to bring about positive changes in the real world through information and communication technology (ICT) (Hevner et al., 2008). In this context, ICT and design-oriented research need to be conducted appropriately sensitive in order to actually meet the goal of making the world a better place (Walsham, 2012; Weigand and Haj-Bolouri, 2022). In order to live up to this responsibility, more than just ethical principles are needed in design-oriented research (Benke et al., 2020). However, common approaches, such as action design research (ADR) according to Sein et al. (2011), lack appropriate methodological guidance to adequately address ethical considerations within the social context. Instead, these approaches leave it up to the researchers to act responsibly in

designing the socio-technical properties of the artifact (Schuppan and Köhl, 2017). We argue that ADR as an established method in information systems (IS) research can benefit from considerations of the interdisciplinary research field of value<sup>31</sup> sensitive design (VSD). VSD offers concepts, theory and methods for incorporating values in design processes (Friedman and Hendry, 2019; Schuppan and Köhl, 2017).

VSD addresses the challenges of eliciting ethical concerns and human values from heterogenous stakeholders and developing designs that are considerate of those concerns and values. VSD provides the theoretical foundations and tools for including considerations of human values into design (Friedman and Hendry, 2019). This allows to proactively design socio-technical artifacts with ethical aspects in mind, to consider possible downsides or unintended side-effects of the ICT, and to deal responsibly with the impact of ICT on society (Friedman and Hendry, 2019).

We therefore work under the assumption that values play a considerable role in design-oriented research processes and have a considerable impact on the resulting ICT designs. We further assume that these values are thus directly or indirectly reflected in the design decisions made by ADR-teams (Blinded\_B).

Initial approaches already exist to link VSD and design-oriented research (Yetim, 2016) by developing a reflection and communication scheme to discuss the values, goals, and actions of the research. This laid an important foundation for us questioning the values behind our own design-oriented research (Yetim, 2011, 2016). However, in everyday project life, we found that ADR-teams are still left to ponder how exactly values influence, have influenced, or shall influence their decisions.

For this reason, we address the following research question in this paper:

*How can action design research be extended to support researchers and practitioners in value-sensitive decision-making and development?*

The aims of this paper are (1) to extend the ADR tasks in each ADR stage with a focus on value-sensitive considerations and decisions and (2) to present a concrete method that enables the ADR-team to document and reflect on their value-laden design decisions. This method leverages a decision log and follows the long tradition in action research of accompanying the

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<sup>31</sup> In accordance with Friedman and Hendry (2019, p. 24), we define values as “what is important to people in their lives, with a focus on ethics and morality.”

research process with logs (Keijzer-Broers and Reuver, 2016). We adopt the established concept of decision logs to also document values, design decisions, and their relations. With such a value-sensitive decision log (vs-DLog), ADR-teams are capable of tracing value-sensitive decision across the whole project.

We identified this need for a value-sensitive method extension for ADR in an ADR-project aiming at developing a digital social innovation (DSI) for people experiencing homelessness. The vs-DLog was developed, evaluated, and enhanced as within a sub-project of the ADR-project. In the formalization of the learning stage, we noticed that the developed artifact and the design principles (DPs) guiding its design and integration in the ADR process could serve as a valuable extension for the ADR method.

## **A.2.2 Theoretical Foundation and Related Research**

In this section, we first cover the established ADR research approach and outline the current state of research on value-sensitive ADR. Subsequently, we give an overview of the VSD field. Finally, we outline why decisions and values are particularly relevant for our context and give an overview of the decision log method as a foundation for its later extension.

### **A.2.2.1 Action Design Research**

At the time ADR was developed, previous design research had often paid more attention to technological rigor at the expense of organizational relevance, and thus ADR was born out of the need to pay more attention to how technologies are shaped in an organizational context (Sein et al., 2011). The primary goal of ADR is the creation of prescriptive design knowledge through the generation and evaluation of artifacts in an organizational setting. The ADR method is segmented into four stages: 1) problem formulation, 2) building, intervention, and evaluation (BIE), 3) reflection and learning, and 4) formalization of learning (Sein et al., 2011). These four stages are accompanied by seven principles (P). For each stage, there are additional tasks for the researchers to follow, thus specifying the concrete procedure in the ADR process. We will discuss and expand on these tasks in detail in Section A.2.4.1.

ADR aims to make a real impact on practical problems in a given (organizational) context by involving and embedding ADR researchers in that context within the BIE stage, working with practitioners and implementing interventions (Cronholm et al., 2016). By focusing on artifacts and solutions for a particular context, ADR outcomes tend to be highly contextualized or situated (Sein et al., 2011). The fourth stage of ADR (formalization of

learning) attempts to generalize from the ‘specific and unique’ to the ‘generic and abstract’ (Sein et al., 2011).

There is a wide range of applications of ADR in the existing literature. However, there is often a lack of reflection or evaluation on the use of ADR (Cronholm et al., 2016). Furthermore, because of the contextualized nature of ADR, identifying problems is a key task early in the process. However, this problem identification and the determination of the class of problems has not yet been sufficiently addressed (Cronholm et al., 2016). For example, Keijzer-Broers and Reuver (2016) emphasize that ADR presupposes an organizational context and problems shaped by an organizational context in their application of ADR to the field of DSI. In contrast, DSI research aims to address social rather than only organizational problems and challenges.

These authors’ study further identified the need to balance political, economic and social values in ADR (Keijzer-Broers and Reuver, 2016). The consideration of values and thus also a critical examination of the artifact development and the artifact itself can be achieved by means of VSD (Schuppan and Köhl, 2017).

#### **A.2.2.2 Value Sensitive Design and its Relation to Design-Oriented Research**

Yetim (2016) combines design-oriented research with VSD in his work and enables critical reflection on one's own research approach in terms of values, goals and actions. Due to the potential of VSD to address to advance value-orientation in design-oriented research in general and specifically in ADR, we draw on exiting concepts and methods of VSD.

According to Friedman and Hendry (2019) VSD seeks ‘to guide the shape of being with technology’ addressing ‘researchers, designers, engineers, policy makers, and anyone working at the intersection of technology and society.’ VSD provides ‘theory, method, and practice to account for human values in a principled and systematic manner throughout the technical design process’ (Friedman and Hendry, 2019). VSD assumes that values can be inscribed in technologies, at least to some extent. Values are defined in a rather open way as something that is important to humans, with an emphasis on ethics and morality (Friedman and Hendry, 2019). VSD aims to account for the values – as expressed by direct and indirect stakeholders – in design decisions.

VSD is a concrete method for establishing responsible research in which stakeholders, their values and their entanglement are taken into account (Simon, 2016). The critical and

responsible consideration of values has been given too little attention in IS research, even when it has been considered important (Schuppan and Köhl, 2017).

By considering values and thus also involving stakeholders at an early stage, the artefact can be designed proactively and responsibly and, for example, the unconscious inscription of prejudices can be counteracted (Simon, 2016).

To enable ADR researchers to systematically account for human values in (socio-technical) design processes (Friedman and Hendry, 2019), VSD builds on three phases of action: conceptual, empirical, and technical investigations. The procedures within the individual phases are deliberately left open in VSD. The approach aims not to be too prescriptive, to allow practitioners to select methods that fit ‘a particular project at a particular point in the design process’ (Friedman and Hendry, 2019).

Recent literature reviews have shown that a broad assortment of methods from various disciplines have been successfully applied in VSD projects (Friedman et al., 2017; Winkler and Spiekermann, 2018). Among these are, for instance, value scenarios, and ethnographically informed inquiry regarding values and technology (Friedman et al., 2017).

Other researchers (Burmeister, 2016; Winkler and Spiekermann, 2018; Yetim, 2011) have shown that it can be challenging to get started in the VSD field. To make this easier for the IS researchers, we want to show how the established research method ADR can be supplemented with explicit VSD tasks.

### **A.2.2.3 Decision-Making in ADR: Between Facts and Values**

Decision-making, especially in – but not limited to – the context of wicked problems is complex and, in addition to facts, values and value conflicts often influence a decision (Pries-Heje and Baskerville, 2008; Simon, 1960). While design-oriented research in the past has developed artifacts to support decision-making in organizational contexts (Pries-Heje and Baskerville, 2008; Sein et al., 2011), decision-making with respect to design decisions during a design research project during the ADR BIE stage has received comparably little attention.

But especially in the ADR BIE stage, researchers and teams are engaged in continuous decision-making. Further, these decisions need to be continuously (re)evaluated and reflected upon as the ADR process progresses (Sein et al., 2011). However, we are at least not aware of a method or tool to support value-sensitive decision-making in ADR on an ongoing basis.

We therefore see a need for a method to support and enable decisions to be reflected and documented in ADR-projects, especially for value-sensitive contexts (Blinded\_B).

Documenting decisions that have been taken has the fundamental advantage of guiding decision-making in the future and enabling future decisions to be in-line with past decisions on the basis of the recorded knowledge (Paech et al., 2014). Moreover, documenting decisions helps to reduce recurring discussions in the ADR-team and can also support quality assurance. In this way, documenting decisions further enables entire teams, and not just developers, to get involved in the decision-making process throughout the lifecycle (Paech et al., 2014). This can be particularly helpful for teams that do not strictly separate strategic and operational levels.

In the VSD context, decisions refer not only to functional and non-functional requirements but also to values relevant for the design process. Hence, existing approaches for documenting decisions need to be extended to also account for the role of values as essential design parameters (Perera, 2019).

Furthermore, teams not only design software but also seek to create or intervene in entire (societal) ecosystems. Hence, existing approaches for documenting design decisions need to be extended further to include this broadened design scope. Here, artifacts in the design process may include, for example, rules for selecting partners in the ecosystem or designing the concept in terms of accessibility (Eckhardt et al., 2021; Friedman and Hendry, 2019).

Since decisions play an essential role in shaping the aforementioned design artifacts (Paech et al., 2014), and at the same time bear the influence of and reference to values in the design process – as design decisions can or should not be taken without considering values (Friedman and Hendry, 2019) – decisions themselves become artifacts related to values. The design of other artifacts such as software code is highly dependent on the decisions made today or in the past, while these decisions in turn are influenced by values (Friedman and Hendry, 2019; Simon, 1960).

A method from project management that supports the documentation of decisions is the decision log. Bressen (2012) defines decision logs as an artifact that documents core decisions in a very simple way by specifying the decision, the date of the decision, and an identifier. In the past, decision logs have been addressed and used in research and practice, but they have not gained much research attention and – at least in their basic form – also do not consider values. Subsequently, we will extend these basic decision logs to a vs-DLog that

is suitable to be used within the ADR BIE stage for the purposes of documentation, reflection and evaluation of design decisions and their relation to values.

### **A.2.3 Research design**

#### **A.2.3.1 Backdrop: An ADR-Project to Develop a Digital Social Innovation for Humans Experiencing Homelessness**

The findings of this paper are grounded in the reflection of an ADR-project in the area of DSI. DSI is an emerging interdisciplinary field with connections to IS research (Leong et al., 2020; Qureshi et al., 2021). DSI is defined as follows: ‘A type of social and collaborative innovation in which innovators, users and communities collaborate using digital technologies to co-create knowledge and solutions for a wide range of social needs and at a scale and speed that was unimaginable before the rise of the Internet’ (Bria et al., 2015).

The social problem we addressed in our DSI project is the lack of support for humans experiencing homelessness in a digitizing society in Germany. There are numerous aid institutions that support people without dwellings. The assistance offered is diverse and ranges from housing-first approaches to acute emergency aid and digital support (Ly and Latimer, 2015; Mackie et al., 2019; Blinded\_A-B).

However, since the past years have shown that political efforts to help humans experiencing homelessness have not solved homelessness and its associated problems, the Blinded\_DSI project has been trying to help people who have fallen through the cracks of the social support system in Germany, with the goal of paving the way for institutional solidarity. The Blinded\_DSI project works in the field of developing digital support for donating money. The ADR research team members are aware that such a system could help to slightly improve the situation of humans experiencing homelessness while it can only be an intermediate step towards solving the issue of homelessness in general.

The goal of Blinded\_DSI is to make everyday life easier for humans experiencing homelessness through a digital donation and payment system and to prevent them being left behind in terms of digitalization (Blinded\_A). The Blinded\_DSI project was set-up as an ADR-project by the first author jointly with a team of practitioners with diverse backgrounds. After several iterations of developing the idea and concept, the technical concept consisted of a mechanism to for individuals to donate digitally (SmallChangeApp) and for humans experiencing homelessness to make digital payments (SmallChangeCard). Beyond the



technical concept, the ADR team also developed the surrounding ecosystem concept: a variety of different actors (aid organizations, money transfer providers, shopping facilities, etc.) coming together in different roles to deliver the DSI. In addition, the project serves to create awareness for the living situation of humans experiencing homelessness and to motivate other humans to actively stand up for them.

Among the many challenges (Blinded\_A-D) in the Blinded\_DSI project, the ADR-team consistently needed to consider the positions of various stakeholders. First, it quickly became clear that moral issues needed to be considered to ensure the accountability of the DSI and to consider the interests of all stakeholders (Blinded\_A) such as humans experiencing homelessness, homeless aid organizations, donors, and legal experts. For example, it had to be decided who should be helped and how donors' prejudices should be addressed. Second, the impact of values on different levels of the DSI and its process was not clear and needed further investigation (Blinded\_B). Third, the method selection and adaptation for value-sensitive DSI was non-trivial (Blinded\_C). Fourth, it was a further challenge to understand how to design DSIs so that they could have a positive impact on society (Blinded\_D).

To guide a consistent decision-making in-line with the project's vision and goals, the team developed a set of values using various methods for empirical and conceptual investigations. Appendix A lists the team's set of values in the words of the team. These values are based on the understanding of values from the VSD context (Friedman and Hendry, 2019). For example, the value 'Be straightforward. Help that reaches out to everyone is the best help. Therefore, Blinded\_DSI should be easy to use' stands for accessibility.

In this paper, we focus on a further challenge the team faced during the project. We found the need (1) to ensure that the ADR process itself should be consistently value-sensitive and responsible, and (2) to develop appropriate methods for consistent decision-making and continuous value reflection throughout the entire project.

### **A.2.3.2 Research Method: Reflecting ADR to Advance ADR**

The results of this paper are based on the second formalization of learning stage (Sein et al., 2011) of the project 'Blinded\_DSI' (Blinded\_A-D). Within the ADR-team, there are people who deal with the core design and development of the DSI and people who deal with the core scientific evaluation and reflection. The first author of this article takes on both roles simultaneously.

The weekly meeting minutes of the ADR-team, the results from data collection and analysis, the entire archive structure and documents of the team, and insights from the literature served as the basis for this study. In addition, to obtain appropriate knowledge from different fields, a further literature analysis was carried out to underpin the experience gained from the project with theoretical knowledge (ideas from enterprise and ecosystem architecture, project management, VSD and DSI were therefore considered).

The project went through two ADR iterations (cf. Figure A.2.1). Each iteration performed the stages (S, shown in purple) and their principles (P, shown outline in purple), whereby stage 2, followed by stage 3 were iteratively executed several times within each iteration.

In the second ADR iteration in stage 3 (reflection and learning), which was about reflecting on the course of the DSI project in progress, it became increasingly clear that the team had made many different decisions about the DSI, and that they had discussed its moral dimensions several times. These decisions and discussions had initially been recorded by the team in the form of weekly meeting minutes. However, as new members joined and others took breaks during the project, it became clear after about eight months that a different means of documenting decisions was required (cf. Figure A.2.1, shown in green/oval with the label 'Need for new documentation & reflection of decisions'). In addition, there needed to be a way to systematically evaluate and reflect on the decisions made in the ADR-team in relation to the values.

To meet this need, we introduced a sub-ADR-project (cf. Figure A.2.1, shown yellow-hatched), the stages of which were integrated to those of the ADR-project. The sub-ADR-project was devoted to the development, use and evaluation of the vs-DLog. The stages of this sub-project are indicated by the addition of an 'S' to the number.

The development of the sub-project and thus of the vs-Dlog was integrated in stage 2 of the ADR-project after the need became clear in stage 3. In stage 1<sup>s</sup> the problem was formulated and the need for the vs-Dlog was defined. Stage 2<sup>s</sup> comprised the development of the vs-Dlog and took place in parallel with the DSI development. It was revised in several iterations with feedback from the team, for example on usability. In stage 2 and 2<sup>s</sup> of the project, the ADR-team regularly reviewed the process of both, the ADR- and sub-ADR-project (indicated in Figure A.2.1 with the round grey symbol with two circular arrows).

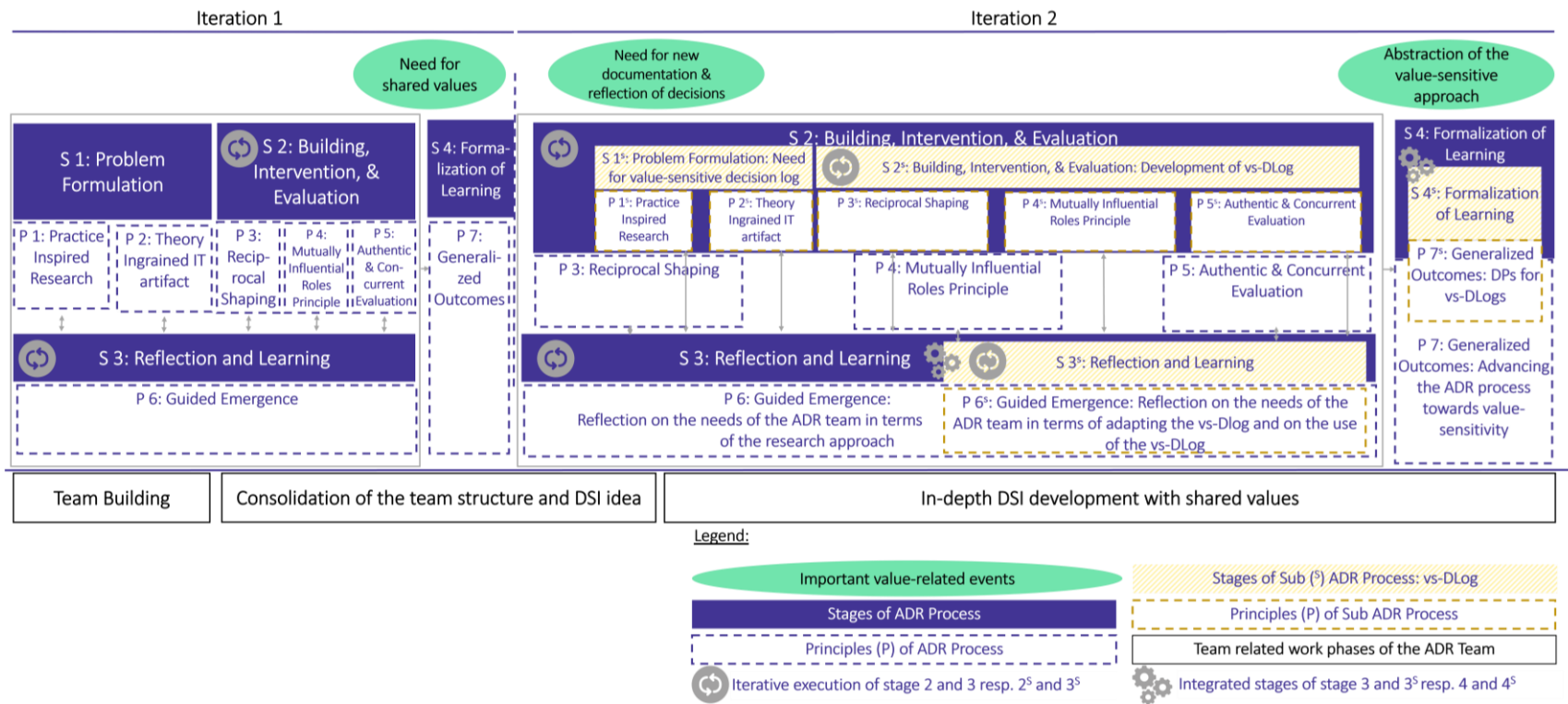
Stage 3 and 3<sup>s</sup> as well as 4 and 4<sup>s</sup> are interconnected (cf. Figure A.2.1 illustrated with a grey gear wheel).

During stage 3 resp. 3<sup>s</sup>, it became apparent that the ADR process was not only supplemented by the vs-Dlog, but that additional tasks were added due to the value-sensitivity to meet the responsibility of the ADR-team. Therefore, in stage 3, the focus lay on reflecting the ADR process and how value identification, discussion, documentation, and reflection took place in it. The reflection also occurred recurrently and is also marked with the circular arrows in Figure A.2.1. Through the recurrent and intertwined reflections (of the ADR- and sub-ADR-project) it became clear that we are not only developing a vs-Dlog, but a vs-Dlog method that is also useful for other projects.

In stage 4, missing tasks for the ADR process regarding value-sensitivity were identified and added as a delta to the ordinary ADR process. The vs-Dlog was very helpful for several tasks. As a result, the ADR process was advanced (section A.2.4.1). The details of the Blinded\_DSI project are demonstrated in section A.2.5.1.

In stage 4<sup>s</sup>, generalization for the vs-Dlog in the form of design principles (DPs) was performed in stage 4. We used three levels of conceptual moves from the specific and unique to the generic and abstract of Sein et al. (2011), namely (a) generalization of the problem instance, (b) generalization of the solution instance, and (c) inductive derivation of DPs from the design research outcomes (Sein et al., 2011). To support the DPs' formulation, the work of Gregor et al. (2020) was consulted, and the DPs that had already been identified were supplemented with the missing elements.

The next section details how the resulting integration of VSD into ADR and vs-DLogs into ADR looked like at the end, including the final set of DPs.



**Figure A.2.1. Two Design Iterations of the ADR-Project.**  
*Note.* Adapted from Sein et al. (2011).

## **A.2.4 Results**

In the following we outline our findings. Section A.2.4.1 covers our proposed value-sensitive extension to the ADR approach. Afterwards, we describe our value-sensitive extension to decision logs in section A.2.4.2. Lastly, we present DPs for the vs-DLog in section A.2.4.3. These can help future teams get started with utilizing their vs-DLog to improve their decision-making in their ADR process.

### **A.2.4.1 Advancing the ADR Process towards Value-Sensitivity**

To support the value-sensitive development of artefacts in the context of ADR, we will discuss below which extensions to the ADR tasks we found to be helpful. In sum, we propose to add five tasks across the four ADR stages (two in the first, and one each in the second to fourth stage), and to modify five of the original tasks (one each for stages 1-3 and two in stage 4). Table A.2.1 is based on the original ADR tasks with all additions and modifications shown in italics. In the following, we will briefly outline the nature and rationale of these additions and changes. These tasks are the steps to be taken in each stage shown in Figure A.2.1. We describe them here first on an abstract level and then demonstrate them in section A.2.5.1 using the example of *Blinded\_DSI*.

**Table A.2.1. Extended and Modified Tasks in Each ADR Stage for Achieving Value-Sensitivity.**

<b>Tasks in problem formulation</b>
<ul style="list-style-type: none"> <li>(1) <i>Identify societal problem(s)</i></li> <li>(2) Identify and conceptualize the research opportunity</li> <li>(3) Formulate the initial research questions</li> <li>(4) <i>Reflect on the ethical impact of the research question(s) and societal need</i></li> <li>(5) Cast the problem as an instance of a class of problems</li> <li>(6) Identify contributing theoretical bases and prior <i>societal and</i> technology advances</li> <li>(7) Secure long-term organizational commitment</li> <li>(8) Set up roles and responsibilities</li> </ul>
<b>Tasks in building, intervention, and evaluation (BIE)</b>
<ul style="list-style-type: none"> <li>(1) Discover initial knowledge creation target</li> <li>(2) Select or customize the BIE form: IT-dominant, organization-dominant, or <i>societal-dominant</i></li> <li>(3) <i>Understand stakeholder values and elicit shared values</i></li> <li>(4) Execute BIE cycle(s) <i>while considering values and documenting decisions and value relations with the vs-DLog</i></li> <li>(5) Assess need for additional cycles, repeat</li> </ul>
<b>Tasks in reflection and learning</b>
<ul style="list-style-type: none"> <li>(1) Reflect on the design and redesign during the project</li> <li>(2) <i>Reflect on the value influence in decision-making based on the vs-DLog documentation</i></li> <li>(3) Evaluate adherence to principles</li> <li>(4) <i>Analyze intervention results according to stated goals, values, and societal impact</i></li> </ul>
<b>Tasks in formalization of learning</b>
<ul style="list-style-type: none"> <li>(1) Abstract the learning into concepts for a class of field problems</li> <li>(2) <i>Reflect on the value influence on the concepts for a class of field problems</i></li> <li>(3) Share outcomes and assessment with practitioners <i>and stakeholders</i></li> <li>(4) Articulate outcomes as (<i>value-laden</i>) design principles</li> <li>(5) Articulate learning in light of theories selected</li> <li>(6) Formalize results for dissemination</li> </ul>

*Note.* Based on Sein et al. (2011), changes indicated in italics

In order to use ADR to make the world a better place (Walsham, 2012), we found it important to consider this already in the very first task within the problem formulation stage. Therefore, we propose to add a new task ‘(1) *Identify societal problem(s)*’ at the very beginning so that the ADR research problem can be considered in the context of society (Keijzer-Broers and Reuver, 2016; Walsham, 2012; Yetim, 2016). These societal problems can be derived, for instance, from the Sustainable Development Goals (SDGs) of the United

Nations (United Nations, n.d.). The two subsequent tasks are unchanged: first, the idea must be concretely defined and recorded in the form of a research possibility (task 2), and afterwards, a corresponding research question must be formulated (task 3) (Sein et al., 2011).

At this point, we propose a second new task *'(4) Reflect on the ethical impact of research question(s) and the societal need'* in the first stage (Yetim, 2016). In this regard, appropriate ethics committee consultation should always be included in critical cases, for example, in case of working with marginalized groups (Le Dantec, 2011). After the problem has been identified as an instance of a problem class (the unchanged task 5), we propose to consider in task 6, in addition to previous theoretical knowledge and technological progress (Sein et al., 2011), how the problem has been addressed so far on a societal level (Keijzer-Broers, 2016; Keijzer-Broers and Reuver, 2016).

We also propose extending the second ADR stage – the BIE stage – with aspects regarding accountability and value-sensitivity. Thus, Keijzer-Broers and Reuver (2016) added the societal-dominant form as another form in addition to the IT-dominant and organization-dominant one and we have adopted this change. In addition, we propose a new *task '(3) Understand stakeholder values and elicit shared values'* to build a shared value basis for the project. There, the values of the different stakeholders of the ADR-project are considered. Should conflicts of values arise, attempts should be made to resolve them. Suitable methods from the VSD can be used for this purpose (Friedman et al., 2017; Friedman and Hendry, 2019), for instance value scenarios or envisioning cards. These shared values are then to be taken into account during decision-making in the course of task (4) to execute the BIE cycles (Sein et al., 2011). Further, in task (4) decisions with reference to the values are to be documented with the help of the vs-DLog (cf. section A.2.4.2) (Bressen, 2012). This allows the team to have an information base at a later point in time, but also to be able to draw conclusions about the project. The conclusions are to be drawn by the researchers of the ADR-team in the ADR-project in stage three and four. The documentation should be as lightweight as possible and serve both practitioners and researchers – again, see sections A.2.4.2 and A.2.4.3 below where we detail the extended decision log and propose a set of DPs for utilizing the decision log. Task (5) of the BIE stage remains unchanged (Sein et al., 2011).

Likewise, we propose modifications to the third ADR stage – reflection and learning – to explicitly incorporate value-sensitive considerations. While the task (1) – the design-related

reflections – are unchanged, we propose a separate (and new) task (2) to reflect on the influence of values on the underlying decision-making. Here, the documentation of the decisions in relation to the values can provide a detailed information base for these reflections over the course of the ADR process. This allows not only to reflect on values on a high level of abstraction, but also on how these values had a concrete impact on design decisions. The subsequent task (3) to evaluate the adherence to principles remains unchanged. At the end of this ADR stage, we propose to analyze the intervention results not only with respect to meeting the initial goals (Sein et al., 2011) but also the with respect to the underlying values and the societal contribution and impact (Yetim, 2016). Here, VSD can provide specific methods for doing so (Friedman et al., 2017; Friedman and Hendry, 2019) such as the value-sensitive action-reflection model (Yoo et al., 2013).

In ADR stage 4 ‘formalization of learning’, we again kept the first task – to abstract the learning into concepts for a class of field problems – the same. We then propose to add a new task (2) afterwards to explicitly reflect the value influence on these concepts. We further propose slight modifications for the next two tasks – first, in task (3) to share outcomes and assessments not only with the involved practitioners but also with a wider range of stakeholders. This promotes transparency but also the accountability of the research. We assume that stakeholders affected by an intervention can better describe from their perspective whether, for example, bias had been incorporated into the research than unaffected practitioners. Second, in task (4) we propose to incorporate the key value considerations into the articulated DPs, if applicable for the project context (Purao and Wu, 2013; Sein et al., 2011). The final two tasks (5) and (6) of the fourth ADR stage (articulate learnings against the selected theories and formalize results for dissemination) remain unchanged. Both tasks may implicitly be affected by the preceding value considerations, but we do not see the impact to be substantial enough to have this reflected in changed names for these tasks. Of course, however, one of the theories used may be VSD itself, for example.

#### **A.2.4.2 Decision Log as Method for Decision and Value Documentation and Reflection**

As values are defined and referred to at many points in the ADR process, we recommend keeping track of the values and their relationships to design decisions and the artefact being developed by using a vs-DLog. Decision logs traditionally document decisions with a short



description and a time stamp for when each decision was made, along with a unique identifier for each decision (Bressen, 2012).

In the following, we present an extended form of a decision log which will allow to document decisions as well as values related to these decisions. The vs-DLog's purpose is to document and foster reflections on decisions and their value relevance. The main ADR tasks in which these vs-DLogs support value-sensitivity are task (4) in stage 2 and task (2) in stage 3 (see section A.2.4.1 for details). In the former, the vs-Dlog is used during the BIE stage to record the decisions made and to relate them to the values. This is necessary to record important discussions, to avoid repeating them and to be able to look at them again, especially systematically, for informing subsequent decisions and later reflections. Furthermore, the documentation of the decision in relation to the values additionally stimulates the discussion on ethical influences on the artefacts. The reflection takes place in stage 3 in task (2). The vs-Dlog can be used to reflect on the decisions and value connections not only in everyday project work, but also on higher levels of abstraction. The vs-Dlog can be used to search for patterns and serves as a basis for reflection for the ADR researchers.

Table A.2.2 shows how our proposal for a value-sensitive extension of decision logs looks like, along with an illustration in the form of three examples from our Blinded\_DSI project. The added columns stem from different research areas such as VSD, DSI, architectural thinking (Aier et al., 2015) and project management.

**Table A.2.2. Value-Sensitive Decision Log for Blinded\_DSI with Three Examples.**

(1) Decision		(2) Value	(3) Project control			(4) Architectural layers & elements			(5) Source
(1a) Description	(1b) Explanation		(3a) Date	(3b) Status of decision	(3c) Status of implementation	(4a) Layer	(4b) Decision area	(4c) Keywords	
To address all people of different nationalities, we try to make our media multilingual. First, we will work out all necessary relevant translations and add English translations as soon as possible. After this has been done, we will involve further volunteers in a “Translation Board” and thus become multilingual as quickly as possible.	Multilingualism is important, especially in terms of Eastern European languages	Be straightforward. Help that reaches out to everyone is the best help. Therefore, Blinded_DSI should be easy to use.	09.02.21	Final	Partly	Social business model innovation	Communication	Inclusion, accessibility, language	<Link>
In the long term, it should be possible to obtain as many different products and services as possible with the SmallChangeCard.	Self-autonomy	Be straightforward. Help that reaches out to everyone is the best help. Therefore, Blinded_DSI should be easy to use.	28.04.20	Final	Partly	Collaboration	SmallChangeCard	Deployment, diversity, products/services	<Link>
At the moment, cryptocurrency is not appropriate for our purpose. Prepaid payment methods are the first option.	Market feasibility still questionable; volatility	Be straightforward. Help that reaches out to everyone is the best help. Therefore, Blinded_DSI should be easy to use.	12.05.20	Final	Final	IT landscape	Backend	Payment type	<Link>

First, just as in traditional decision logs, the team needs to briefly describe the decision in column (1a) and its rationale in column (1b). The aim here is to record only the essential information and thus avoid excessive documentation.

Second, we propose to document related values for a decision in column (2). Ideally, an ADR-team in a value-sensitive context has a list of their values they can draw on (such as the one in the Blinded\_DSI project as shown in Appendix A). By making values explicit, the impact of these values on the decision can be better reflected (Friedman and Hendry, 2019).

Third, we found that further information per decision can be helpful to support project management. For a quick and easy overview of the current state of decisions, we introduced three further columns, namely the date of the decision (column 3a), the status of the decision (column 3b), and the status of its implementation (column 3c). In our project, we used automatic formatting for columns (3b) and (3c) based on traffic light colors: green (final), yellow (partly), red (not initiated). The decision on the status is made by the ADR-team.

Fourth, we noticed that vs-DLogs of long-term projects such as ours can quickly become complex and confusing due to the high number of decisions they contain. For this reason, we drew on architectural thinking from the context of ecosystem architectures (Aier et al., 2015; Drews and Schirmer, 2014) to situate each decision according to the main architectural layer(s) it affects (column 4a). The examples of layers shown in Table A.2.3 were specifically developed in the Blinded\_DSI project to fit the project context.

**Table A.2.3. Examples of Architectural Layers and Elements of the vs-DLog from Blinded\_DSI**

<b>Layer</b>	<b>Decision area</b>	<b>Keywords</b>
Influence factors and domain	Societal impact	Blinded_DSI / Limitation
Actors	Financing	Value commitment
	...	
Collaboration	Participation board	Humans experiencing homelessness
Social business model innovation	Communication	Accessibility / Branding
IT Landscape	SmallChangeCard	Use / Diversity Products/Services

*Note.* Layers are based on Burmeister et al. (2019), Carayannis et al. (2021) and Friedman and Hendry (2019).

The introduced layers are based on the models for digital transformations in ecosystems (Burmeister et al., 2019) and complemented by research contributions from VSD (Friedman and Hendry, 2019), DSI (Carayannis et al., 2021), and experience from the Blinded\_DSI project.

Furthermore, we propose to classify decisions more detailed by introducing decision areas, which are elements of layers (column 4b). In addition, keywords (column 4c) were used as a further means to characterize decisions, detailing decision areas. The keywords in the Blinded\_DSI project were primarily created bottom-up from the day-to-day project work, supplementing the structuring layers and decision areas. During the project, it became clear that abstract terms should be avoided, especially for the decision areas and keywords, to increase comprehensibility for all team members. Instead, our suggestion is to use names and terms that are as concrete as possible. For instance, Table A.2.3 shows that for IT artifacts, the exact name of a Blinded\_DSI artifact (SmallChangeCard) is specified. We have recorded further examples in Table A.2.3.

Fifth, to avoid redundant work, documents created or considered in the decision process are linked to the decision as external sources (column 5).

#### **A.2.4.3 Design Principles for a Value-Sensitive Decision Log**

Since the extended vs-DLog was developed specifically for the purpose of documenting and reflecting decisions and related values in the Blinded\_DSI project, we further derived more generalized DPs for using and adapting vs-DLogs in other suitable ADR-project contexts. Other ADR-teams can therefore draw on these DPs to tailor our template for vs-DLogs in Table A.2.2 for their specific purposes.

Table A.2.4 contains the DPs themselves as well as the core topic each one addresses. We then use the example of our Blinded\_DSI project to illustrate the application of these DPs for utilizing vs-DLogs in an actual project.

**Table A.2.4. DPs for Tailoring and Utilizing a Value-Sensitive Decision Log**

DP#	Core topic	Design principle (DP)
		<i>For teams and ADR researchers developing a vs-DLog to document decision within the BIE stage of a value-sensitive ADR-project, it is important to...</i>
1	Traceability of values	...document the influence of values on design decisions for creating transparency and for supporting the review of previous decisions and the influence of values on these decisions.
2	Architectural layers	...define appropriate architectural layers (e.g., actors, values, collaboration, IT landscape) to structure elements of the design domain according to their type and to position elements on the layer.
3	Dimensions of the vs-DLog	...elaborate on the content they want to include in the vs-DLog accurately and highlight the important aspects for their project.
4	Simplicity	...keep the decisions up to date by keeping the documentation simple and avoid multiple documentation of the same content.
		<i>For teams and ADR researchers, when evaluating/reflecting on entries in the vs-DLogs, it is important to...</i>
5	Reflection	...reflect on the influence and impact of the artifact, particularly regarding values, and document the conclusions drawn from this for future decision-making.
		<i>For teams, before implementing the vs-DLog, it is important to...</i>
6	Tools & automation	...select a tool for realizing the vs-DLog that is easy to use, does not require lengthy training, and which supports automated reports.

*DPI: Traceability of values*

The challenge of reviewing and aligning decisions and corresponding actions within a project with respect to the values increases the longer an ADR-team is working together and the more fluctuation there is in the team. Further, there is a risk that the team will not always

recognize the moral or ethical significance of a decision or action (ethical blindness) and will make decisions without having discussed their significance in terms of values (Palazzo et al., 2012; van Steenberg et al., 2020). In this context, Reuver et al. (2020) spoke of the need to consider and monitor values throughout the whole project lifecycle. This requires continuous consideration and integration of values into every team member's daily work.

For this reason, we propose that ADR-teams should make the values explicit in a separate field in the vs-DLog (Table A.2.2, column 2) and relate them directly to a decision. Based on our experiences, we further recommend that a project develops a list of their shared values early on (e.g., as part of the project charter).

#### *DP2: Architectural layers*

Ecosystem architecture layers can be used to structure the vs-DLog and thereby keep the decisions clearly positioned (Bressen, 2012; Burmeister et al., 2019). However, the specific architectural structure for a project will be very dependent on their domain and context. Thus, we see selecting, determining, and labeling the actual architecture-related columns that are to be used as part of the task for each ADR-team. And like the list of shared values mentioned for DP1 we also found it helpful to develop a reference architecture to have standardized terminology to classify the decisions according to relevant architectural concerns. To define the architecture layers, teams can consider, for example, existing architecture models in their domain, or develop their own. Another challenge in this context is to find an appropriate level of abstraction and granularity for a reference architecture.

#### *DP3: Dimensions of the vs-DLog*

The intention of a vs-DLog is to document decisions during the project along with important decision or project-related aspects such as the affected values. As section A.2.4.2 and Table A.2.2 show, we adapted our vs-DLog to incorporate more than just values but also dimensions related to design and architectural thinking, as well as project management.

Beyond our own project context, we see the vs-DLog as a framework which every ADR-team can and should adapt according to their own needs and project context. Nevertheless, we regard these dimensions (decision, values, project management, architectural layers and elements, source) as applicable to many ADR-project contexts. Therefore, we propose that all ADR-teams should at least consider these dimensions on a general level whether they apply

to their project, and then develop specific dimensions (columns) based around these core dimensions.

Note that a specific ADR-team might have other core dimensions that they find to be relevant for their specific project context and thus they want to include in their version of the vs-DLog as well. We caution, however, against overloading a vs-DLog with too many different aspects to document.

#### *DP4: Simplicity*

Keeping knowledge documentation current is a huge challenge due to the necessary time and effort (Hauder et al., 2013), and this also applies to the vs-DLogs as an instance of project knowledge documentation. Therefore, striking the right balance between oversimplification or omitting important details on the one hand and requiring effort to document irrelevant/redundant documentation on the other hand is key. Moreover, all team members can and should be able to work with the vs-DLogs and find ‘their’ architecture layer in the reference model. This need to strike the right balance is probably most evident in the level of detail of the reference architecture documentation, as too high complexity or too abstract structures might limit the desire of team members to regularly use and work with the vs-DLog (Aier et al., 2015).

#### *DP5: Reflection*

Ideally, it would be possible to study the impact of each technology and design decision in an ADR-project on organizations and society systematically. However, we are not aware of any coherent and suitable metrics for doing so (Friedman and Hendry, 2019; Terstriep et al., 2020). Nevertheless, we regard it as important to investigate and subsequently reflect on whether the initial values are inscribed into the artifact and what influence the resulting decisions and interventions had on society (Blinded\_B). Here, the vs-DLog can help through the documentation and illustration of the values that had influenced the decisions, and vice versa.

#### *DP6: Tools and automation*

DSI projects often emerge as grassroots and are limited in terms of financial and time resources (Eckhardt et al., 2021). This may also be the case with other ADR-projects. To avoid unnecessary strain on these resources through utilizing the vs-DLog, tool support and automation of vs-DLog management tasks is a relevant aspect as well.

We identified five requirements for the selection of tools supporting vs-DLogs: First, the cost factor, especially in the light of limited resources. Second, the potential to integrate the tools into an existing tool landscape. Third, direct embedding into the team workflow – otherwise, there is the danger that the vs-DLog will be quickly become outdated. Fourth, automated report options, especially with respect to the values related to decisions. And fifth, a good search function.

There are a variety of tools available on the market that can meet these requirements – from modern project management tools or EAM tools to classic tools such as Google Sheets – so a selection process may not be trivial.

### **A.2.5 Demonstration: Impacts on the Blinded\_DSI project**

The following section is divided into four parts. First, we give insights into the impact of the advanced value-sensitive ADR process on the Blinded\_DSI project (cf. Figure A.2.1). Second, we will discuss the impact of the vs-DLog, followed by a discussion of the DPs' impact. We conclude this section with an overall assessment of the impact of our proposed extensions to ADR and vs-DLogs on the work of the ADR-team.

#### **A.2.5.1 The Value-Sensitive ADR Tasks in Blinded\_DSI**

In the following, we will discuss the new or changed tasks in the ADR process at Blinded\_DSI (cf. Table A.2.1).

**Problem Formulation Stage.** As outlined in section A.2.3.1, the ADR-project was set up to help people experiencing homelessness, a societal problem. This objective was established at the beginning of the ADR process in stage 1 of the problem formulation (cf. the new task (1) in Table A.2.1).

In order not to do more harm than good with the ADR-project, we have questioned our goals at regular intervals. The ethics committee was consulted to ensure compliance, especially when working with marginalized people. The research questions were designed to be value sensitive and to contribute to societal challenges (cf. the new task (4)).

However, to make sure that there are not already other (D)SI teams addressing the same challenges, we searched for existing solutions. It was important to us that technologies do not solve everything, and that societal progress should also be considered, such as housing-first (cf. the adaptation in task (6)).



**BIE Stage.** Since, as described before, the societal goal has been chosen to help people experiencing homelessness, we found neither the organizational nor the IT-dominant BIE to be suitable and thus chose a societal-dominant form (Keijzer-Broers and Reuver, 2016) (cf. the extension of task (2)).

To meet the responsibility of the societal goal, a variety of different stakeholders were included in the development. There ethical dilemmas arose that needed to be resolved, such as whom to help and how to address the prejudices of those not experiencing homelessness. For this purpose, a workshop for shared values (cf. the new task (3)) was conducted at the very beginning of the project. A further purpose of the workshop was to address that fundamental value-related questions and issues kept coming up within the team (cf. task (3)).

The team further discussed interim results such as first prototypes or concept details and questioned them in the light of the values. For instance, how to create accessibility among a diverse group that may be deprived of regular access to the internet or even electricity? These discussions and decisions were initially recorded in the form of minutes until the vs-DLog was developed. All decisions made beforehand were retroactively entered into the log (cf. the extended task (4)).

**Reflection and Learning Stage.** Initially, the minutes were also used in ADR stage 3 as a basis for reflection (in addition to the project's other quantitative and qualitative results). After the introduction of the vs-DLog, however, the vs-Dlog was used instead to discuss the past procedures and the relationships between values and decisions (cf. the new task (2)). This made it easier to break down the rich findings of the projects and go into detail using examples, as was done in *Blinded\_B*. This enabled us to discuss the value-influence on the decisions on different levels of abstraction and to go through concrete examples.

In addition, during the reflection and learning stages we looked not only at whether the goal of the project was met, but explicitly considered what values had which impacts and how these impacts relate to the larger societal goal (cf. the extended task (4)). For instance, could *Blinded\_DSI* also have negative effects on society? This questioning was supported, for example, with the help of evaluations with affected persons.

**Formalization of Learning Stage.** In stage 4, the strong influence of values at the very beginning of the project became further apparent (cf. the new task (2)). This was because different stakeholders had different values but also biases to consider (*Blinded\_A*). For example, we addressed the prejudices of potential donors and indirect stakeholders against

humans experiencing homelessness. Some indirect stakeholders and potential donors did not want to help all people, but only those who, in their view, deserved help. The reflection helped to question which image of human beings lay behind this and that things like victim blaming often play a role here.

Moreover, it was important for the team to share the results not only with practitioners (cf. the extended task (3)) for the sake of transparency. Furthermore, the shared values that the team developed for themselves early on the project were also incorporated into the Blinded\_DSI project's DPs of different publications (cf. the extended task (4)). For example, one of the DPs for the DSI includes that freedom from bias should be an explicit aim (Blinded\_A-D). Here, the team could, for example, regularly discuss biases and thus meet their aim to develop their DSI as bias-free as possible.

#### **A.2.5.2 Impact of the Value-Sensitive Decision Log**

In addition to the changes the vs-DLog brought to the ADR tasks, the vs-DLog also had an impact on the team and the researchers themselves. In particular, the extended log enabled us to keep track of our own decisions in the past, providing a solid foundation for our ongoing decision-making and reflection. We can demonstrate the usefulness and impact of the vs-DLog using the three examples from Table A.2.2 which were chosen to illustrate the range of decisions we had to take and their impact. All three examples are related to the value of accessibility (Friedman and Hendry, 2019), although the manifestations across the three examples impact at different levels.

The *first decision* concerned the choice of languages or multilingualism, which has a particular effect on the social business model innovation. To be able to help each affected person, language should not be exclusionary/hindering the accessibility. As Blinded\_DSI is a grassroots organization, resources are limited, and an attempt will be made to build a volunteer translation board.

The *second decision* was about the possibility of shopping at different stores, which has a particular effect on the collaboration level. For people to be able to decide autonomously where and when they want to shop, a collaboration with a payment processor or financial service provider must be established. Setting up a local network with purchasing options is too labor-intensive. Without this option, accessibility of use is significantly limited, and people must travel further distances, for example.

The *third decision* was about how to pay digitally, which affects the backend or IT landscape. For instance, cryptocurrency has been excluded from this for several reasons. Among other things, it was not selected because payment with cryptocurrency at the checkout in Germany is very rarely offered and thus not easily usable and thus accessible for the people concerned.

### **A.2.5.3 Reflecting on the Design Principles for the Value-Sensitive Decision Log**

Thirdly, we also reflect on the DPs and how they affected the Blinded\_DSI project work.

#### *DP1: Traceability of values*

Over the duration of the Blinded\_DSI project, many decisions were made; some of these had clear ethical implications, and some seemed neutral at first glance but actually turned out to be ethically laden (Kassa and Mentz, 2021). For instance, in which app stores should the DSI be available? Not every smartphone costs the same, the app store depends on the smartphone, and access to good devices varies. Explicitly placing the decisions in relation to the values in cases such as this helped identify the influence of the respective values on the individual elements of Blinded\_DSI as well as to approach each decision in the project with the appropriate care.

#### *DP2: Architectural layers*

The actual architecture for the Blinded\_DSI was of course much more detailed than Table A.2.3 shows, but Table A.2.3 turned out to be on a good level of abstraction to classify the vs-DLog entries. How the layers were derived has already been described in A.2.4.2.

During the development of the Blinded\_DSI vs-Dlog, it further became apparent that having three columns for structuring (layers, decision areas, keywords) was indeed helpful (Table A.2.2, columns 4a-c). In actual practice, there were team members in the Blinded\_DSI project who on the one hand tended to use the layers and decision areas (columns 4a-b) for a rough overview. On the other hand, there were also team members who wanted to use the keywords as shortcut instead of reading the decision description (Table A.2.2, column 4c).

#### *DP3: Dimensions of the vs-DLog*

First, to allow the traceability of values (DP1), we found it to be important to map the related values for a decision to this decision (column 2 in Table A.2.2 in our case). The relationship between values and decisions in our case was an n:m relationship, and this may be the case for most projects. Second, we could also map important project management information in a

lightweight way (such as columns 3a-c in our case). Third, we found architectural support to be helpful to keep the structure of the vs-DLog clear (columns 4a-c in our case, see also DP2 above). The relationship between decisions and structure elements in our case was an n:m relationship as well.

#### *DP4: Simplicity*

Here, we found it important to ensure that the decisions were formulated concisely. Further, to avoid redundant work, we linked documents created or considered in the decision process to the decision as external sources (in different connected tools; Table A.2.2, column 5). The documents were developed among the team according to the strengths and interests of the respective team members. The vs-DLog was therefore the central point at which all information came together.

#### *DP5: Reflection*

First, during reflection in the Blinded\_DSI project, we found that especially the more idealistically minded team members can find it very disillusioning to accept the compromises and limitations of the resulting artifacts or interventions.

Second, through the reflection of certain decisions within Blinded\_DSI's vs-DLog, it stood out how little influence a small DSI projects can have on large platforms (e. g., regarding the use of Instagram). Therefore there is also only a very limited scope to question or challenge the values inscribed in those platforms (Jacobs et al., 2021). In everyday life, those platforms are often simply selected without further consideration since many people use them daily anyway. Therefore, to be able to promote the project sufficiently, the ADR-team ultimately decided to make compromises, for instance, regarding the use of social media platforms. Their choice was evaluated on a case-by-case basis, accompanied by a critical reflection of the available platforms. Such reflections happened not once but regularly check in order to check whether there were value tensions, especially when integrating the ecosystem, and how to deal with them accordingly (Reuver et al., 2020).

Lastly, we found that Friedman and Hendry's (2019) guiding principle "progress, not perfection" can serve as a further aid to finding orientation during reflection.

### *DP6: Tools and automation*

In the case of Blinded\_DSI, it was important for the team to select a tool that they were already using. The team already used a Kanban board, but this was rather less commonly used than other tools. For the meeting minutes, word processors were frequently used. For this reason, we used a simple spreadsheet program for our vs-DLog. We also considered paid tools, but there were two main reasons against them: First, there were already a variety of other tools being used in the project, so adding another non-trivial tool was seen as adding too much complexity to the internal tool landscape. Second, we did not see the value of paying for a documentation tool when free alternatives with lesser, but still acceptable feature sets were available.

In retrospect, however, a tool based on more strictly prescribed forms or fields and with an automated reporting functionality would have been more appropriate. A spreadsheet program allows 'freestyle' entries also for those columns with prescribed content (e.g., the values or the architecture layer column). The team also needed to compile any analyses themselves, costing additional time. In both areas, time could have been saved with a tool directly designed for creating standardized reports.

#### **A.2.5.4 Overall Impact on the Team**

Beyond supporting the process of discussing and reflecting on values, the newly introduced vs-DLog further helped avoid repetitive discussions in team meetings since there was now proper documentation on past decisions, their connection to the project values, and their influence on the design process (Blinded\_B-C). Moreover, the vs-DLog provided a common knowledge base to support the on-boarding and integration of new team members (Blinded\_B-C).

#### **A.2.6 Discussion**

The topics of sustainability and social responsibility are currently being pushed in many companies and society in general, and values are often at the core of these considerations. However, these values, which are often prominently featured on websites and in promotional materials, also need to be consistently established throughout organizations. Our paper here can help to turn words into actions and to take values into account in the process through the following three contributions:

First, we extend ADR with the value considerations from VSD, integrating these two so far mostly separate schools of thought (and action). In particular, we added and changed the ADR tasks so that the consideration of values as postulated by VSD can take place throughout all ADR stages. In-line with the ADR spirit, our extensions arose from reflections and learning early in an actual ADR-project and were evaluated in further stages of the project. We thus extend the existing methodological guidance by adding value-sensitive tasks to an established approach in IS research and make the extant more abstract calls for extended value considerations more actionable for researchers.

Second, we extend the established decision log method to support value sensitive design. Here, we added the relationship between decisions, values, the affected architectural layers, and project management considerations as elements in the vs-DLog. The extension of the decision log complements the catalog of methods currently used in the VSD community (Friedman et al., 2017; Friedman and Hendry, 2019) and is further tailored to – but not limited to – work for projects that follow our extended ADR tasks. Such a systematic documentation enables ADR-team members to trace decisions over time at the respective decision-making levels as well as their reflection on the implementation of values and their influence on organizations or society (Blinded\_B).

Third, as the extended vs-DLog arose from an actual ADR-project and thus was situated in that context, we further introduced DPs for tailoring and utilizing the vs-DLog in other ADR and VSD projects beyond the context of the Blinded\_DSI project. Other ADR-teams can therefore draw on these DPs to adapt our template for vs-DLogs in Table A.2.2 for their specific purposes. Previously, literature on specific means to adapt a decision log template to specific contexts was scarce (Bressen, 2012).

On the practical or impact side, our three contributions can enhance the established ADR process for all projects where the consideration of values is a concern – especially for, but not limited to, DSI projects. Thus, we hope that our contributions can help other teams executing their ADR process to achieve a more pronounced and more sustainable positive impact to organizations and society while avoiding negative side-effects due to a lack of consideration of values underpinning technological design decisions.

Of course, there are also limitations in our work. The extension of the ADR tasks arose from a specific class of project contexts: an ADR-project dealing with value-sensitive DSI. Further studies should follow to test the applicability of our approach and the vs-DLog to different

projects and project contexts. In addition, the question arose during the Blinded\_DSI project how DPs and values are related to each other. Yet there is still no uniform view of this question among researchers. For example, values are seen as part DPs or it is assumed that values can be abstracted to DPs (Liu et al., 2014; Liu et al., 2016; Liu et al., 2018; Puroo and Wu, 2013; Yetim, 2016). However, abstraction can lead to the loss of the core of the original value. Tackling this question was outside the scope of this paper, unfortunately.

### **A.2.7 Conclusion and Outlook**

Society is currently facing a multitude of challenges and calls to become active in IS research are becoming ever greater (Leong et al., 2020). In this context, it is not only necessary to take up for research work in areas such as DSI or ICT for development, but also to focus design-oriented research holistically in terms of responsibility and value-sensitivity (Walsham, 2012). In doing so, VSD provides a way to holistically reflect on the design of an artifact and have a proactive impact for it (Friedman and Hendry, 2019; Schuppan and Köhl, 2017). Here, our three contributions – extending ADR with VSD considerations, vs-DLog, DPs for utilizing the vs-DLog – help to integrate VSD knowledge into action tasks as part of an established IS research approach and thus facilitate responsible and impactful IS research.

Through our work, it became particularly clear to us that the relationship between DPs and values is an exciting issue for the future. As outlined towards the end of the previous section, there are no conclusive findings yet in the literature. Therefore, we see extended consideration of this issue through, for instance, ethnographic methods, to be a fruitful area for further research.

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## A.2.8 Appendix A

Since values are seen as the basis for the team's work and used as the theoretical basis in VSD, we outline the values of Blinded\_DSI as follows:

Be human. In everything we do, we do it out of humanity and with passion.

Respect dignity. We treat each other, our partners, and each of our human's experiencing homelessness with respect, without exception.

Reach out. Small amounts of money make everyday life easier for our homeless neighbors. We enable self-responsible care.

Enable solidarity and individuality. We help by providing a monthly fixed amount and enable the collection of individual donations. We do not replace any other assistance.

Give perspective. Nobody should have to live permanently on the street. We try to pave a sustainable way for humans experiencing homelessness out of need.

Be straightforward. Help that reaches out to everyone is the best help. Therefore, Blinded\_DSI should be easy to use.

Show transparency. We treat each other fairly and squarely and communicate in this way.

Join forces. We work together instead of against each other and with partners who share our values.

Be secure. The security of all the data of our donors and humans experiencing homelessness is important to us. That's why we protect them.

Take responsibility. We are aware that our donors, partners, and homeless neighbors trust us. We question ourselves and the Blinded\_DSI.

## **Eidesstattliche Versicherung**

Hiermit erkläre ich an Eides statt, dass ich die vorliegende Dissertationsschrift selbst verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe.

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Ort, Datum

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Unterschrift