How Service Ideas Are Implemented

Ways of Framing and Addressing
Service Transformation

Tim Overkamp

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How Service Ideas Are Implemented

Ways of Framing and Addressing Service Transformation

by

Tim Overkamp

Department of Computer and Information Science

Linköping University,
SE-581 83 Linköping, Sweden

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Abstract

As a field in practice and academia, service design is moving out of its formative phase. In service design research, the realisation of service transformation from idea to service practice and the ways that design(ers) can contribute to this process are topics that are not well understood yet. The work presented in this thesis contributes to improving this understanding.

A programmatic design research approach was used to explore service transformation. This resulted in the formulation of two ways of framing and addressing the topic: type 1 service transformation, which frames the realisation of service transformation in terms of assembling a service delivery system, and type 2 service transformation, which views the realisation of service transformation as enabling value co-creating relationships between service actors.

Type 1 service transformation builds on the assimilation perspective on service innovation where service transformation is realised by implementing service concepts. Service Design contributes to this by facilitating the development of desirable service experiences. Trained designers can apply implementation strategies and support the handover of service design projects to contribute to the realisation of type 1 service transformation by. Design for manufacture and assembly (DFMA) is a generative construct for addressing type 1 service transformation. DFMA is central to the program *implementation during design*, which was used to explore type 1 service transformation.

Type 2 service transformation builds on the synthesis perspective on service innovation, which adopts a service-dominant logic. Service transformation is the shaping of value co-creating relationships between service actors and is realised by enabling service actors to enact roles that make the envisioned value co-creating relationships possible. Designing contributes by helping service developers to improve their understanding of value co-creating relationships and the way that realising service transformation is expected to affect those relations. Trained designers contribute by supporting this inquiry. The concept of roles, including Role Theory vocabulary, is a generative construct for addressing type 2 service transformation and is central to the program *enabling enactment*, which is suggested for the study of type 2 service transformation.

The main contribution of this thesis is the articulation of these two perspectives on service transformation. The articulation of these two framings helps service developers and researchers in their efforts to study and work on the realisation of service transformation.

Populärvetenskaplig sammanfattning

Efter en lång arbetsvecka är det skönt med lite fredagsmys med en film från en strömningstjänst och hemlevererad plockmat. Om man inte mår bra är det betryggande att kunna söka medicinsk rådgivning. I våra liv använder vi oss av otaliga tjänster, såväl via digitala kanaler som ansikte mot ansikte. Vi vet emellertid inte så mycket om hur ändringar i tjänster faktiskt sker och hur dessa ändringar kan bli framgångsrika. Denna avhandling presenterar två sätt att se på hur tjänster förändras, hur tjänsteutvecklare kan arbeta för att förändra tjänster, samt designers kan bidra till dessa förändringar.

Det ena sättet att se på implementation av förändringar i tjänster bygger på processmodeller för produktutveckling, där konceptdesign sker i en tidig fas och ändringar förverkligas i en senare produktionsfas. Tjänsteförändringar innebär då att ett tjänstekoncept designas först att förutsättningarna för att rulla ut tjänsten skapas därefter. För att realisera en matleveranstjänst krävs, till exempel, att webbsajter, och mobilapplikationer byggs, samt att chaufförer och cykelbud anställs. Design handlar i detta synsätt om att ta fram tjänstekoncept på ett iterativt och användardrivet sätt. Designers kan bidra till förändringar i designfasen av en sådan process genom att tillämpa implementationsstrategier såsom att förankra projektet i inblandade organisationer, samt stödja överlämningen av det designade tjänstekonceptet.

Det andra sättet att se på förverkligande av tjänster bygger på tanken om att en tjänst är ett samarbete mellan personer som använder sina kunskaper och färdigheter för att hjälpa varandra. I detta synsätt leder ändringar i tjänster

till förändrade förhållanden mellan de aktörer som deltar i tjänsten. Det gör att aktörernas roller förändras. Till exempel ändras en patients förhållande till primärvården genom en mobilapplikation som erbjuder läkarbesök via videosamtal, eller genom lagstiftning som kräver patientinvolvering i verksamhetsutveckling. Sådana ändringar sker löpande och är inte bara en del av en tjänsteutvecklingsprocess. Design är i detta synsätt ett stöd i ständiga förbättringar genom att hjälpa aktörer i tjänsten att lära sig mer om den framtida tjänsten och förstå hur förhållanden inom tjänsten kan komma att ändras. Utbildade designers bidrar då genom att stödja tjänsteaktörer i denna lärandeprocess.

De som jobbar med tjänsteutveckling kan välja vilket av dessa två perspektiv som passar tjänsten de jobbar med bäst. Att se på realiseringen av förändringar som att skapa förutsättningar är lämpligt för standardiserade tjänster, såsom strömningstjänster för film och hemleverans av plockmat. Individanpassade tjänster som inte hela tiden levererar en och samma sak, som till exempel i sjukvården, stämmer bättre överens med ett synsätt där realiseringen av förändringar handlar om att ändra förhållanden mellan tjänsteaktörer. För professionella designers ger båda perspektiven ett sätt att inta en givande position i tjänsteutveckling, samt ett sätt att kommunicera hur design kan bidra till tjänstetransformation.

De två bilderna av tjänsteförändring gör att vi nu vet lite mer om hur utvecklingsarbetet kan gå till för att vi ska kunna titta på vår favoritserie via en strömningstjänst, eller kunna få medicinsk rådgivning på, exempelvis, en vårdcentral.

Populairwetenschappelijke samenvatting

Na een week hard werken kan het fijn zijn om niet te hoeven koken, maar eten te laten bezorgen terwijl je thuis een film of serie streamt. Als je je niet lekker voelt, is het een geruststellende gedachte dat je naar een dokter kan gaan. We gebruiken dagelijks talloze diensten, zowel via digitale kanalen als face-to-face. Deze diensten veranderen continue en er komen ook dagelijks nieuwe diensten bij. Tegelijkertijd weten we nog niet zo veel over hoe veranderingen in diensten eigenlijk plaatsvinden en hoe zulke veranderingen succesvol kunnen zijn. Deze scriptie presenteert twee manieren om te kijken naar 1) hoe diensten veranderen, 2) hoe degenen die diensten ontwikkelen kunnen werken aan zulke veranderingen en 3) hoe ontwerpers kunnen bijdragen aan het realiseren van veranderingen in diensten.

De ene manier om naar het implementeren van diensten te kijken, gaat uit van hoe producten ontwikkeld worden, waar in een vroege fase van het proces een product bedacht wordt, dat in een latere fase geproduceerd wordt. Voor diensten betekent dit dat een dienstconcept eerst wordt ontworpen, om vervolgens de voorwaarden te creëren die nodig zijn voor het uitrollen van de dienst. Om een maaltijdbezorgingsdienst uit te kunnen rollen, moeten bijvoorbeeld websites en apps gebouwd worden, en moeten chauffeurs en fietskoeriers aangenomen worden. Binnen deze manier van kijken naar verandering in diensten betreft ontwerpen het ontwikkelen van een idee voor een dienst, waarbij de gebruiker centraal staat. Ontwerpers kunnen bijdragen aan het ontwikkelen van diensten tijdens de vroege fase waarin de dienst bedacht wordt. Ze kunnen strategieën toepassen die bijdragen aan succesvolle implementatie, zoals het creëren van draagvlak binnen de

betrokken organisaties en het ondersteunen van de overdracht van het idee voor de dienst naar de organisatie die het uitrolt.

De andere manier van kijken naar hoe dienstverlening verandert, ziet diensten als een samenwerking tussen mensen die hun kennis en vaardigheden gebruiken om elkaar te helpen. Binnen deze zienswijze leiden veranderingen in een dienst tot veranderingen in de verhoudingen tussen degenen die deel uitmaken van de dienst. Hun rollen binnen de dienst veranderen. Zo verandert bijvoorbeeld de verhouding van een patiënt tot de gezondheidszorg wanneer het mogelijk wordt om een doktersconsult te hebben via videobellen, of als wetswijzigingen het verplichten om patiënten te betrekken bij de ontwikkeling van nieuwe werkwijzen. Zulke veranderingen vinden continue plaats; niet alleen als onderdeel van projecten die gericht zijn op het ontwikkelen van nieuwe diensten. Binnen deze manier van kijken naar de transformatie van diensten kan ontwerpen zulke continue veranderingen ondersteunen door degenen die betrokken zijn bij de veranderingen te helpen om meer te leren over de toekomstige dienst, zoals wat de gevolgen van veranderingen kunnen zijn voor de verhoudingen tussen degenen die onderdeel uitmaken van de dienst.

Mensen die werken met het ontwikkelen van diensten kunnen kiezen welke van deze twee perspectieven het beste past bij de dienst waar ze aan werken. Voor gestandaardiseerde diensten, zoals het streamen van films en series of maaltijdbezorging past het om het realiseren van veranderingen te zien als het vervullen van de randvoorwaarden voor een dienst. Diensten zoals gezondheidszorg, die vaak per patiënt en per situatie verschillend zijn, komen meer overeen met het beeld waarbij het realiseren van diensten inhoudt dat de rollen van betrokkenen veranderen. Voor ontwerpers bieden beide perspectieven een manier om een positie in te nemen die bijdraagt aan het realiseren van verandering in diensten en een manier om duidelijk te maken hoe ze bij kunnen dragen aan de succesvolle transformatie van diensten.

Beide beelden van hoe verandering in diensten plaatsvinden, maken dat we nu iets meer weten over hoe het werk eruitziet dat het mogelijk maakt dat we onze favoriete films en series kunnen streamen of medische hulp kunnen krijgen via, bijvoorbeeld, een huisarts.

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Tim Overkamp Linköping, August 2019

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Chapter 1 Introduction

Like many practitioners and researchers in the field of Service Design I did not have a formal education as a service designer. Instead, my background is in product design. My bachelor's education in Industrial Design Engineering covered a broad range of topics related to product design, such as aesthetics, economics, ergonomics, production technology and mechanics of materials. As a product design student, I found it interesting to focus on developing product concepts that would be feasible to mass-produce. I did not want to develop conceptual designs with no practical application – rather, I made a point of thinking about, and then demonstrating, how my designs could become a reality. I was interested in constructs such as design for manufacture and assembly (DFMA), wherein a product is designed with the expectation that it will be manufactured and assembled at some point. DFMA advocates that products should be designed in such a way as to facilitate an easier and more straightforward assembly process.

Later during my studies, I became interested in how people interact with products and how end users can be involved in the design process. Therefore, I chose a master's programme that emphasised co-design approaches, learning about various methods of involving people during different stages of the design process. Working with these methods taught me that I feel most comfortable as a designer when working collaboratively and giving others the tools that they need in order to express their needs and wishes, rather than designing without any user input. I learned that I preferred to work with other people instead of designing a solution entirely by myself. The projects and courses during my master's education focussed on designing product concepts based on extensive research with a human-centred perspective. It was seldom required to develop these concepts and prototypes to a point

where they were ready for production. Yet I kept working to come up with designs that were grounded in the insights from co-design activities on the one hand while they would be feasible to mass produce on the other hand.

During my studies at the master's level, I also developed an interest in design in a service context. To me, it felt that the collaborative design approaches that I encountered during my master's work were natural and logical tools to use in this context. Firstly, the intangibility of services would seem to require a more profound understanding of people than product design, and secondly, service interactions often involve a multitude of stakeholders, rather than an interaction between one product and one user. There are more people, i.e. actors in the service, who influence each other's experiences with the service.

Having taken courses in service design and read about the topic, and having worked on a few service design projects, I learned about how collaborative design tools can be used to do user research and come up with service concepts. Driven by my preoccupation with developing designs that seem feasible to realise, I started looking into the realisation of service designs. I learned that service transformation is an important aspect of successful service development. If service transformation is not given sufficient consideration, the chances are that service ideas will not be implemented into service practices. As a result, the intended outcome of the envisioned service will not be achieved. In other words: the goals of the service design project and the intended effects of a service design will not be realised.

Besides that, if the service transformation does not consider or support actors in the service, it can cause problems. For example, when travellers at an airport are required to check in their luggage themselves, it can lead to confusion, anxiety and frustration for both passengers and ground crew, if the passengers are not familiar with the routines of this self-check-in process and what is expected of them. Another example is when local governments are expected to handle work that was previously the responsibility of the national government. This transition can be a positive thing, because municipalities arguably have a better understanding of what is needed at a local level than government bodies at a national level. However, municipalities may not have the skills, knowledge, time, or other resources to handle these additional responsibilities in a way that is sustainable in the long term.

Yet another risk of not carefully tending to service implementation is that the momentum that is created during a service design project is lost when

trying to sort out the details and practical problems related to realising a service concept. Stakeholders who have become motivated through their involvement in the project lose their interest because they do not notice any progress or change. To them, it may feel like a waste of all of the time, energy, and money that have been invested in the project.

These examples highlight the importance of addressing the implementation of service designs and suggest that service transformation has various aspects. The fact that all of these various elements must be considered complicates the realisation of service transformation. At the same time, service implementation has received little attention in service design research (Sangiorgi & Prendiville, 2014; Raun, 2017) and the topic seems to have a limited place in the collective discourse of service design practitioners (Manhaes, 2018). When I started looking into how service transformation was addressed in service design literature in the early 2010s, only a few publications addressed service transformation specifically in academic fora (e.g. Lin, Hughes, Katica, Dining-Zuber, & Plsek, 2011; Tsianakas et al., 2012) and non-academic fora (e.g. Keller, Woodley, Lafrance, & Grimes, 2013; Kronquist, Koivisto, & Vaajakallio, 2014). Furthermore, there is a need to better understand the ways in which design(ers)¹ can contribute to service transformation. Geoff Mulgan voiced a criticism of service designers in particular, suggesting that service designers pay too little attention to the economics of their service designs, along with organisational and cultural aspects relating to service transformation, which “condemns too many ideas to staying on the drawing board” (Mulgan, 2014, p.4). The combination of limited discourse about service transformation in service design and a critique of service designers regarding their skills in service transformation made me—as a designer who considers how the results of my work can be realised later on—interested in exploring the topic myself. My decision to do so by means of design research as a PhD student was the result of my training as a Master of Science in the field of design as well as my work with service design as a research assistant.

¹ The reason that I use parentheses here is to address two words. In my view, design (the activity) is not exclusively done by trained designers. By writing about contributions of both design and designers I want to emphasise that design as activity can contribute to realising service transformation in ways that are different from what trained designers can do to facilitate service transformation.

1.1 Scope of the thesis

Recently, the topic of realising service transformation has received more attention as ‘service implementation’, in service design practice, in books, conferences and journals for practitioners. Discussions about this aspect of service development include a variety of topics. This thesis addresses service transformation as the process of transitioning from the initial idea or concept for a service to a situation where that envisioned service is performed as a service practice.

In literature, the term *service transformation* is used to address the aforementioned type of transforming a service into a service practice, but it can refer to strategies for the organisational change of product manufacturers towards becoming service providers as well (Adrodegari, Saccani, & Saccani, 2017). Another name for this transition is *servitization* (Baines et al., 2017), which includes, for instance, developing a service mindset (as opposed to a product mindset) in the organisation. The adoption of an approach to innovation that supports service development is also mentioned as part of this type of organisational change towards becoming a service provider. The transition to a service mindset can include the adoption a service design approach. Service design(ers) can facilitate this by providing methods and approaches for human-centred service design (see e.g. Costa, Patrício, Morelli, & Magee, 2018; Calabretta, De Lille, Beck, & Tanghe, 2016; Sangiorgi et al., 2012 for examples and case studies). But whether or not service design is suitable as a facilitator of servitization depends on the characteristics of the organisation (Teso & Walters, 2016). Organisational transformation through service design has also been discussed beyond servitization specifically (see e.g. Sangiorgi, 2010; Iriarte, Alberdi, Urrutia, & Justel, 2017; Yu & Sangiorgi, 2018a). These discussions about the adoption of a (service) design approach² are related to the topic of building (service) design capabilities in organisations in order to support service development (Malmberg, 2017; Yu & Sangiorgi, 2018a; 2018b).

This thesis does not address these topics regarding the transformation of organisations towards a service mindset or the adoption of a (service) design approach to service innovation. Instead, this thesis looks at realising the transformation of ideas or concepts of a service into service practices and the way in which design and trained designers can support this process.

² I write parentheses around ‘service’ because parts of service design as particular activity arguably also apply to design as activity in general. Service design builds on design in general.

1.2 Aims and research questions

On the topics of realising service transformation and its relationship to design and trained designers, this thesis addresses the following three research questions:

How can the realisation of service transformation be framed?

While previous work has addressed the actions that take place as part of service transformation, there is little discussion about the assumptions regarding service transformation that underlie these discourses.

Existing literature in service research is used to explore the question of how the realisation of service transformation is currently conceptualised.

What generative constructs facilitate studying the realisation of service transformation given the way that service transformation is framed?

Given the ways in which service transformation is framed, what theoretical constructs can be helpful to study the realisation of service transformation?

How can design and trained designers relate and contribute to the realisation of service transformation given the way that service transformation is framed?

Given the assumptions regarding service transformation, what relationship can design and trained designers have to service transformation and what possibilities does that provide for design and trained designers to contribute to service transformation?

In an effort to answer these questions, I will provide two views: *type 1 service transformation* and *type 2 service transformation*, grounded in two ontologies of service, with accompanying perspective on realising service transformation, generative construct and the role of design and trained designers (see Figure 1.1). *Type 1 service transformation* is based on literature in the fields of service innovation and service design and was also found in the empirical material. *Type 2 service transformation* started with empirical material that was incompatible with type 1 and was subsequently articulated using literature.

Figure 1.1 - Overview of framing (top part) and studying (bottom part) type 1 and type 2 service transformation

Recent research in service design literature that specially studies transforming services from idea to practice has explored topics such as how the handover of service design projects could be changed in order to better facilitate realisation of service visions (Almqvist, 2019) and the strategies that service design consultants use to increase the odds of successful realisation of service designs (Raun, 2017). In these works, service development is framed as a process in which service transformation—the implementation of service design projects or service visions—takes place in a phase that comes after the design of the service. This view of service transformation in service design literature builds on process models for service development from service management and New Service Development literature, in which service transformation is framed as the implementation of a service concept. I call this framing of service transformation *type 1 service transformation* (see Figure 1.1).

Type 1 service transformation formed the starting point of my exploration of service transformation. Through design engagements that were part of this programmatic design research work, a second view developed: *type 2 service transformation*. The results of these engagements suggested that the term ‘implementation’ is not always a fitting one to address service transformation, because of its connotations: 1) a process model with a design and implementation phase, where implementation is only addressed towards the end 2) the notion of developing specifications for implementation up front

and 3) the expectation of a handover of work from the design phase to the implementation phase.

Type 2 service transformation builds on the notion of value co-creation from service logic (Grönroos, 2008) and Service-Dominant Logic (Vargo & Lusch, 2004; 2008) and frames service transformation as the continuous work of shaping value co-creating relations. In this view, service transformation takes place by enabling service actors to enact the roles that make the intended value co-creating relationships possible (see Figure 1.1).

1.3 Structure of the thesis

The research in this thesis has followed an abductive process of knowledge development, wherein reviewing relevant literature has been intertwined with collecting and analysing empirical data. I begin by presenting my theoretical framing of type 1 service transformation, how this understanding evolved during the research and how this gave rise to a theoretical *reframing* of type 2 service transformation, which takes place continuously rather than during the implementation phase of a service development project.

Chapter 2 – Theoretical framing: Type 1 service transformation

This chapter addresses the starting point of the research into service transformation presented in this thesis. The starting point was type 1 service transformation, which is built on literature in the fields of service innovation and service marketing. The chapter presents literature in these fields that conceptualises the design and implementation of services as two phases, similar to design and production in product design. Design for manufacture and assembly (DFMA) from the field of product design is presented as one generative construct for exploring type 1 service transformation through the program *implementation during design*. The way that design and trained designers relate and contribute to type 1 service transformation and implementation during the design process is also addressed in this chapter.

Chapter 3 – Method

This chapter starts by introducing the programmatic design research approach that was used. It addresses how this constructive design research approach is used for knowledge development: how the pragmatist philosophy shapes the approach and its contributions to knowledge, as well as the relationship between research questions, programs as scaffolds and experiments as substantiations of the program.

Chapter 1

In addition, this chapter introduces the context for the empirical work in the thesis: a service development project that was aimed at improving a troubleshooting service for trucks and buses. This development project has been the context for the design engagements that have driven the development of programs to study service transformation and, in turn, to develop knowledge about the two types of service transformation. The context and structure of the project are described, along with my role as a design researcher in the project. Finally, the engagements that were part of this research are described.

Chapter 4 – Results

During the research and development project that provided the context for the design research, I have planned and executed discrete engagements, and have also performed more ad-hoc, continual engagements. In this chapter, the outcomes of these engagements are presented. While some of the outcomes were expected, given the framing of the engagements in type 1 service transformation and the program *implementation during design*, other outcomes were unexpected. Together, the expected and unexpected outcomes influenced my understanding of service transformation and led to a theoretical reframing of service transformation.

Chapter 5 – Theoretical reframing: Type 2 service transformation

The outcomes of the design engagements developed my understanding of service transformation and led to the formulation of type 2 service transformation. This perspective frames service transformation as a continuous process of shaping value co-creating relations by building on service logic theory. This chapter addresses 1) the framing of this type of service transformation, 2) the generative construct of roles and Role Theory for exploring service transformation from this perspective, and 3) the contributions of design and trained designers in type 2 service transformation.

Chapter 6 – Discussion

In this chapter, type 1 and type 2 service transformation are put side by side: I summarise the two perspectives on realising service transformation as well as the related generative constructs and roles for service design(ers). The knowledge contributions of the research in the thesis are discussed, including their limitations. Finally, implications for practice are addressed.

Chapter 7 – Conclusions and outlooks

In the last chapter of this thesis, the starting points, approach, outcomes and contributions of the research are summarised and suggestions for future research are presented.

1.4 Publications

While this thesis is written as a self-contained monograph, several papers that I have written as a PhD student have helped me to shape and get feedback on my thoughts and ideas regarding service transformation and how design relates to it. The following works are more central to this thesis:

Overkamp, T., & Holmlid, S. (2016). Views on Implementation and How they Could Be Used in Service Design. In N. Morelli, A. de Götzen and F. Grani (Eds.), *Service Design Geographies: Proceedings of the ServDes.2016 Conference* (pp. 205-214). Linköping, Sweden: Linköping University Electronic Press.

Overkamp, T., & Holmlid, S. (2017). Implementation during design Developing understanding about service realisation. *The Design Journal*, 20(Sup1), 4409-4421.

Overkamp, T., & Holmlid, S. (2017, 12-15 June). *Roles of in-house service designers towards service implementation*. Paper presented at QUIS15, 15th International Research Symposium on Service Excellence in Management.

Overkamp, T., & Holmlid, S. (2017, 15-17 June). *Evolutions of Service Actor Roles Towards Future Service*. Paper presented at Nordes 2017: 7th Nordic Design Research conference: Design and Power.

Overkamp, T., & Holmlid, S. (2018). Towards a structured way to represent future service roles. In *Proceedings of the 5th Participatory Innovation Conference* (pp. 345-348).

Overkamp, T., Čaić, M., Holmlid, S., Mahr, D., & Odekerken-Schröder, G. (2018). Understanding generalisability from network-conscious service design projects. In A. Meroni, A. M. O. Medina, B. Villari (Eds.), *Service*

Design Proof of Concept: Proceedings of the ServDes.2018 Conference (pp. 368-385). Linköping, Sweden: Linköping University Electronic Press.

Overkamp, T., Blomkvist, J., Rodrigues, V., Arvola, M. & Holmlid, S. (2018, 2–6 July). Resource integration as a perspective on value in interaction design. In *British HCI 2018: Proceedings of the 32nd International BCS Human Computer Interaction Conference*. BCS Learning and Development Ltd.

Other publications have contributed to my understanding of service design research and service transformation, but they do not take centre stage in this thesis. These publications are:

Blomkvist, J., Overkamp, T., & Holmlid, S. (2016). Research in the first four service design and innovation (ServDes) conferences. In N. Morelli, A. de Götzen and F. Grani (Eds.), *Service Design Geographies: Proceedings of the ServDes.2016 Conference*. Linköping, Sweden: Linköping University Electronic Press.

Overkamp, T., & Holmlid, S. (2016, 24-26 October). *Multi-Touchpoint Design of Services for Troubleshooting and Repairing Trucks and Buses*. Paper presented at NordiCHI'16: Game-Changing Design (Experience Design for Multiple Customer Touchpoints workshop).

Overkamp, T., & Ruijs, F. (2017). Involving stakeholders towards service implementation. Co-designing change of practices using a visual language. *The Design Journal*, 20(sup1), 531-549.

Chapter 2 Theoretical framing: Type 1 service transformation

This chapter introduces type 1 service transformation, which was the starting point for my research into service transformation. While there weren't many discussions about the realisation of service transformation in service design research back in 2015, service transformation was addressed in service marketing and New Service Development as part of service innovation literature. The literature on service transformation in these fields is discussed below. More specifically, the way the concepts of service, service development, service transformation and service design are framed in this body of literature is addressed: as the implementation of a service concept that has been designed during the earlier stages of a service development process.

Since the framing of service transformation bears a resemblance to manufacturing and assembly in product design, design for manufacture and assembly (DFMA) is introduced as one way to address service transformation (earlier) in a service development process. First, the assumptions of DFMA are tested for a service development context, in order to determine whether it is possible to apply the construct of DFMA in that context. Then, the service equivalent of design for manufacture and assembly is addressed: *implementation during design*. The relationship and contribution of design and trained designers to service transformation as part of implementation during design are discussed as well.

2.1 Service transformation through design and implementation of service concepts

In service design literature written before 2015, both in academic fora and practice, service transformation has mostly been depicted as happening after the design of a service concept. In books aimed at practitioners, this was the case in early works that addressed service design (Stickdorn & Schneider, 2011, p. 134-135) as well as in later works that provide an introduction to the field of service design (e.g. Polaine, Løvlie, & Reason, 2013). Accounts by practitioners about service transformation address changing behaviour in order to realise service transformation (Keller et al., 2013; Kronquist et al., 2014). In academic literature, Lin, Hughes, Katica, Dining-Zuber, & Plsek (2011) addressed how people-centred design can be used to facilitate a smoother introduction of new routines among hospital staff. Factors that influence service implementation in healthcare were also studied from a patient perspective (Tsianakas et al. 2012). Yu and Sangiorgi (2014) had framed service transformation as taking place after the development of a service concept. They based this framing on the conceptualisation of service design and implementation in New Service Development literature, which is part of the field of service innovation.

2.1.1 Service as an experience delivered through touchpoints

Zooming in to the part of the process models that address service transformation, there seem to be similarities between the product and service contexts in the sense that realisation is mainly addressed in marketing literature (Overkamp & Holmlid, 2016). While product and service development share the similarity that research on realisation is found in the field of product and service marketing, respectively, service marketing has developed as a separate category of marketing with its own theories (Grönroos, 1982). Service marketing views services as a category of market offerings (Edvardsson, Gustafsson, & Roos, 2005). When Shostack wrote her 1977 article *Breaking free from product marketing*, criticising the traditional marketing mix as not being useful for marketing services, researchers started to consider differences between services and products. One of the more popular suggestions that resulted from this was the IHIP model of service (Zeithaml, Parasuraman, & Berry, 1985). This model suggested that, in contrast to products, services were Intangible and Heterogenous, that production and consumption were Inseparable and that services are Perishable—they cannot be stored (ibid.). The impossibility of owning a

service was also mentioned as a characteristic that sets services apart from products (Lovelock & Gummesson, 2004). Unlike selling products, service marketing was about selling the promise of an experience and working to provide it (Pine & Gilmore, 1998). The value of a service offering (or service experience) is delivered during interactions—or service encounters—between the customer and the service provider. Service operations management focuses on how to orchestrate these different interactions that are part of a service so that the quality of the output of service delivery is as constant as possible (Johnston & Michel, 2008). To do this, manufacturing principles from operations management are applied to services (e.g. Chase & Apte, 2007; Heineke & Davis, 2007). The main difference between operations management for manufacturing and service provision is the involvement of customers in the ‘production’ of a service.

In this perspective which compares services with products, service is seen as something that can be designed. In other words: there is a service ontology where a service is an artefact. The intended service concept or experience is designed and evaluated first. The task of service marketing and management is then to develop a service process and service delivery system that delivers the service concept in a consistent and repeatable way, to maintain a constant level of quality in the service (Edvardsson, 1997).

Table 2.1 - Overview of the service ontology of service as artefact

Key concepts	Service concept Service experience Service delivery
Service interactions are viewed as	dyadic encounters of the service provider and customer
Value is	enclosed in the service concept (also referred to as service offering or service experience) and delivered through interactions (i.e. touchpoints/service encounters) that are part of a service process
Role of context	The location where the service interaction takes place (also referred to as servicescape (Bitner, 1992))

2.1.2 Design and implementation as phases in a process

Type 1 service transformation is related to outcome-based and process-based archetypes of service innovation (Helkkula, Kowalkowski, & Tronvoll, 2018) and the assimilation perspective of service innovation (Coombs & Miles, 2000). The assimilation perspective formed the basis for the development of service innovation literature (Carlborg, Kindström, & Kowalkowski, 2014). It builds on innovation models and terms from product innovation and addresses how service innovations are invented and implemented. New Service Development (NSD) literature is part of the assimilation literature stream and has produced various models that describe the process through which these innovations are developed. These NSD process models build on process models for New Product Development (NPD) (Alam & Perry, 2002; Menor, Tatikonda, & Sampson, 2002) that have a sequential nature with stages and gates (Cooper, 1990; Booz, Allen, & Hamilton, 1982). NSD models are often linear (see e.g. Meiren et al., 2015; Alam & Perry, 2002) although circular models do exist (Johnson, Menor, Roth, & Chase, 2000).

The new service is seen as the outcome of such processes (e.g. Goldstein, Johnston, Duffy, & Rao, 2002), just as new product innovations are the outcome of a NPD process. Similar to product development process models, the generic phases in NSD process models depict the design and realisation of service concepts as separate activities, taking place in different stages of the process (see Figure 2.1). This type of service innovation is thus related to the outcome and process archetypes of service innovation (Helkkula et al., 2018). In these process models, design precedes implementation. The outcome of the design phase of service development is the design of a service concept and a service process for delivering the value of that service concept. This service concept and service process are then tested and carried further in the development process, to the implementation phase.

The transition from the design phase of a service concept may include a handover from those who designed the service concept to those who are in charge of implementing the service concept. Those responsible for implementation of the service concept are in charge of developing the service

Figure 2.1 - Generic phases in an NSD process model (adapted from Meiren et al., 2015)

delivery system that will enable the service process that will deliver the value of the service (i.e. the service experience). This may be the case when design consultants are hired for service design (Yu & Sangiorgi, 2018a).

The implementation of a service concept does not take place in a vacuum and includes the integration of the new service concept into the existing service system. Tax and Stuart (1997) presented a planning cycle as a process model for this integration. Their model consists of seven steps, starting with analysis of the status quo and moving via design and risk assessment to determining if and how a new service concept can be integrated into an existing service system, or to modification of the service concept. The steps in this model lead either to integration of the service concept (if it fits the current service system) or to modification of the service concept so that it will fit into the current service system. But even if a service concept fits into the current service system, it is arguably not likely that it can replace or be added to another service without any side-effects. Besides the planning cycle by Tax and Stuart (1997), a service blueprint can also provide support for the implementation of new services. Blueprinting (Shostack, 1984) is mainly considered to be a tool for the fuzzy front end of the service development process. However, it can function as a tool to support implementation as well, because it provides both a view of the service activities (frontstage) and of the processes or systems (backstage) that are required to support these activities (Bitner et al., 2008). This helps to identify the parts of the organisation that should be involved in the design and implementation of a service (ibid.). The service blueprint can thus be a tool to determine the consequences of a certain a service concept (and the related delivery system) for service transformation.

2.1.3 Service transformation as implementation of a service concept

In service marketing, service transformation is defined as the implementation of a service concept. This requires the realisation of a service process, consisting of service encounters or touchpoints, through which the service concept can be delivered (e.g. Edvardsson & Olsson, 1996). The service process is supported by the service delivery system (Edvardsson & Olsson, 1996; Ponsignon, Smart, & Maull, 2011). If the service concept and the target market have been defined, the service delivery system can be designed in such a way that it is aligned with the service concept (Ponsignon et al., 2011), which is required for a service to be successful (Roth & Menor, 2003). In other

words, the realisation of the service delivery system enables successful implementation of the service concept.

The components of a service delivery system differ slightly between authors. Tax and Stuart (1997) stated that skills and knowledge, processes and physical facilities should be taken into account. Heskett (1987) focussed on people, technology, facilities, equipment, layout, processes and procedures. Goldstein et al. (2002) mentioned structure (facilities, equipment), infrastructure (job design, skills, etc.) and processes as design elements. Finally, Ballantyne, Christopher, & Payne (1995) defined the physical setting, process design, job design and people as design elements. Edvardsson and Olsson (1996) called this support for the service process the 'service system'. They stated that this service system contains "the resources that are required by or available to the service process" (ibid., p. 149). The service system itself consists of four elements: employees, organisation and control, physical and technical environment, and customers (ibid.). Implementing a service includes, among other things, hiring and training staff (employees), developing the right administrative and financial support, defining how interaction with customers should take place (organisation and control), and building, for instance, computer systems and stores (physical and technical environment) (ibid.). The physical surroundings in which the service delivery takes place have also been referred to as the servicescape (Bitner, 1992). According to (Edvardsson, Gustafsson, Johnson, & Sandén, 2000), "[service] implementation includes service training, launch and internal and external marketing" (ibid., p. 148). Therefore, type 1 service transformation requires that elements of the service delivery system are determined and specified so that they can be developed. For instance, detailed specifications for what the physical environment should look like are needed in order to build the servicescape (Bitner, 1992) that supports the delivery of the service offering. Also, the content and form of training that employees need must be specified in order to develop a fitting training programme. Put together, these specifications form a plan for service implementation.

The perspective that service transformation is the implementation of a service concept is similar to the framing of implementation in implementation science. This field studies how evidence-based practices can best be introduced to achieve a smooth rollout of new routines, so that they become sustainable, established practices (Fixen, Naoom, Blasé, Friedman, & Wallace, 2005). Fixen et al. (2005) argue that developing an implementation plan starts by determining the core components of intervention: the elements that

need to be in place for successful implementation. If the principles of intervention (the aim and content) underlying those core components are known, the form (processes, strategies) can be designed flexibly to best fit a specific site of implementation.

2.2 Design for manufacture and assembly as generative construct

Framing service transformation as the realisation of a service delivery system, which takes place during a later stage in the service development process, is related to the realisation of product concepts through manufacturing and assembly. In the field of new product development, process models often contain phases that are similar to phases in new service development. This is not surprising, since some of the literature and theories about service innovation are built on research about innovation in a product development context.

In product development, concept design is often seen as a single phase that precedes production and assembly. Therefore, the construct of design for manufacture and assembly (DFMA) (Boothroyd, Dewhurst, & Knight, 2011) can function as a generative construct to explore type 1 service transformation and its relationship to design. DFMA accounts for the fact that a product has to be produced and assembled during the design of the product concept. For instance, a part that is symmetrical can be assembled in two ways rather than one, which means that less time is required to rotate the part to a correct position relative to the part to which it has to be connected. Making a part obviously asymmetrical helps to prevent incorrect positioning. Design decisions thus influence how easy or quickly assembly is later on, and DFMA allows evaluation of how easy or difficult a product concept will be to assemble later on.

As discussed above, in a service context, design and implementation have been framed as two phases in a service development process, with a relationship that is similar to the one between design and assembly. If it were possible to evaluate the consequences for implementation during the design of a service concept, designers could address implementation, as a concept, earlier. The outcomes of such evaluations can improve the service designs with respect their implementation, in the same way that DFMA aims to develop product concepts that are optimised for assembly.

While the construct of DFMA works in product design, it is not known whether it is possible to apply a similar construct in service design. In order to determine the suitability of this construct for service design it is necessary to evaluate whether the assumptions on which DFMA are built also apply to services.

DFMA is based on three assumptions. One is that it is possible to distinguish 'design' and 'manufacturing and assembly' as discrete activities. The second assumption is that design precedes assembly in the process model of product development. The third assumption on which DFMA is grounded is that decisions that are made in the design phase, when the product concept is defined, affect how easy or difficult it will be to assemble a product later on. In order for DFMA to be useful as a generative construct for addressing type 1 service transformation, these assumptions would have to be valid in a service context too.

As discussed above, design and implementation are seen as two distinct phases in type 1 service transformation, similar to the way in which design and production are two distinct phases in product development. Therefore, the assumption that design and assembly are two phases is thus also valid for a service context, where 'design' and 'implementation' are two distinct phases. Secondly, design preceded implementation in the process models for service development. Thirdly, the design of a service influences its implementation. The service concept stipulates the service process through which the service concept is delivered, which in turn defined the service system that should support the service process. The three assumptions on which the construct of DFMA in product development is built are thus valid for service development as well.

Hence, it seems that type 1 service transformation can be addressed in a way that is similar to DFMA in product design. However, the preposition *for* in 'design for manufacture and assembly' suggests that ease of assembly is a driver for design decisions. It suggests that ease of assembly receives more attention than the functionality of the product and its other use qualities. However, addressing type 1 service transformation earlier in the service development process does not prioritise easy implementation, rather it aims to determine the consequences of design decisions in order to determine whether or not a more difficult implementation is worthwhile, given the value that the service delivers. Therefore, the term *design for manufacture and assembly* from the product context has been developed into *implementation*

during design for the service context. Taking up implementation as a concept during design means that the consequences of a service concept design for implementation are addressed during the design of that service concept (see also Overkamp & Holmlid, 2017b). Such consequences include both 1) prerequisites for the implementation of the service concept that is currently being designed (i.e. elements of the service delivery system) and 2) effects of the design of the service concept on elements of the service delivery system(s) of already existing service concepts. Connections between DFMA and implementation during design are summarised in Table 2.2.

Table 2.2 - Overview of design for manufacture and assembly and implementation during design

Design for manufacture and assembly (DFMA)	Implementation during design
Product as artefact that is manufactured and assembled; value delivered by selling the product	Service as artefact; value delivered through a series of service encounters or touchpoints
Builds on process models where <i>design</i> and <i>manufacture and assembly</i> are two distinct phases and where design precedes manufacture and assembly	Builds on process models where <i>design</i> and <i>implementation</i> are two distinct phases and where design precedes implementation
Manufacture and assembly are defined as producing and putting together a product's component parts to form a functioning product	Implementation is defined as assembling a delivery system that allows the value of the service to be delivered
Assumes that decisions made regarding the design of the product concept affect assembly of the product	Assumes that decisions made regarding the design of the service concept affect the (assembly of the) service delivery system
Aims to design a product concept that is optimised for quick and easy assembly	Aims to determine consequences of service concept design for assembly of the service delivery system to inform decision-making in the design of service concepts

2.3 Position of design and designers in type 1 service transformation

Prior to the implementation phase and the development of the service delivery system, the service concept is designed. This happens during what NSD process models refer to as the design phase or the phase during which the (service) concept is developed (Meiren et al., 2015). Service Design³ is seen as an approach to service innovation and as a way to enhance service experiences (Patrício, Gustafsson, & Fisk, 2018; Secomandi & Snelders, 2018).

2.3.1 Contributions of a Service Design approach

Service Design provides tools and methods that can be used in different phases of a service development process (Blomkvist, Holmlid, & Segelström, 2010; Holmlid, 2007). If Service Design is used for the design of a service concept or to enhance a service experience, it is often depicted as two consecutive diamonds, each with a divergent and convergent phase. Therefore, it is also referred to as the *Double Diamond* process model (The Design Council, 2015). The first diamond is seen as the analysis phase and the second diamond is seen as the synthesis phase.

Figure 2.2 - Double Diamond process model (adapted from The Design Council, 2015)

In a Service Design process, service designers typically apply an outside-in perspective and design the service from the perspective of the service customer (rather than starting from what the service provider can deliver). Seeing the service from the perspective of the customer supports the design

³ I use *service design* (lower case) to address the phase in New Service Development processes where a service concept is designed. I use *Service Design* (capital S, capital D) to refer to this specific approach to designing service concepts.

and delivery of superior service experiences (Zomerdijk & Voss, 2010). This begins by developing empathy for service users and their needs, followed by ideating, prototyping and evaluating service concepts. This process shares similarities with the notion of *design thinking* in management (e.g. Brown, 2009). See Johansson-Sköldberg, Woodilla, & Çetinkaya (2013) for a more detailed review of design thinking. Throughout the Service Design process, Service Design consultants involve and engage with stakeholders that are part of the service in different ways (Han, 2009; Akama, 2009; Sangiorgi & Prendiville, 2014) and translate insights from these engagements into communication with their client companies (Wetter-Edman, 2014). Service Design builds, among others, on user-centred methods from interaction design (e.g. Sangiorgi, 2009; Pacenti & Sangiorgi, 2010).

The work of service designers typically starts by exploring the context and actors associated with the service in order to discover issues that need to be tackled. From interviews with people who called themselves service designers Blomkvist and Segelström (2014) found that service designers work with various tools for user research. This user research aims at developing empathy for and understanding of the stakeholders in the service and their needs, which must be addressed when designing service concepts (Segelström, 2013). The evaluation of existing services can also provide insights for redesigning and improving those services (Foglieni, Maffei, & Villari, 2014; Foglieni, Villari, & Maffei, 2017).

Having decided upon which issues to address, service concepts are ideated. In this synthesis phase, the focus lies on orchestrating the elements of the service interface, which affect the service experience as a whole (Sangiorgi, 2009; Kimbell, 2009). The service interface consists of all the elements of the service which a service customer interacts with (Secomandi, 2012; Secomandi & Snelders, 2011). These interactions take place in touchpoints, or service encounters, which have been mentioned as one of the design materials of service (Clatworthy, 2011). The service interface is the collection of touchpoints in the service (taking into account the timing and sequentially of touchpoint interactions) as the service customer perceives them, which is also referred to as the *customer journey* (Parker & Heapy, 2006). The fact that interactions in the service extend over a longer time is one of the differences between service design and interaction design (Holmlid, 2007; Holmlid, 2009a). In the synthesis of service concepts, Service Design activities include modelling various aspects of the service (Holmlid, 2007), such as the customer journey (Halvorsrud, Lee, Haugstveit, & Følstad,

2014; Følstad & Kvale, 2018). In a Service Design process, the development of service concepts takes place in a collaborative way, also referred to as co-design or co-creation (Sanders & Stappers, 2008), by involving stakeholders in the design process in order to generate insights for service (re)design, explore service concepts and determine prerequisites for service transformation (Holmlid, Mattelmäki, Sleeswijk Visser, & Vaajakallio, 2015). service designers facilitate bringing service concepts to life through different kinds of visualisations (Diana, Pacenti, & Tassi, 2009; Kimbell, 2009) and prototypes which represent possible future situations of service (Blomkvist, 2014). Different types of visualisations can be used to represent different aspects of a service. For instance, flow-type visualisations such as service blueprints and customer journey maps show the order of service activities over time (i.e. diachronic) in an abstract way (Diana et al., 2009). Service actor maps provide a synchronic overview of those who are involved in the delivery of the service (ibid.). Prototypes are used to communicate and learn about a service concept (Blomkvist & Holmlid, 2010). Such prototypes can be developed at the level of touchpoints or at the level of the entire service. Developing prototypes at the level of the service in its entirety, such as service walkthroughs or desktop walkthroughs, highlights other elements of the service than developing touchpoint-level prototypes does (Blomkvist, 2016).

Service Design thus contributes by developing service concepts from the perspective of the service customer. Implementation of these tried and tested service concepts takes place in a later phase, in which designers are not involved. Both researchers and practitioners in Service Design literature have adopted this view throughout my PhD studies (i.e. between 2015 and 2019). For instance, referring to the Double Diamond process model, implementation has been considered as the third diamond (Editorial note in Touchpoint (Grimes, 2018)), thus suggesting that it happens after the design work is done. Almqvist (2017) found through interviews with Service Design consultants in a healthcare context that designers are often only involved during the design phase of a project.

2.3.2 Contributions of trained designers

As discussed above, in type 1 service transformation, design is seen as a phase, wherein a service concept is developed and tested before being detailed further and realised during the implementation phase that follows. In type 1 service transformation, service designers are typically involved during the service design phase of the NSD process, but not during the

implementation of the service. The involvement of service design consultants usually ends with the delivery of a prototyped and tested service concept. At that point, service designers hand over the service concepts to their client organisation, which then continues with detailing the elements of the service concept further and implementing the final design of the service concept. This might explain why there is relatively little discussion about implementation in service design research (Almqvist, 2017; Raun, 2017; Overkamp & Holmlid, 2016) and why there are various tools in Service Design literature for exploring existing services and creating new ones, but fewer tools that are dedicated to implementation (Bækkelie, 2016; Martins 2017).

If trained designers are not considered to be part of realising type 1 service transformation, how can they relate and contribute to it? If design and implementation are done in two different phases, by two different groups of professionals, there is a point at which documentation of the service concept—and possibly suggestions for the implementation of that service concept—are handed over. This happens regardless of whether the development of the service concept is done by design consultants (Raun, 2017; Yu, 2015) or in-house designers (Blomkvist, 2015). Service Design consultants hand over work to their client organisation for implementation (Yu, 2015). In-house designers hand over work to, for instance, software developers (Overkamp & Holmlid, 2017c). Such software development for a service includes translating a service concept into software specifications for IT-development (Lee, 2016). The development of software as part of a service touchpoint is one example of how the progression from service design to implementation is addressed as the translation of a service concept into implementation actions (Almqvist, 2019). Such translation seems particularly important in cases where the service concept that is handed over is an abstract vision (*ibid.*). If stakeholders do not see a plausible path from an existing situation to an envisioned future scenario they may find it difficult to commit to the scenario, because it may seem impossible to achieve and therefore not worth the investment of time and energy (Gaziulusoy & Ryan, 2017). Moving from abstract service concepts to concrete implementation actions can be difficult. Some of the in-house service designers that Blomkvist (2015) interviewed had the experience that there is not a clear step between design and implementation of services. The service design roadmapping approach, suggested by Almqvist (2018; 2019) can provide a solution to this issue, because it supports a dialogue between designers and their client

organisations about the steps that need to be taken to realise the proposed service concept.

An obvious way to reduce the issues that follow from handovers in service development processes is to set up the relationship between service designers and those who continue the work in such a way that no handovers are expected: based on 28 semi-structured interviews with service designers and their clients in eight cases, Yu & Sangiorgi (2018a) suggested that these client organisations had a better idea of how to realise service concepts in situations where the service solution development is facilitated by service designers, rather than in cases where service designers were hired to develop a service concept in isolation. This relates to discussions about the ways in which service designers, through their involvement in Service Design projects, can facilitate organisational transformation. These discussions are outside of the scope of this thesis.

When working with type 1 implementation during service design, trained designers can keep implementation in the back of their minds while designing a service concept. Halse, Brandt, Clark, & Binder (2010) have suggested the concept of *rehearsing the future* as a way to do this, which “collapses the front end and the back end of the design process, in that we already from the very beginning do what is usually in the end: rehearsing the relationships and practices that follow with a new artifact.” (ibid., p. 17). While they addressed how new *artefacts* change practices, the same goes for new services. The construct of *implementation during design* that was introduced in section 2.2 has been developed to explore whether it is possible to prevent a hard division between design and implementation of service concepts. More specifically, this means 1) exploring whether the consequences of design decisions for service transformation can be mapped during the design phase of service development and 2) detailing prerequisites for the new service and develop the whole plan for implementation as part of the service concept design, so that when designers leave, the implementation plan is internalised in the organisation, which can then continue the implementation work after the designers have left.

While there is a considerable body of knowledge regarding production technologies and the mechanics of materials that can help to understand how design decisions affect the production and assembly of a product, a similar knowledge database does not yet exist for services. In fact, there is no consensus in literature about what the design materials of service are (Blomkvist, Clatworthy, & Holmlid, 2016). Therefore, service designers may

not be the people who can foresee all of the consequences of their design decisions. Actors in the service may be in a better position, given their knowledge about the service. These actors can be seen as the equivalent of the production engineers in design for manufacture and assembly. The work of trained designers as part of addressing implementation as a concept during design includes engaging in dialogue with those who are knowledgeable about the delivery (i.e. the *production*) of the service. The knowledge, experience and insights about the service that these service actors have is useful for mapping what the consequences of design decisions in the service concept will be for realising service transformation.

This view of the relationship between designers and service implementation, and of what designers can do during the design phase to affect the success of the implementation has continued to be discussed during my PhD. Lotte Christiansen (2015) analysed a case of a Service Design project in a healthcare context, and she found that service designers who worked on that project applied certain tactics to increase the probability of successful implementation. Later on, based on the analysis of this case and three other cases, she suggested that designers addressed service implementation in different ways during their involvement in service design projects (Raun, 2017). First, the designers aimed to create favourable implementation conditions for the service design project, among other things by making sure that the project group had the capabilities and mandate needed to successfully implement the service, and by placing ownership over the project with that project group (ibid.). On top of that, the designers applied implementation strategies related to both *content* and *people*. Content strategies included adopting a narrow project scope and letting stakeholders in the organisation evaluate the feasibility of suggested service ideas (ibid.). People strategies included involving and engaging relevant stakeholders in the project (ibid.).

Furthermore, in an article based on the PhD research of Tina Weisser⁴, Weisser, Jonas, & Mager, (2018) suggested a set of 24 implementation tactics that can be applied before, during and after the design phase during which service designers are typically involved. These suggestions included six hygiene factors and 18 additional factors that influence whether or not

⁴ Tina Weisser's PhD thesis was published in 2018, in German. It is titled *Systemische Betrachtung der Einflussfaktoren bei der Implementierung von Produkt und Service Design-Systemen* and is available via: opus.hbk-bs.de/files/208/Diss_tinaweisser.pdf

services are successfully implemented. Similarly, Lønvik, Pettersen, & Verhulst (2016) posited that service designers can learn from organisational change literature in order to become better at developing readiness for change in the organisation as part of implementing Service Design projects. This includes establishing (the outcomes of) Service Design projects in the organisation by involving stakeholders, prioritising journey over destination and realising change from within. Stakeholder management and involvement means mapping who in the organisation is affected by the change processes that are related to service realisation. It includes making sure that there is a shared understanding among these stakeholders of the goals for change and considering the concerns of individual stakeholders. Prioritising journey over destination suggests putting less emphasis on the situation in which the service concept has become a reality—the destination of the change. Instead, the journey towards this situation should be considered a part of Service Design as well, paying more attention to the changes that come with the implementation of the service concept. Finally, change from within means that the organisation needs to see the value of the changes that come with service transformation in order to be willing to invest time and effort in realising them. If change is only suggested by service designers, but not supported by the organisation, service transformation is likely to fail.

Finally, as mentioned earlier Frida Almqvist (2018; 2019) developed the service design roadmapping approach to facilitate the handover from service designers to their client organisation. She suggested that service designers should collaborate with their clients to develop a roadmap for service transformation, to break down an abstract service vision or service concept into concrete actions for realising service transformation (ibid.).

2.4 Chapter summary

This chapter introduced type 1 service transformation, which builds on how service transformation is framed in the assimilation perspective of service innovation, specifically New Service Development literature. This stream of literature is positioned in a service ontology of service as artefact. Service design is seen as a phase of service development in which a service concept is conceived. The outcome of the design phase—a prototype of the service concept—is often handed over to a different group of professionals, who then work on realising the service transformation. Activities regarding service transformation are thus part of a phase of the service development process that comes after the design of the service concept. Service transformation is

framed as the implementation of that service concept, which is done by assembling a service delivery system. Such a service delivery system supports the service process through which the service value is delivered to the service customers.

The way design and implementation of service concepts are framed in the literature on type 1 service transformation shares similarities with the design and manufacture of products. In both fields, the process models for development frames design and realisation as two distinct phases, where design precedes realisation. In product design, the construct of design for manufacture and assembly (DFMA) allows designers to address the consequences of their design decisions with regard to manufacture and assembly. Therefore, DFMA would seem to be a generative construct for exploring the relationship between service design and realising type 1 service transformation. DFMA was used as a starting point for developing the construct of *implementation during design*, where DFMA is adapted for a service context given the similarities in the ways that product and service realisation are framed. Adapting DFMA to a service context means that service transformation (as the implementation of a service concept) can be addressed earlier in the service development process. More specifically, the consequences of design decisions in the service concept can be evaluated. These consequences include effects on the existing service infrastructure and prerequisites of the delivery system for the newly-designed service concept.

As an approach, Service Design contributes to the development of desirable services and enhanced service experiences. Service Design develops the service interface from a holistic and people-centred perspective. The outcome of a Service Design process is a prototype of the service interface, where touchpoints have been evaluated with prospective service customers to determine whether the touchpoint design will facilitate the delivery of the intended service experience.

Trained designers are not usually part of the realisation of type 1 service transformation, because this takes place after the designers have left the service development process. They commonly hand over the prototype of the service to those who will work on the implementation of the service. Even though designers are not likely to be involved in service transformation, they can nonetheless contribute to type 1 service transformation. On a general level, service designers can 1) apply strategies to facilitate implementation of

Service Design projects during the service design phase and 2) facilitate the handover of the service concept at the end of their involvement. When using the notion of *implementation during design* in particular, designers can contribute by 1) involving the equivalent of production engineers in order to evaluate the consequences of the service concept with them and 2) supporting the development of an overview of these anticipated consequences, as input for further development of the service concept and a plan for the assembly of the required service delivery system.

Type 1 service transformation is summarised below in Table 2.3.

Table 2.3 - Overview of type 1 service transformation

Service ontology	Service as artefact
Service development	A process consisting of phases or stages, which are addressed in a sequential order
Realising service transformation	Assembling a service delivery system to support a service process by rolling out touchpoints according to a specification, which happens during the <u>implementation phase</u> in service development
Streams of literature in service innovation	Process and outcome archetypes of service innovation, assimilation perspective
Generative construct	Design for manufacture and assembly (DFMA)
Program	Implementation during design
Object of design	Service concept and touchpoint specifications
Design in relation to realising service transformation	Develop service interface from holistic and people-centred perspective Explore and evaluate service experience using prototypes of the service
Trained designers in relation to realising service transformation	Apply implementation strategies during involvement in the project Facilitate handover of service concept and service prototypes
Stream of literature in design research	Service Design

Chapter 3 Method

In the previous chapter I presented type 1 service transformation and *implementation during design*. In this chapter I introduce programmatic design research as the methodological approach that I used to explore type 1 service transformation. I used *implementation during design* as a *program*, which facilitated this exploration by providing a scaffold for design engagements. I begin this chapter by introducing programmatic design research and the pragmatist philosophy on which it is based. I address how programs develop through design engagements, the relationship between research questions, program and design engagements, as well as how designing is used to produce academic knowledge. Finally, I discuss criteria for evaluating the quality of programmatic design research and pragmatist inquiry in general.

I used *implementation during design* as a program to explore type 1 service transformation as part of a project in a service development process. The project was aimed at research and development of technology for performing remote and workshop guided troubleshooting on trucks and buses. To provide some general background on the service of troubleshooting trucks and buses, I present the current process of troubleshooting. Then, I present the remote and workshop guided troubleshooting that was the focus of the development project during which I performed the design engagements. Although the project was focussed on developing technology, it is part of a service development process aimed at improving the service of troubleshooting. The project thus provided a fitting context for exploring parts of type 1 service transformation through the program *implementation during design*. I discuss the particular aspects of type 1 service transformation that I expected could be studied, as well as the design engagements that I used

for this purpose. For each engagement, I begin by explaining the goals that I had in terms of exploring different aspects of type 1 service transformation. Then, I present the content of the engagements (setup and materials used). I close the chapter by addressing analysis of the research data from the engagements and the ethical considerations of my research.

3.1 Programmatic design research

Research through design (Frayling, 1993)—also referred to as constructive research (Löwgren, Larsen, & Hoby, 2004) or constructive design research (Koskinen, Zimmerman, Binder, Redström & Wensveen, 2011)—has developed as an alternative to science-based methods of doing research. Research through design emphasises the role that design can play in the development of academic knowledge development: “as design research engages in making many different kinds of things, theory might well be one of those things it is—or could be—making.” (Redström, 2017, p. 1). Programmatic design research has developed as one form of design research.

Programmatic design research builds on the notion of scientific research programs that consist of a combination of theory and hypotheses (Lakatos, Feyerabend, & Motterlini, 1999). In these programs, the theory informs hypotheses for experiments and the outcomes of experiments informs theory and the program (Redström, 2017). The program provides suggestions for experiments that could be used to test the worldview that the program suggests. The outcomes of such experiments provide insights on whether the program still *works*, in other words: whether the program still holds or if the outcomes require that the program should be altered.

In this sense, a program is similar to the notion of paradigms that was introduced by Thomas Kuhn (Gaver, 2012). A paradigm suggests a worldview—a frame or pair of glasses through which we look at the world. Examples of such paradigms are the geocentric and heliocentric models of our universe. A program, however, does not aim to provide a way to look at the world in the way that a paradigm does. It is more specific than a paradigm, and suggests what *designing* is (Redström, 2017).

In programmatic design research, a program is defined and realised by designing, implementing and evaluating design examples that could be part of the scaffold that the program provides. As Brandt & Binder (2007, p. 16) wrote: “[The] program is to the design researcher the suggestion that must be substantiated through experiments.” These experiments in the program do not necessarily have to take the form artefact-centred design sketching

(Löwgren et al., 2004). Analysis of and reflections on the results of these experiments then provide insights for new hypotheses or reformulation of the design program (Redström, 2011). Program and experiments—or engagements⁵ (Seravalli, 2014)—are thus linked: The design program provides a tentative worldview, a provisional knowledge regime (Redström, 2011). It provides a frame, that can then be explored through engagements, which are conducted as if this worldview were true: “Designing *could be* this; what would be its implications?” (Redström, 2017 p. 97). The program partly defines what *designing* is, while the engagement makes a partial definition of what *a design* is within that worldview (ibid.).

3.1.1 The lifecycle of a program

It is not necessary to develop a program first and then realise it through design experiments. On the contrary, it is sometimes only possible to define a program after a set of engagements has been performed, as was the case with the Bauhaus manifesto (Redström, 2017). Initial engagements may lead to the formulation of a tentative program (ibid.) which is then transformed into a series of new engagements that materialise the program further. In other words, the program does not necessarily precede the experiments chronologically, but always epistemologically (Seravalli, 2014).

The relationship between the program and the engagements is dialectic: “the program represents a hypothetical worldview that needs to be materialized, and the experiments are in need of having a frame that provides them coherence and specification.” (Seravalli, 2014, p. 51). The program and the interventions develop simultaneously, in a dialogue between the two (ibid.). Engagements in programmatic design research are not a way to confirm or reject a hypothesis, but rather a way to explore the program, the same way that a design space can be explored (Seravalli, 2014; Redström, 2011). A program is thus not fixed, but “changes in time to accommodate learnings and findings emerging from the experiments, which are the interventions that the design researcher carries out.” (Seravalli, 2014, p. 50).

⁵ The terms experiments, interventions and engagements are used interchangeably in literature on programmatic design research. I will use the term *engagement* because this term incorporates experiments that take place over a longer time (Seravalli, 2014) and the notion of working in the wild (Löwgren et al., 2004), which best fits the nature of the interventions that I performed as a design researcher.

While programs build on a certain worldview, they are not meant to defend that worldview at all cost and cling to it. Rather than staying in the comfort zone of the program, activities should seek out its boundaries (Redström, 2017). The ongoing dialogue between program and engagements comes to a close when the program ceases to inspire new engagements and when engagements no longer provide new insights about the program (Brandt, Redström, Eriksen, & Binder, 2011) or when the worldview of the program is fundamentally questioned (Redström, 2017).

3.1.2 Relation between program and engagements

As previously mentioned, the relationship between engagements and the program is not simply that the program dictates the engagements; there is a dialogue going on between the program and the experiments. Programmatic design research can thus be seen as a conversation with the material, through individual engagements (Seravalli, 2014). This builds on the idea that by engaging in a conversation with the material, designers frame (i.e. define) and reframe the design situation (Schön, 1983). “Problem-setting represents an ongoing process through which a practitioner defines the issue and decides how to proceed to respond to it.” (Seravalli, 2014, p.47). Schön (1983) suggested that the core of design work is problem setting (i.e. framing the problem), not problem solving. Problem setting helps to shape the problem, which is then used as a starting point to determine what needs to take place. In programmatic design research, the program provides the function of setting the problem. Engagements, in turn, provide insights and contribute to the designer’s understanding of the situation.

Framing and reframing the design situation is done in two ways: through exploratory experiments and move-testing experiments (Schön, 1983). The former strategy is aimed at probing the situation whereas the latter involves defining actions that are taken to produce the intended effect (Seravalli, 2014). Such acting in the situation is aimed at change-making as well as an inquiry: “the situation and its materials talk back to the designer informing and adjusting her understanding of it” (Seravalli, 2014, p.49). This is what Schön (1983) calls reflection-*in*-action. In programmatic research, the design engagements allow a designer to engage in a conversation with the materials. The program sets the problem, which suggests engagements that can be performed as exploratory or move-testing experiments. In turn, the outcomes of the design engagements provide what Schön (ibid.) calls ‘back-talk’. This back-talk allows the designer to evaluate whether the current problem setting

is productive given the design situation or whether the problem setting needs to be changed. The difference is that in programmatic research, this process of problem-setting and problem-solving is not meant to facilitate solving a design problem. Instead, the process of framing and reframing the design situation (through the definition of the program) and performing exploratory or move-testing experiments is meant to develop academic knowledge about a phenomenon. In this sense, programmatic research shares common elements with action research (Binder & Redström, 2006).

In the process of framing and reframing designers may subconsciously try to fit a situation to existing frames (Seravalli, 2014). In order to prevent traps of this type, designers apply reflection-*on*-action, which takes place outside of the design actions. Reflection-*on*-action is aimed at determining whether the right problems are addressed: whether the problem is framed correctly. In programmatic design research, reflection-*in*-action takes place during the engagements, while reflection-*on*-action takes place between the engagements (Seravalli, 2014). Together, these activities result in an oscillation between the particular and the whole. In other words, between engagement and program, respectively.

3.1.3 Knowledge contributions in programmatic design research

The formulation of a program is more open than the way in which a hypothesis is traditionally understood in research. As previously mentioned, the program should open a space for experimentation and provide a scaffold for interventions (Redström, 2011). Research questions lie neither on the level of the program nor on the level of individual engagement, rather they are bigger than both program and engagements (Brandt & Binder, 2007; Bang & Eriksen, 2013). It is in the dialogue between the engagements and the program that research knowledge is developed. This knowledge provides answers to the research questions, forming a link to the scientific discourse in the field(s) in which the program is grounded (i.e. the genealogy (Brandt & Binder, 2007)) and where the programmatic design research intends to make a contribution to academic discussions. Such links between design practice and theory can strengthen the work of designers by extending the foundations on which design practice rests (Redström, 2017).

3.1.4 Criteria for assessing the quality of the research

Programmatic design research is grounded in the philosophy of pragmatism. The initial development of pragmatism is ascribed to the classical pragmatists

Charles Sanders Peirce, William James and John Dewey (Bacon, 2012). Pragmatism assumes an objective reality while our understanding of this reality is based on subjective perception: although there is an objective world, this world cannot be observed objectively, but only through subjective interpretations of those who observe it (Rorty, 1981, as cited in Cornish & Gillespie, 2009). In other words, pragmatism rejects the idea of one universal, objective truth and instead considers that multiple truths about the same phenomenon or situation co-exist. Furthermore, pragmatism posits that phenomena are bound to specific contexts and should be seen as situations rather than isolated events. Such situations are not static, but changeable over time. Dewey refrained from using 'truths' to refer to the outcome of pragmatist inquiries (because this suggested a reality in a fixed state) and preferred the phrase "warranted assertibility" (Bacon, 2012, p. 53). Therefore, the outcome of a pragmatist inquiry should not be judged in terms of whether it is a good mirror of an objective reality (Alvesson & Sköldbberg, 2017). Instead, the quality of the research should be judged relative to its situation. Moreover, pragmatism aims to provide actionable knowledge that is considered useful. Usefulness of knowledge as a criterion does not mean that something is true simply if it seems to work (Bacon, 2012). Instead, knowledge is useful if it helps to resolve a doubtful situation: "inquiry does not aim at truth, but at security from doubt." (ibid., 2012, p.21).

In line with pragmatism, programmatic design research—as a form of research through design—does not aim to provide general theories that can be falsified through research (Gaver, 2012). Rather, programmatic design research aims to develop knowledge that is useful for both practitioners and academics (Löwgren et al., 2004). It aims to provide concrete, context-dependent knowledge rather than universal theories (Seravalli, 2014). The contextualised nature of the research is a result of 1) the fact that the researcher is part of the method in programmatic design research, since the researcher both designs the engagements that are part of the research and interprets the back-talk from those engagements, and 2) the fact that knowledge in programmatic design research is co-creating with the practice that is studied. The setup of the design engagements is driven by the researcher's pre-understandings about a situation (Crouch & Pearce, 2012; Alvesson & Sköldbberg, 2017), and by the researcher's agenda (Alvesson & Sköldbberg, 2017). The outcomes of programmatic research should be judged on the extent to which this context-specific knowledge can be used by researchers and practitioners. However, this does not mean that it should

provide a step-by-step guide: “designers can be prepared-for-action but not guided-in-action by detailed prescriptive procedures” (Stolterman, 2008, p.61, as cited in Gaver, 2012).

The context-dependent nature of the knowledge development means that the contributions cannot be evaluated in terms of their generalisability. The pragmatist idea that situations that are being studied change over time means that it is possible to develop other interpretations. For situated research approaches like programmatic design research, generalisability is also of little value (Löwgren et al., 2004). Moreover, Flyvbjerg (2006) posited that “[p]redictive theories and universals cannot be found in the study of human affairs. Concrete, context-dependent knowledge is, therefore, more valuable than the vain search for predictive theories and universals.” (p. 224).

Hence, rather than judging the quality of the programmatic design research presented in this thesis using the notion of generalisation, it should be judged in terms of its *transferability*: the extent to which the findings from the research can provide working provisional hypotheses for researchers who study service transformation in other situations. In addition, programmatic design research should be evaluated using the criteria of novelty and clarity: the extent to which the claims made by the research are a contribution to the genealogy to which the research is connected and how clearly the learnings from the research are articulated, respectively (Seravalli, 2014). Finally, as mentioned above, the results of programmatic design research should be evaluated in the situation in which they were developed and in terms of their usefulness to researchers and practitioners who want to address that situation.

Reliability in this type of research is realised by being open about the research process and the theoretical stances that have been taken (Silverman, 2015). The research can be validated by providing thick descriptions of the research and long-term involvement in a situation (i.e. ‘the field’) (Maxwell, 2005; Creswell, 2014) as well as through constantly comparing provisional hypotheses from one case with other data material, comprehensive treatment of the data as well as seeking out and addressing deviant cases (Silverman, 2015).

3.2 Data collection

In this section I describe the project I have worked on as a design researcher, which has formed the context for the design engagements. I begin by introducing the troubleshooting of trucks and buses, which formed the

context of the project. Then, I describe the content of the project itself as well as how the project provided a fitting context for exploring type 1 service transformation through the program *implementation during design*. Finally, I introduce the design engagements. For each engagement, I first explain the objectives in terms of exploring different aspects of type 1 service transformation. Secondly, I present the content of the engagements (setup of the engagement and materials used).

3.2.1 Context of the project

The project with which I have been involved in was a research and development project that was led by a company that developed transport solutions, which I will refer to as Truck&Bus⁶. The project was set in an industrial business-to-business (B2B) service context. More specifically, it was concerned with the troubleshooting of trucks and buses. Troubleshooting refers to the work that is aimed at finding the cause of a problem with the vehicle and performing repair actions to remove this cause (e.g. replacing a broken part) in order to resolve the issue with the vehicle. Figure 4.1 shows the typical steps in the current troubleshooting process from the point at which a driver notices a problem with the vehicle, through troubleshooting, to continued duty.

⁶ A fictional name that is easier to refer to than a description of the company.

Figure 3.1 – Typical steps in the existing service of troubleshooting trucks and buses

The details of these steps depend on several factors, so they may vary somewhat depending on, for instance, whether the driver is at the same time the owner of the vehicle (or employed by a logistics company that owns the vehicle), the size of the garage, and whether the garage in question is the place through which the vehicle was ordered (also called *home workshop* or *home dealer*). If the troubleshooting takes place at the home workshop, the people involved in the troubleshooting already know each other. Whether the garage is captive (owned by Truck&Bus) or non-captive (independent) may also affect the troubleshooting routines. Moreover, the type of contract for troubleshooting influences the process: if all troubleshooting is paid for separately, an invoice for the troubleshooting work will be sent to the owner of the vehicle. The other option is a contract wherein the owner pays a fixed amount (flat rate) each month rather than paying for each repair separately. In the latter case, the transportation company has the benefit of less fluctuation in their monthly cost, because regardless of the extent of the repairs in a certain month, they always pay the same monthly fee. A downside is that in months where few or no repairs are needed, this contract is more expensive than paying for each repair separately. A transportation company

only becomes a customer of a garage for repairs once a work order has been opened, which happens when the vehicle arrives at a garage. A work order is a contract between the garage and the transportation company and is used as a basis for invoicing. Until the point at which the work order has been created, nothing that a garage does (for instance, troubleshooting over the phone) can be charged. This work can thus be considered as part of creating goodwill with the customer and is therefore done by the home dealer in certain situations.

The process shown in Figure 3.1 is only possible during the hours that the garage is open, because it assumes that employees such as receptionist, mechanic and spare parts manager are on site. Outside of the garage's opening hours, it is possible to call to a roadside assistance office that is open 24 hours a day, seven days a week. Several garages have a mechanic on call 24 hours a day. Several garages have a mechanic on call 24 hours a day, for urgent cases that cannot wait until the next morning to be resolved. For these cases, operators at this roadside assistance office can connect a driver or logistics planner to a mechanic who is on call at a garage near the location of the truck or bus. If after-hours troubleshooting occurs at some garage other than the home dealer, the type of contract also influences the process. If the customer has a flat-rate contract, the home dealer (which receives this monthly payment) reimburses the garage that has performed the repair. If the transportation company pays separately for each repair, the transportation company will pay the foreign garage directly. In cases where a garage that is not the home workshop performs the troubleshooting, the other garage can check the transportation company's *guarantee of payment* with that company's home dealer. The guarantee of payment is the maximum amount that the transportation company will guarantee to pay the garage that performs the troubleshooting. Any troubleshooting work that is likely to cost more than the guarantee of payment covers need to be cleared by the transport company first.

If the vehicle is currently abroad and the driver does not speak the local language, the roadside assistance office can also provide language support, either directly or through a colleague at the roadside assistance centre for the region where the vehicle is located. For instance: a Swedish truck driver who is in Spain to make a delivery can call to the roadside assistance office for Scandinavia and explain the problem in Swedish. The roadside assistance operator then translates this problem description to English and forwards the case to a colleague at the roadside assistance office for southern Europe. In

this example, the roadside assistance colleague in the southern European office would then translate the English problem description into Spanish and forward the case to the garage closest to the location of the vehicle. Then, either the driver continues to that garage (if the truck is drivable) or a mechanic from the Spanish garage drives out with a support van to the truck to troubleshoot the vehicle.

Today, mechanics use software in the process of troubleshooting the vehicles produced by Truck&Bus. They can connect a computer that runs troubleshooting software to the vehicle. Using this software, mechanics can download error codes from the vehicle's onboard computer. The error codes are generated by various components in the vehicle, if sensors in the component register a deviation from the normal operation. Based on these error codes, the troubleshooting software will provide suggestions regarding which components to check in order to locate the cause of the problem. The checks include running diagnostic tests on the component that is suspected to be faulty, in order to collect (additional) data on its behaviour. For example: a mechanic might test the voltage levels in electrical cables to ensure that they are within the normal operating range. The software also provides suggestions for repair actions, such as resetting the instrument panel or replacing a component. The time that all possible repair actions (e.g. change the oil filter) are likely to take have been measured and documented in the existing troubleshooting software. These so-called *standard times* are currently used as to determine the labour costs for a repair; that is, to determine the total time that a mechanic has spent on a vehicle. In some cases, a repair takes more time than the standard time, for instance if bolts have corroded and are difficult to loosen.

The diagnostics software that mechanics use, provides them with information that could be relevant and then lets the mechanic determine what information actually is relevant in the given case. For instance, the software lists all of the potential issues that could have caused an error code to become active. Error codes can be downloaded if the vehicle has a mobile internet connection and the key in the ignition is turned once, to turn on the battery and power the vehicle's electrical systems. Sometimes it happens that when a download is needed, one or both of these conditions cannot be met (e.g. there is no cellular reception where the vehicle is located or the battery is depleted). If the vehicle cannot move and is in a location where there is no mobile internet reception it is not possible to download the codes at all. In this case, a mechanic has to take a support van from the garage (containing tools and

parts) and drive out to the truck, connect a laptop to the broken vehicle using a cable (instead of connecting wirelessly), do a readout of the onboard computer and start troubleshooting from there. Since the latter process is time-consuming, Truck&Bus wanted to research the possibility of improving the communication with the truck.

If a truck or bus needs to be serviced or repaired, it cannot be used for a company's operations. The time that a vehicle cannot be used is also referred to as the *downtime* of the vehicle. During a vehicle's downtime, it cannot transport people or cargo and thus cannot contribute to the production of revenue for the transportation company. Downtime during a delivery job leads to delays which in turn can lead to financial penalties imposed by the company that ordered the shipment and can make it harder for the transportation company to win bids for future contracts. While the importance of on-time deliveries differs somewhat between different countries and transportation sectors, it can be argued transportation companies typically want to limit the downtime of their vehicles and maximise *uptime*. As part of improving after-sales services, manufacturers of trucks and buses can provide a benefit by minimising the time required for scheduled maintenance of vehicles or for troubleshooting vehicles.

3.2.2 Content of the project

The project that I have been part of as a design researcher was a research and development project aimed at exploring the possibility of speeding up the troubleshooting process and to make it possible to find the cause of a problem earlier and with better precision. The project tried to achieve this goal in two ways: firstly, by developing improved algorithms for the software support for troubleshooting and repairing vehicles, and secondly, by making improvements to the hardware on the vehicle, in order to improve the possibility of communicating with the vehicle remotely. Hereafter I will refer to the combination of hardware and software technology aimed at improving troubleshooting and repair as *remote and workshop guided troubleshooting technology* or *guided troubleshooting technology*.

The improved communication with the truck should make it possible to continuously send out error codes from the vehicle's onboard computer to a central server and to run certain diagnostic tests on the truck wirelessly. Instead of *pulling* the error codes from the vehicle when requesting a download from the vehicle's onboard computer, the error codes are *pushed* to a server whenever the vehicle's ignition is on and the vehicle has a mobile

internet reception. The aim of constantly uploading error codes is both to prevent delay in starting the troubleshooting and to increase the odds of having access to error codes at the start of the troubleshooting process.

In addition to researching and developing the possibility of pushing error codes from the vehicle, the project aimed to make it possible to perform diagnostic tests remotely. Currently, it is only possible to run such tests when the vehicle is connected to a computer via a cable (in the garage or if a support van has gone out to the vehicle). Being able to perform diagnostic tests remotely makes it possible to collect additional data regarding the issue before the vehicle arrives at the garage.

The project also aimed to develop a guided diagnostics engine for improved support during troubleshooting. It should be possible to enter error codes and additional data about the issue at hand into a computer algorithm. This algorithm would then give recommendations regarding which diagnostics tests (possible to perform remotely) and workshop tests (only possible to run when the vehicle is in the garage) to run in order to collect more information about the problem and which repairs to carry out. Moreover, the diagnostics engine should consider both the repair costs and the costs of not having access to the vehicle (i.e. cost of downtime), in order to come up with a suggestion for a plan that is optimised to limit the costs of the repair from the vehicle owner's perspective. Figure 3.2 shows what engineers at Truck&Bus imagined the process of troubleshooting and repair of vehicles would look like if the diagnostics engine were available.

The remote and workshop guided troubleshooting technology should allow troubleshooting to take place, not only at the garage, but also when the vehicle is still on the road (see Figure 3.3). The diagnostics engine should support finding the root cause of the problem and planning the remaining parts of the troubleshooting. However, decisions and repair actions will still be made by people. The outcomes of the repair actions are fed back into the diagnostics engine, to update the image that the diagnostics engine has of the vehicle and to log the actions that have been performed by the mechanic. These logs of a troubleshooting case contain all of the information that is collected about the case, such as error codes, results of the remote troubleshooting and the data from the troubleshooting at the garage. This information will be stored centrally and will be available to all actors that are involved in performing the troubleshooting. In addition, the case logs can be used to improve the models and algorithms that calculate the best action plan for troubleshooting.

Figure 3.2 – Description of how the step-by-step guidance by the software would support troubleshooting, as imagined by engineers at Truck&Bus

Figure 3.3 – Depiction of how engineers at Truck&Bus envisioned guided troubleshooting would be done remotely (in case of failure on the road) or at a garage

The project built on a previous development project that I had not been part of, which resulted in a proof of concept of the remote and workshop guided troubleshooting technology. The project that I participated in aimed at developing this proof of concept further so that the remote and workshop guided diagnostics could be tested in a real-world environment. Based on this technology demonstrator, a decision could then be made within the organisation regarding whether or not to take the technology further to the production stage and roll-out to different markets via the company's distributors.

Besides developing the remote and workshop guided troubleshooting technology, the project envisioned that the process of troubleshooting would be sped up through the realisation of a *Helpdesk*, which would perform remote troubleshooting before the vehicle arrived at a garage (see Figure 3.3).

3.2.3 Troubleshooting as a service

While the focus of the project was on the development of the technology needed for remote and workshop guided troubleshooting, the project can also be framed as being part of a service development project, aimed at transforming the troubleshooting service. The deployment of remote and workshop guided technology will shape the service of troubleshooting trucks and buses. It will affect the actors in this service, which include drivers, transport planners, mechanics, workshop receptionists and spare part managers. Additionally, the customer of the transportation company (i.e. the customer's customer) and in some cases even consumers (the customer of the customer's customer) will also notice the effects of changes in the service.

The introduction of this technology will likely change the nature of the mechanic's work in different ways. Mechanics will have a type of software support that suggests a set of next actions in a prioritised order, and that requires them to log their work, rather than only providing notes on the printed work order as reference material for invoicing. In addition, it is likely mechanics have to continue where someone who has done remote troubleshooting before the vehicle arrived at the garage has left off.

It is not just the work that the mechanic does in the service that is likely to change, but the work of other actors at the garage might change as well. For instance: who will decide where the bus or truck will go after the initial (remote) troubleshooting? Will the garage that is appointed be involved and have a say in this decision? In addition, it will likely affect service actors that

are part of service of troubleshooting trucks and busses beyond the workshop, such as the roadside assistance office.

Finally, the deployment of the technology arguably brings changes for actors that are part of the service but are not directly and actively involved in the process itself. For instance, it will require employees from the contract department of Truck&Bus to think about who will own the vehicle data and how this should be communicated. Today, a driver or the owner of a vehicle can give their consent to download data from the vehicle when the roadside assistance department or a garage wants to get a remote readout of the error codes. But if this data is continuously pushed to a server that is owned by Truck&Bus, this consent should be given earlier, and it should also be determined whether and how data that is produced by a vehicle that is owned by a transportation company becomes owned by Truck&Bus.

So, while the R&D project took the guided troubleshooting technology as the starting point and looked primarily at the development and deployment of this technology, this technology affects the service of troubleshooting. If the technology is deployed, the troubleshooting service transforms to become a guided troubleshooting service which is performed partly remotely and partly at a garage. Although the change is due to the planned deployment of new technology (remote and workshop guided diagnostics) the examples above show how the service of troubleshooting is not a technology-driven service; people are and will remain involved in the service of troubleshooting trucks and busses.

Hence, the project that I have been part of can be seen as part of a service development process. The project did not, however, cover the entire process of New Service Development. Firstly, market research to identify user needs had already taken place prior to this project. The understanding of the troubleshooting service—in particular the work of mechanics—that the members of the project group at Truck&Bus had, formed the starting point of a project preceding this one. During this earlier project, a proof of concept of the guided troubleshooting technology had been developed. In addition, the project did not end with the implementation of the service concept of guided troubleshooting. Therefore, it was not possible to study the actual implementation of the service concept. However, it should be possible to study type 1 service transformation through the program *implementation during design* and address the consequences of implementing the service concept.

3.2.4 Structure of the project

The project consisted of different work packages, each focussing on a different aspect of the development of the guided troubleshooting technology. Below, the content of the different work packages is briefly explained:

1. Work package A focussed on developing the diagnostics engine that is required to model the relationships between fault modes of component parts, the related error codes, possible causes of the fault, possible actions to repair or inspect a component, (remote) tests that could be performed to gather additional information about the problem, etc.
2. Work package B explored how the information about component parts could be written in such a way that it could be machine-readable and could thus become input for the diagnostics engine.
3. Work package C aimed at developing the diagnostic engine that would make suggestions for follow-up actions based on the information about the vehicle (error codes from the onboard computer, repair or inspection actions that had been performed, etc.).
4. Work package D worked on developing the hardware and software needed to continuously push fault codes to a central server.
5. The work package that I was involved in, work package E, started with the assumption that the remote and workshop guided diagnostics technology (the hardware and software required for this) had been developed and was operational. Based on this assumption, the aim of the work package was to look into how the availability of the remote and workshop guided troubleshooting technology would affect the troubleshooting service.

The project members met in person on several occasions over the course of the project at times corresponding to project board meetings. In addition, bi-weekly online meetings were held for each work package to give status updates about the work and find opportunities for collaboration where relevant.

The people with whom I have mostly been in contact⁷ were the following members of the project team: Ferdinand (project leader), James (who had a background in computer science and worked as a software engineer on the

⁷ I have used fictional names in order to 'pseudonimise' the people in the project, while still being able to refer to people by a name, rather than their role in the project.

diagnostics engine), Olivia (who had a background in computer science and interaction design and who was involved in work package C), Mathew and Maria (both hardware engineers who worked on the remote connection to the vehicle). The members of the project team were affiliated with different groups at Truck&Bus and external organisations. I have had three different contact persons at Truck&Bus, who were also part of work package E. I started the work with Michelle, who was replaced after about one year by Diane, who in turn handed over to Michael. All three had a background in interaction and user experience design. They worked as interaction designers in the same group as James and Ferdinand which worked on developing workshop information software solutions. Towards the end of the project, Paul, a user-experience consultant, became part of the work in work package E.

3.2.5 My involvement in the project as design researcher

The project started in October 2014 and ended in April 2018. I was actively involved in the project from January 2015 until December 2017 (see Figure 3.4). My role in the project was defined in the project description as working on modelling possible service practices and mapping potential consequences of the deployment of the technology for the work of current service actors. As a starting point, my work assumed that the system and models that were under development in the other work packages of the R&D project would be available and functioning. This would form the basis for learning about how the technology could be used in future workflows within and outside of the garage. It would focus in particular on the systemic requirements and qualities that would need to be considered in order to deploy and integrate the technology into existing practices. Part of this work would involve creating representations of the service practice together with the different actors in the service of troubleshooting trucks and buses.

Figure 3.4 - Time plan of the project where the discrete and continual engagements are mapped over time

During the project I had two simultaneous roles: designer and researcher. As a researcher I was interested in studying service transformation. I was interested in how design as an approach could provide insights for service transformation. The context and structure the project meant that the focus would lie in research and development of the technology for remote and workshop guided troubleshooting. While the project itself can be framed as a research and development project in a service context, the project did not take a service perspective, rather it focussed on the software and hardware for remote and workshop guided troubleshooting. In other words: if I wanted to learn about service transformation and the contribution of design for learning about shaping resources for service practices, I would have to introduce a service perspective to the project myself. I have therefore tried to shift attention away from the technology and the interactions of individual actors with the diagnosis engine, to the value of the service concept of remote and workshop guided troubleshooting.

I have worked to balance producing interesting data for my own research with developing output that was valuable for the project. I did not have any prior experience with the context of logistics and road transport in general or troubleshooting trucks and buses specifically. Therefore, I felt that the best way to deliver results that were relevant to the project would be by working together with the project team and service actors. The quality of the knowledge developed for the project would be higher using this collaborative approach than if I alone, in my role as designer, had been responsible for it. Furthermore, the program *implementation during design* suggests that service implementation can be addressed by involving people who are the equivalent of production engineers in a service context. Their knowledge of the delivery of the existing service helps to determine the consequences of a service implementation, just like the knowledge of production engineers helps to determine the consequences of a product concept design for manufacture and assembly. This approach was inspired by the courses and projects that were part of my master's programme, which had also led me to realise that I feel most comfortable as a designer when giving others the tools that they need in order to express their needs and wishes, rather than designing for them. I have always preferred working collaboratively with people over designing a solution on my own, on their behalf. These were my reasons for taking a role as designer where I facilitated the project team in designing. At the beginning of the project, I focussed more on the role of researcher, while at the end I spent more time in the role of designer.

3.2.6 Framing in type 1 service transformation and the program

The aim of the empirical work was to explore type 1 service transformation through the program *implementation during design*. In order to do this, it had to be possible to frame the development project for improving the troubleshooting service in terms of type 1 service transformation and the program. Below, I will begin with a brief introduction to the way that the project could be described as type 1 service transformation and allowed exploration of type 1 service transformation using the program *implementation during design*. Then, I will address the expectations that I had, given the framing as type 1 service transformation.

I discussed in Section 3.2.3 that the project can be framed as being part of a service development process. This meant that I expected that the project would adhere to the phases in a typical service development process model. I also expected that the realisation of this service transformation would be the implementation of a service delivery system for that service concept. Finally, I expected that the service concept would be delivered through a service process that consisted of a series of dyadic interactions.

Regarding the program, I discussed above that the scope of the project was such that it would not reach the implementation phase. Therefore, the project provided a context in which to explore the program *implementation during design*. More specifically, this implied three things. Firstly, I expected that it would be possible to address the consequences of realising service transformation. Secondly, I expected that involving the equivalent of production engineers for the service of troubleshooting would contribute to the identification of those consequences. Thirdly, I expected that the mapped consequences would contribute to adaptations of the service concept that would be necessary for successfully assembling the service delivery system.

Regarding the role of design and trained designers, I expected firstly that Service Design would entail the conception of a service concept by applying a holistic, people-centred perspective and a design process that would begin by researching the users' needs and end with delivering a prototyped service concept. I also expected that my role as trained designers would be to apply implementation strategies and facilitate handover to other people in the organisation, who would then develop the service concept further towards implementation.

As I mentioned earlier, the project can be framed as a being part of a service development process that is aimed at improving the service of troubleshooting. While most of the work in the different work packages focussed on developing the hardware and software that were required for the remote and workshop guided troubleshooting (see Section 3.2.2 and Section 3.2.4), the project can also be framed as part of service development (see Section 3.2.3). More specifically, the service can be framed as an industrial business-to-business service. As a result of this, I had three particular expectations related to type 1 service transformation when I planned design engagements in the project.

First, I expected that it would be possible to identify the different phases of the service development, most notably a design and implementation phase. In a previous project, a proof of concept for the remote and workshop guided troubleshooting technology had been developed, which would be developed further during the current project. Furthermore, the outcomes of the project would be used to support a decision about whether or not to continue with the production and deployment of the remote and workshop guided troubleshooting technology. The project thus seemed to follow a similar process model to those described in New Service Development literature, where a service concept is developed and tested before handing it over to those who are responsible for implementing it, as discussed in Section 2.1.2.

Second, I expected that the design phase of the project would consist of developing and testing a service concept, while the realisation of service transformation would consist of the implementation of this service concept. In order to realise this service, a service delivery system would need to be assembled that would support a service process. Since the project could be framed as a service development project of the type that was discussed in 2.1.2, I expected that it would be possible to define the service concept for remote and workshop guided troubleshooting and the related service process. Realisation of service transformation through the assembly of a service delivery system (as addressed in 2.1.3) would not be possible to study, since the project would not stretch into the implementation phase of service development.

Third, given that the project could be framed as being part of a service development process, I expected that it would be possible to define the guided troubleshooting service in terms of the service value (i.e. a service concept) that would be delivered through a service process, in line with what was discussed in Section 2.1.1. In turn, I expected that it would be possible to

define the service process as a series of touchpoints where dyadic interactions would take place.

To elaborate on the expectations relating to exploring the program: I mentioned above that the current project would not continue all the way through to implementation, or the realisation of service transformation through the assembly of a service delivery system. This meant, of course, that it would not be possible to study service transformation itself, but the project still provided a way to assess whether it would be possible to address type 1 service transformation as a concept, earlier in the service development process. In other words, it would be possible to explore the program *implementation during design* as part of this project. More specifically, I expected that I could explore the following three aspects of the initial program and the way design and trained designers relate to the service transformation.

First, I expected that it would be possible to identify the consequences of the service concept. The program, *implementation during design*, uses design for manufacture and assembly (DFMA) as a generative construct. DFMA uses knowledge about various existing production and assembly processes in order to determine how a product concept can be optimised for production and assembly. Similarly, *implementation during design* focusses on determining the consequences of implementing a service concept during the design phase of service development. The consequences might include both prerequisites for the delivery of the service concept (service process and service delivery system) and effects on the existing service infrastructure. Since the project is compatible with the way service development was framed in Section 2.1.2 and the positioning of this project allowed exploration of the program *implementation during design*, my expectation was therefore that it would be possible to address the consequences that design decisions about the service concept would have on the assembly of the service delivery system.

Second, I expected that identifying the consequences that the service concept would have for service implementation would require the involvement of the equivalent of production engineers in a service context. In design for manufacture and assembly, the optimisation of the product concept takes place in dialogues between designers and production engineers (Boothroyd et al., 2011). To be able to identify the consequences of a service concept, such dialogues would need to take place with actors that have a relationship to the service that is the equivalent of the relationship of

production engineers to manufacture and assembly of products. The designer of a service concept can foresee some of the consequences of the service concept design, just like product designers are likely to have some knowledge of how easy or difficult it will be to produce and assemble a certain design. However, the dialogue with production engineers (in product design) and their equivalent in a service context is necessary to find all of the consequences of a concept design. Therefore, in this project I expected that there would need to be dialogues between the project team (as the designers of the service) and actors who were familiar with the service of troubleshooting (as the equivalent of production engineers). The consequences of the service concept for service transformation would be mapped in those dialogues.

Third, mapping the consequences of a service concept for the assembly of a service delivery system was suggested as an input for adapting a service concept to better support the assembly of the service delivery system. Based on the feedback regarding the consequences of a proposed service concept, the concept can be adjusted in such a way that it addresses any undesirable consequences for the realisation of service transformation. Further development of the service concept will then include detailing the touchpoint interactions and developing specifications for the different touchpoints that can be used to implement them. In this project, I expected that it would be possible to use the consequences that were addressed by service actors as input for further development.

To elaborate on the contribution of design and trained designers, I expected firstly that Service Design would be to apply a holistic, people-centred perspective during a typical Service Design process (see Section 2.3.1), using external representations to explore, evaluate the service, and to communicate about it. At the beginning of the project there were only representations that explained how the remote and workshop guided troubleshooting technology was envisioned to work (see Figure 3.2 and Figure 3.3). I expected that a Service Design approach would facilitate a more holistic and people-centred perspective on the development of the guided troubleshooting service.

I also expected that an appropriate role for me as a trained designer would be facilitate the realisation of service transformation by 1) applying implementation strategies during the design phase and 2) support the handover of the service concept to those who would work on assembling the service delivery system by making the prerequisites for the remote and

workshop guided troubleshooting specific. These expectations were based on how literature addresses the work of trained designers in relation to type 1 service transformation, as presented in Chapter 2.

3.2.7 Design engagements to substantiate the program

I have used design engagements to substantiate the program *implementation during design*. I have planned, designed and performed discrete engagements, such as workshops that I facilitated, and I have also been part of more ad-hoc engagements, as a result of my continuous involvement in the project. Figure 3.5 shows an overview of the discrete design engagements. The discrete design engagements were set up to explore the constructs of the program *implementation during design*, which were addressed above in Section 3.2.6. These engagements are briefly introduced below and elaborated on in Sections 3.2.7.1.-3.2.7.4. I have documented the thoughts and decisions that went into setting up and planning these engagements in my research diary. In addition to the discrete engagements that were designed and planned up front, there have also been a number of continual engagements in the project (e.g. project meetings, presentations) that were of a more ad hoc nature than the discrete engagements. These continual engagements are described in more detail in Section 3.2.7.5. I have documented these engagements in my research diary as well.

Since the focus in this project was on the development of the guided troubleshooting service, I began by looking at whether it would be possible for the project team to define a service process and service delivery system for a service concept that builds on remote and workshop guided troubleshooting. This was the goal of engagement 01, which shifted the focus from functions of the technology to value of the service. The assumption behind this was that by defining and representing the envisioned service process and touchpoints that had been envisioned, it would become possible to determine the prerequisites and effects of the design decisions. Therefore, engagement 01 focussed primarily at articulating the service process and service encounters for remote and workshop guided troubleshooting.

Figure 3.5 – Positioning of the discrete design engagements in relation to each other in terms of the purpose of the engagement and the people who were involved

The flow-type representation (Diana et al., 2009) of the remote and workshop guided troubleshooting that was developed during this design engagement was used as a foundation when addressing potential consequences of the design decisions with service actors outside of the project team. In order to test the notion of addressing implementation as a concept during service design, I was interested in knowing whether service actors could define consequences of the decisions that the project team made in their design of the service concept. If so, I also wanted to know how these consequences were addressed. Therefore, engagements 02 and 03 allowed service actors in the frontstage and backstage of the troubleshooting service to evaluate the design of the service concept for remote and workshop guided troubleshooting. During engagement 02 some of the actors that operate in the backstage of the troubleshooting service participated in an evaluation workshop. In engagement 03 frontstage actors were involved through interviews. Engagements 02 and 03 thus mainly aimed to articulate consequences of the service concept.

The prerequisites for and effects of the service that these engagements identified could inform specifications for the assembly of the service delivery system that would support the guided troubleshooting service. During engagement 04, data from the interviews with frontstage service actors was provided to the project team, in order to help them understand the consequences of the design decisions that they had made during engagement 01 and to determine what to keep and what to change in the service concept before service implementation. Therefore, this engagement was mainly focussed on identifying the consequences of the service concept but also addressed making changes to the service concept in advance of implementation.

3.2.7.1 Engagement 01: From functions of the technology to value of the service

This engagement consisted of two workshop sessions of four hours each. During this engagement, I introduced a service perspective to the project as a way to test the assumption that the remote and workshop guided troubleshooting could indeed be framed as a service. In addition, the engagement focussed on defining the envisioned guided troubleshooting service. My assumption was that when the service concept and service process were defined, it would be possible to determine what would be required to deliver the service (i.e. what the prerequisites for the service were) and to evaluate effects of the design decisions related to the service concept and the touchpoints in the service process. In Figure 3.6, the position of engagement 01 in relation to the other engagements is highlighted.

- trained designers could contribute to realising service transformation by facilitating the project team in designing the service concept of remote and workshop guided troubleshooting and making the consequences for this service concept explicit.

From the perspective of the development project, the main aim of the first engagement was to get the members of the project team to think about their project as part of a service development process and to begin to consider service transformation during the early phases of a service development process. This engagement aimed to define the service concept for remote and workshop guided troubleshooting, as well as its service process. In turn, it would be possible to consider the assembly of the service delivery system during the development of the service concept (i.e. early in the service development process) rather than when actually assembling the service delivery system (i.e. late in the process).

Therefore, for development project, the first engagement was meant:

- to let the project team consider remote and workshop guided troubleshooting as a service.
- to learn how the project team viewed the value that the guided troubleshooting service (which would be based on the technology being developed) would provide value for the service actors involved in it.
- to let the project team consider realising service transformation before the development process reached the implementation phase.
- to start development of an overview of the consequences of the service concept in relation to the current troubleshooting service.

This engagement was intended to help determine desirable ways of setting up a certain touchpoints. The result would service as a basis for evaluations with service actors, to determine whether the interactions would be realistic and desirable from their perspective. After this project had been completed, the definition of the service process as well as the service value and interactional qualities for each touchpoint interaction could be used to evaluate whether service transformation had been realised as it was intended.

Within these overall aims, the first workshop was meant to introduce a service perspective to the project. It aimed to let the project team:

- consider remote and workshop guided troubleshooting as a service (rather than only as a technology).
- define how they envisioned the service process for guided troubleshooting in general.
- assess how they envisioned the service process in specific situations.

During the second workshop we went from covering the service process as a whole to addressing interactions in the individual touchpoints. We addressed specific touchpoints in the service process in more detail. The aims of the second workshop were:

- to determine whether it would be possible to define what the touchpoints should/would look like.
- to look at the value that would be delivered through the interactions in the touchpoint.
- to determine the interactional qualities that would help to realise those intended service values in the touchpoints.

Content of the engagement

During the first workshop session, the project team designed the service process for the envisioned guided troubleshooting service. During the second workshop session, they zoomed in on specific interactions that would be part of the service process. Both workshops were video recorded.

In the first workshop the participants:

1. mapped the activities of the envisioned service individually and presented their individual views to each other.
2. combined their individual views into a shared view.
3. used scenarios that were based on real-world examples to stress-test the shared view of the envisioned service of guided troubleshooting.

Since the project team was new to using a service perspective, I decided to start with the concrete aspect of defining activities that the participants envisioned as part of the future service. They were asked to consider what the service of troubleshooting would look like when the remote and workshop guided troubleshooting technology was deployed.

Each member of the project team first documented individually how they envisioned the process for the remote and workshop guided troubleshooting service. Prior to the first workshop of this engagement, I asked the participants prepare for the session by thinking about how they envisioned the troubleshooting service where there would be remote and workshop guided troubleshooting. During the workshop, I gave them a template to define the steps that they envisioned would take place from the moment a truck or bus broke down to the moment when it was working (see Figure 3.7). By letting the participants consider the entire process, I expected that they would not only look at the technology but at the service (cf Sangiorgi & Clark (2004)). Once each participant had defined this process individually, we moved on to formulating a shared vision of the process.

I chose to move from individual views to one shared view because I wanted to consider the differences there were among the team members in terms of their visions on the guided troubleshooting service. As a researcher, I was interested in how the project team would talk about activities, goals, and people in the process, as well as, what the project team thought the service actors needed in their work.

Figure 3.7 - Template for exercise to define the service process with remote and workshop guided troubleshooting, from the moment when there is a problem with a vehicle (left) to the point where it is on the road again (right)

In contrast to the development of the collective view, the exercise with the scenarios focussed on the concerns of the actors in the scenarios. Having defined a generic service process in the first two exercises, I let the project team assess this process by using a number of scenarios. For this exercise I had prepared a set of cards that contained different scenarios (see Figure 3.8 for some examples of scenarios). The scenarios were based on observations and contextual interviews during my visit to a garage, earlier that year, as well as on secondary data that was provided by Michelle.

I let each group draw a card and instructed them to build a process view, as we had done before the break, with the scenario described on the card as the starting point. I then asked them to map the process from the moment the problem occurs until it is resolved again for the situation that was described on the scenario card (see Figure 3.9). I told the participants to link the decisions that were made in the troubleshooting process and the content of the visualisation of this process to the scenario; the decisions had to fit in the scenario. During this exercise, the participants could explore how the generic process that they developed earlier during the workshop could accommodate variations. My intention with this exercise was to facilitate a discussion among the members of the project team about what situations should be supported by the remote and workshop guided troubleshooting and what situations would fall outside the scope of the technology development and the service. As a researcher, I was interested in hearing the concerns and requirements that the project team discussed in relation to the scenario and what they would choose to focus on. Would the steps and actions they recommended change given the new scenario, and what new requirements did they identify as necessary in order for service actors to do their work?

Figure 3.8 - Examples of the content of the scenarios that the participants could draw (back side of the cards)

Figure 3.9 - Defining the service process for a specific situation in a scenario

In the second workshop, the project team zoomed in on several touchpoints in the service process and:

- defined 1) interaction qualities for the touchpoints, 2) who would contribute to those qualities and 3) how the qualities would provide (positive or negative) service value.
- discussed how the interaction qualities of one touchpoints might affect interaction qualities and service value in other touchpoints.

I started the second workshop by presenting what we would be working on during this second workshop. In workshop 1, we focussed on the process, and in the second workshop we would examine specific touchpoints of that process. We would explore what interactional qualities these touchpoints should have, which actors could contribute to those qualities and how and for whom these interactional qualities would be valuable. We would explore the benefits we wanted to provide for managers, drivers, mechanics, receptionists, Helpdesk employees, etc., as well as possible consequences that the characteristics of one touchpoint could have for other touchpoints in the process.

Following this introduction, I gave a recap of the first workshop and the digitised version of the service process as it was envisioned during that first workshop, in order to gather input on possible changes.

I then introduced the participants to the template that they would use to define qualities and values for these interactions (see Figure 3.10). I explained that they would be identifying qualities for several of the interactions in the

service process and identifying the value that these qualities brought to the interaction: for whom a quality of a service interaction is valuable. I mentioned that it could be useful to think about what the goals of these actors are and what they need in order to achieve their goal. Using the template, the workshop participants would write down: the qualities they considered relevant for the interaction (1), which actor(s) would contribute to that quality (2), how the quality would be valuable for each actor (3) and what negative value could occur for the actors (4). For each interaction, the actors that were identified during the first workshop as being involved in that interaction were included on the template. The two rightmost columns in the ‘actors’ section were unlabeled, to allow participants to add additional actors that were not pre-printed.

Troubleshooting by helpdesk									
Names of those in the group:									
1	2						3	4	
Qualities	Which actors contribute to the quality?						How is the quality valuable for each actor?	What negative value could occur for the actors?	
	Driver	Helpdesk	Vehicle	Expert for helpdesk	Owner/manager/fleet care	Backoffice IT system			
Main scenario									
Scenario 2									
Scenario 3									

Figure 3.10 - Template for defining interaction qualities and how these qualities create value for the service actors involved. Sections about qualities per interaction (1), which actor(s) would contribute to that quality (2), how the quality would be valuable for each actor (3) and what negative value could occur for the actors (4) are highlighted

To clarify the meaning of ‘qualities’ and ‘values’, I used two examples of service encounters, to illustrate the concept of qualities of service interactions and value for the stakeholders in the interaction. The first example involved a bank transaction between a clerk and a customer of the bank. If a quality to describe this process was ‘solid’, it would be valuable for customer because it gives a sense of security. For a clerk it would be valuable because they are seen as a trustworthy person. In this example there were no negative service values. The second example was about a checkout at a supermarket. If the quality of the process is ‘speedy’, it would be valuable for customer because it provides time savings. However, there is a possible negative value for a cashier because it might be stressful to handle the checkout quickly.

After this introduction to interaction qualities and service value, I let the participants discuss, in two groups, the value and interactional qualities for several touchpoints of the service process as defined in the first workshop. I let the participants begin by defining what they considered general qualities for the touchpoint in question and then asked them to use the framework developed by Arvola and Holmlid (2016), that consists of different types of service value, to articulate what kinds of value the members of the project team aimed for in the service process. I provided scenarios again (see Figure 3.11), because in the first workshop scenarios helped to go beyond a focus on the logistics of the service process and adopt a people-centred perspective that addresses the concerns of service actors. In this case, the scenarios were not meant to be discussed specifically, but to help the project team think consider what could happen in the touchpoint in question and what interactional qualities and service values would be desirable.

Figure 3.11 - Example of the scenario cards for the handover from Helpdesk to workshop

The last part of the workshop focussed on looking at possible consequences of the qualities in one interaction for touchpoint interactions for other parts of the process. For instance, being quick in one interaction might mean that actors in later interactions have less time to prepare themselves, leading to added stress and possibly a bottleneck. This discussion was planned to take place in separate groups, but due to time limitations, all participants were present in one group instead.

I provided the participants with a template for each of the touchpoints that they had looked at during the previous part of the workshop. An example of such a template—for consequences of *troubleshooting by Helpdesk*—is shown in Figure 3.12. In the template, the touchpoint that was in focus was highlighted (1). The column consisted of six cells, providing space for up to six qualities. For each quality, there is room to write down both expected positive (2) and negative (3) consequences of that quality for the touchpoints before and after the touchpoint that was in focus (see Figure 3.12).

I added this exercise because I considered it important that the project team assess possible consequences of interaction qualities and service values. As a researcher, I added this exercise because I was interested in how the project team would discuss consequences of the qualities that they had defined for touchpoint interactions.

[illegible]

Figure 3.12 - Template for defining expected consequences of qualities of the interactions, with room to write down up to six intended qualities (1) and expected positive (2) and negative (3) effects of this quality on other stages in the process

The service process had been made more concrete as a result of this first engagement. The next step was to involve people who are involved in the service, both in the backstage and in the frontstage of the service, during two other engagements.

3.2.7.2 Engagement 02: Backstage service actors articulate consequences of the service concept

During the second design engagement, which was a workshop that lasted four hours, actors involved in the backstage in the existing troubleshooting service were asked to evaluate the service process of guided troubleshooting service that the project team had developed during the first engagement. More specifically, they were asked to address consequences that they imagined the service would have if it were to be realised.

My motive for involving other parts of the organisation was to include them in thinking about further development and realisation of service transformation. I had decided to first work with the project team on the development project and then gradually involve people beyond the project team, in line with suggested approaches in change processes (Kotter, 1995; Beer & Nohria, 2000). This would allow the project team to create their vision of service first and then let other people in the organisation test this vision in order to uncover consequences of realising service transformation that had not been considered yet. In Figure 3.13 the position of engagement 02 in relation to the other engagements is highlighted.

Aim of the engagement

The aim of this second engagement was to continue to explore type 1 service transformation, the program *design for implementation* and the relationship between design(ers) and the realisation of service transformation. In this engagement, I wanted to involve people beyond the project team at Truck&Bus, to:

- prepare them for the realisation of the guided troubleshooting service.
- inform them about the work the project team was doing.
- ask for their help in determining consequences of the implementation of the guided troubleshooting service concept.

Figure 3.13 - Engagement 02 in relation to the other engagements

More specifically, my aim as a design researcher was to use this engagement to explore how involving the equivalent of production engineers in the troubleshooting service would:

- help to fill gaps in the service concept that were left after the first engagement.
- contribute to finding consequences of design decisions in the service concept for realising service transformation (i.e. finding effects of the existing troubleshooting service and prerequisites for the guided troubleshooting service).

My original plan was to invite people within the Truck&Bus company who would likely be involved in the assembly of the service delivery system for the guided troubleshooting service. I wanted to ask them to think along about the project and the envisioned transformation of the troubleshooting service: What would be required to realise the envisioned service process? Where did they see bottlenecks and obstacles? I suggested involving people who were

knowledgeable about the garages, the roadside assistance and those who would likely be responsible for packaging and marketing the services based on remote and workshop guided troubleshooting. In an e-mail to the project leader, Ferdinand, I wrote that I wanted to involve:

- people who were responsible for the garage network, because I believed that their more detailed knowledge about the garages would be valuable and because they would most likely be responsible for introducing/rolling out the new way of doing troubleshooting at the garage.
- people who were responsible for roadside assistance, whose work would change (based on the design of the service process that we created during the first workshop) and would include remote troubleshooting in the future. I believed that their knowledge regarding current ways of working as well as their ability to assess the consequences of the changes in this work and the responsibilities of roadside assistance would be valuable in the session.
- people who would work on packaging and marketing the (extra) service of guided troubleshooting to Truck&Bus clients/vehicle owners and providing the required material for the service salesforce at garages. I believed that their knowledge regarding how Truck&Bus services are marketed and communicated will be valuable in the engagement.

I explained to Ferdinand that I wanted to invite people who had knowledge regarding economics and costs for the guided troubleshooting service. I assumed that knowledge about these factors would be distributed among these groups of people whom I suggested should participate.

In response to my e-mail, Ferdinand suggested involving people in the following positions in the organisation:

- **Method engineer**, who creates the descriptions for tests and repair actions for different systems on a truck or bus that are described in the software that mechanics currently use for troubleshooting.
- **On-board diagnostics**, who work on developing systems that support diagnosis by the on-board computer and triggering warning lights (if necessary).

- **A software developer**, who focussed on developing software environment for method engineers where input options are designed in such a way that they can be machine-readable.
- **Workshop flows**, who are responsible for developing the way work is structured into workflows at garages.
- **Fleet uptime manager**, who are responsible for monitoring vehicles and detecting if the behaviour of components deviates from the way they are supposed to work.

Ferdinand decided not to invite the people who actually sell service contracts.

I did not know exactly what kind of knowledge the people would contribute, because I did not know much about the content of their daily work. Therefore, I let go of my original aim of focussing explicitly on finding the information that would fill the gaps in the service concept that were left after the first engagement. Instead, I decided on three topics to explore in the workshop session:

- What participants thought they would be able to contribute in the service.
- How they thought the service would affect their work.
- How they thought the service would affect other people who would be involved.

Regardless of the knowledge that the participants would bring to the session, they would be able to answer based on the knowledge and understanding that they had of the current troubleshooting service.

Content of the engagement

I started the workshop with an introduction to the project, and a presentation of the flow-type visualisation of the service that was the outcome of the first engagement (see Figure 3.14 and Figure 3.15).

Envisioned process steps for guided r

Figure 3.14 - Flow-type representation of the envisioned service presented to the participants (left half)

remote and workshop troubleshooting

Figure 3.15 - Flow-type representation of the envisioned service presented to the participants in (right half)

I explained that I wanted the participants to consider, for each row of the flow-type visualisation, at:

- Are the steps realistic? Why are they (un)realistic?
- What additions/changes/suggestions/etc. do you have for the steps?
- How does your work relate to this?
- How can you contribute to the realisation and implementation in the organisation? Why?
- How do you think that your work will be influenced? Why?

The participants addressed these questions in groups of two. When rows one and two (see Figure 3.14 and 3.15) had been addressed, each group presented the outcomes of their discussion to the each other. After rows three and four and been addressed, the participants presented again. Video was taken of these presentations.

3.2.7.3 Engagement 03: Frontstage service actors articulate consequences of the service concept

In addition to involving actors from the backstage of the troubleshooting service, this engagement involved actors in the frontstage of the service. During a series of interviews, that were performed in different countries, the flow-type representation of the guided troubleshooting service as it was envisioned by the project team was used in a dialogue with frontstage actors about the service concept and possible consequences of implementation. In Figure 3.16 the position of engagement 03 in relation to the other engagements is highlighted.

Aims of the engagement

As a design researcher, my aim with this engagement was to further explore type 1 service transformation, as well as how design and trained designers relate and contribute to it. More specifically, I wanted to explore:

- How involving the equivalent of production engineers for the troubleshooting service would contribute to identifying the consequences of design decisions in the service concept for realising service transformation.
- My role as trained designer in addressing service transformation during the design phase of service development by involving service actors in the evaluation of consequences of a service concept for service transformation.

Figure 3.16 - Engagement 03 in relation to the other engagements

For the project, this engagement was aimed at investigating:

- What frontstage service actors value in the service concept of remote and workshop guided troubleshooting.
- What effects frontstage actors see on their own work from the implementation of the service concept of guided troubleshooting;
- How frontstage actors at garages reason about how guided troubleshooting will affect the service that they can provide for Truck&Bus customers.

In addition, my goal for the interviews was to determine 1) how the informants reasoned regarding the service they provide and 2) if/how this would change with the implementation of the guided troubleshooting service. Furthermore, I wanted to learn what the informants at the garage thought the consequences of service transformation would be for other service customers, such as drivers and transport planners.

Content of the engagement

In total, 40 interviews were conducted in four different countries across Europe and Africa (see Table 3.1). Unfortunately, it was not possible to conduct interviews with drivers, because of their full schedules: they are either on the road or resting before their next driving shift. A member of the project team joined me during the interviews with representatives of transport companies and employees at the garages in foreign countries. James (a software engineer who worked on the diagnostic engine) joined me on two trips and Ferdinand (the project leader) accompanied me on one trip. The interviews lasted between 30 and 120 minutes, with an average time of around 75 minutes. The interviews were audio recorded.

For the interviews with the representatives of transport companies and employees at garages, a representative from the distributor joined the conversation. In these interviews in the European countries (24 interviews), the representative translated questions from English to the local language and translated the interviewees' answers from the local language to English. All the 14 interviews in Africa were conducted in English. The two interviews with the roadside assistance operators were performed in the local language of the operators but did not require an interpreter.

The visits to garages and companies of Truck&Bus customers consisted of both observation and semi-structured interviews. A visit started with a short tour of the premises, which aimed at getting an understanding of the context of the garage or the transport company. At the garages, the tour was aimed at gathering information regarding, for instance, workflows at the garage, responsibilities, level of technical knowledge that different employees had, as well as the use computers and software in their work. At the transportation companies, we gathered information regarding workflow and division of labour, as well as the contact they had with their customers, their drivers and the garage.

Table 3.1 - Overview of the interviews, broken down per country and position of the service actor

	Country 1 (Europe)	Country 2 (Europe)	Country 3 (Europe)	Country 4 (Africa)	Total
Workshop manager	2	2	-	2	6
Receptionist	2	1	-	2	5
Mechanic	2	4	-	2	8
Person responsible for spare parts	-	1	-	2	3
Service manager	1	2	-	2	5
Transport company representative	4	3	-	4	11
Roadside assistance operator	-	-	2	-	2
Total	11	13	2	14	40

After the tour of the premises, the semi-structured interviews were conducted together with the member of the project team that accompanied me on the trip. We talked with the informants about the current work and routines, as well as the development and implementation of the guided troubleshooting service. The interview started with general questions regarding the daily work of the informant. The interviews were set up like this to give the interviewees an *easy start*. We wanted to gather information on these topics and to have the interviewees think about and reflect on them, so that they would be sensitised about the existing troubleshooting service when we began to discuss the guided troubleshooting service and the potential consequences of service transformation. Knowing more about their work also allowed to ask follow-up questions and facilitate the informant's reflection on the consequences of the guided troubleshooting service.

During the second part of the interview, the development project was introduced through 1) a written description of the aims of the project and generic process for the service (developed in collaboration with Ferdinand, the project leader) and 2) a flow-type visualisation of the envisioned service process, based on the outcomes of the first part of engagement 01 (see Figure 3.17). The written description introduced the project as a research project with the goal of speeding up the process of troubleshooting by finding the

Figure 3.17 – The left and right halves (top and bottom, respectively) of the flow-type representation of the envisioned service, based on the outcomes of engagement 01. Used for interviews in Europe (including roadside assistance operators)

cause of the problem earlier and with better precision. It explained that these changes would hopefully lead to more uptime for the vehicles. The text then continued by explaining that the project explored 1) the development of software for step-by-step guidance to diagnose the problem with better precision and provide support during the troubleshooting and 2) the introduction of the Helpdesk as a new part of the process of troubleshooting, with the goal of obtaining an accurate diagnosis of the problem earlier in the process. Finally, it explained the envisioned service of remote and workshop guided troubleshooting, from the moment a driver calls the Helpdesk, through remote troubleshooting, the handover to a garage and the work that a mechanic performs to replace the broken part. This description was based on the outcomes of the workshops with the project team (i.e. engagement 01). The visualisation of the process consisted of three rows that discussed, for each step in the process (i.e. each touchpoint), 1) what would happen at that

touchpoint, 2) who/what would be involved in that touchpoint and 3) what those involved would need in order to complete their work at the specific touchpoint. This visualisation was used during the interviews in the European countries.

After the introduction of the project, the remainder of the interview focussed on any consequences that the interviewee anticipated as a result of the implementation of the guided troubleshooting service. The interviewees were asked both about anticipated effects for their own work and the work of other actors. For instance, personnel at the garages were also asked about what effects they believed the implementation of the service would have for drivers and logistics planners who work at the transportation companies.

In addition to interviews with actors at garages and transportation companies, I conducted interviews with two of roadside assistance operators in Europe. These interviews had the same structure as the interviews during the visits to garages and transport companies in Europe: I started by addressing the contemporary work of the roadside assistance operators and continued with an introduction to the project, using a textual and visual description of the project. The flow-type representation that was used during the visits to garages and transport companies in Europe was also used in these interviews. The remainder of the interview focussed on the consequences that the roadside assistance operators anticipated for themselves and other actors in the troubleshooting service if the transformation to the guided troubleshooting service were to be realised.

Between the interviews in Europe and the interviews in Africa, the visualisation of the envisioned service was redesigned. I redesigned the visualisation together with James, the member of the project team who accompanied me during the interviews in one of the European countries and who would also join me on the trip to Africa. I provided sketches for a number of alternative redesigns that we developed together into redesigned visualisations, which are presented in Figure 3.18 and Figure 3.19. In comparison to the initial version, these representations have more visual and less textual information. Furthermore, two separate versions were developed, to make more explicit the distinction between the scenario where a vehicle can continue to the garage and the scenario where the garage has to send out an assistance vehicle because the truck or bus cannot drive on. In addition, the project description was shortened, the term 'Helpdesk' was

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Figure 3.18 - Updated version of the representation of the envisioned service, showing the normal situation, when the truck is driven to the workshop

Figure 3.19 - Updated version of the representation of the envisioned service, showing the process in case the mechanic has to go out to the truck because the truck cannot drive on

replaced with ‘advanced assistance’ and an overview of the generic troubleshooting process was added to the textual description of the project that was provided at each of the interviews (see Figure 3.20).

The overall structure of the visits and the interviews in Africa was the same as during the visits to customers and garages in Europe: each started with a tour of the premises, followed by the semi-structured interview. The interviews started with questions about the daily operations in the contemporary situation and the second part of the interview was about the project and the consequences that the interviewee anticipated for their own and work the work of other actors involved in the troubleshooting service, if the guided troubleshooting service concept were to be implemented.

Figure 3.20 - Overview of the generic process that was shown as part of the project description during interviews in Africa

3.2.7.4 Engagement 04: Rich data to iterate the service concept

This discrete design engagement consisted of a workshop of four hours in total, divided into two blocks of two hours of work, before and after lunch. During the workshop, data from the interviews with frontstage service actors was presented to the project team. The members of the project team used quotes from the interviews to discuss continued development towards realising the service transformation to support remote and workshop guided troubleshooting.

Aims for the engagement

As a design researcher, this engagement was aimed at exploring the following aspects of type 1 service transformation:

- If and how applying holistic and people-centred perspective of Service Design during the earlier engagements would help to arrive at a prototyped and tested version of the service concept.
- If and how the consequences of implementing the service concept that came up during the interviews would cause the project team to consider service transformation when making changes to the service concept.
- If and how the adapted service concept and service process could be detailed further by specifying elements of the service delivery system for remote and workshop guided troubleshooting.
- The extent to which would be possible to develop an implementation plan based on detailing of the service concept and service process as well as definition of the elements of the service delivery system.

In Figure 3.21 the position of engagement 04 in relation to the other engagements is highlighted. For the project, the aim for this engagement was to explore how the vision for the service needed to be developed further, based on feedback that actors in the service practice had given during the interviews (engagement 03). The way in which engagement 01, 03 and 04 are related in time is shown in Figure 3.22.

Figure 3.21 - Engagement 04 in relation to the other engagements

Figure 3.22 - The way in which engagements 01, 03 and 04 were linked: the flow-type visualisation that was based on the outcome of engagement 01 was used during the interviews of engagement 03 to get feedback from service actors on the envisioned guided troubleshooting service. This input was then fed back to the project team.

During engagement 04, the project team compared their vision of the guided troubleshooting service, developed during engagement 01, to the comments from interviews with actors in the frontstage of the existing troubleshooting service. The results of this comparison were used to update the design of the guided troubleshooting service and determine how to continue towards implementation of the service concept. My expectation for the project was that this engagement would lead to a redesign of the guided troubleshooting service and possibly to a reprioritisation of the future work for the development of the service concept and realisation of service transformation.

Content of the engagement

To support a dialogue within the project team about whether and how to iterate on the service concept, I provided its members with quotes from the data gathered during interviews with service actors in Europe⁸. Rather than providing the project team with the outcomes of an analysis of this data, I let the project team work with the raw data itself, so that they could determine which aspects they felt needed to be prioritised. I let them interpret selections from this data themselves as a starting point for a discussion about whether the envisioned service concept needed to be adjusted in relation its original formulation during engagement 01, and if so, how it should be adjusted.

The workshop consisted of four exercises:

1. A warm-up exercise to become familiar with analysing interview quotes.
2. Two exercises where the project team focussed on interpreting feedback on the service concept from interviewees and evaluating what those quotes meant for further service development.
3. An exercise where each member of the project team summarised and presented their main insights from the workshop and how they believed those insights would affect further development of the service.

I started the workshop by introducing the aim for the workshop and the context for the data that the participants would be looking at during the workshop. During the introduction I covered when and where the interviews had taken place and the type of service actors (e.g. customer, mechanic,

⁸ When this engagement took place, the interviews in Africa that are described in engagement 03 had not yet taken place.

receptionist, roadside assistance) with whom we had performed the interviews. I explained the division of labour and responsibilities of different people in the garages, so that the participants could keep this in mind while going through the data (quotes) from the interviews.

After the warm-up the project team analysed comments that were made by interviewees with regard to specific steps in the service process. This analysis was done in two groups. Figure 3.23 shows two examples of quotes that were provided for this exercise. In total I provided each participant with seven quotes to analyse. The template first showed a quote from the interview and then asked two questions: 1) Describe in your own words what you think this person is saying/means by saying this and 2) Describe what insights this gives you with regard to the project. I provided each participant with a variety of quotes in terms of the quote came from (which type of actor) and which phase in the service process their comment referred to. My goal was to provide the group as a whole with as many different quotes as possible. The selected data fragments that I gave the groups for their analyses were spread proportionally over the various touchpoints in the service process that were represented in the flow-type visualisation, depending on the number of comments a touchpoint had received during the interviews. I did not include duplicates of the quotes; each quote was used only once in the material for the different exercises in the workshop session. First, I let each participant fill out their templates individually. Then, they presented their quotes and interpretation to each other. My intention was that more quotes could be analysed in parallel, and all participants in the same group would hear more quotes than they would have on their own. Furthermore, presenting the quotes and the interpretations of it would allow participants to discuss each person's interpretations.

Assignment 2 - comments on the process	
Quote from the data:	
Workshop manager	Best to have the workshop involved after the decision point, when the customer has decided that he wants to come to my workshop. Then I can do other work in the workshop while the assistance makes a decision together with the customer. Otherwise I can call the whole day and not get work for my workshop.
Describe in your own words what you think this person is saying/ means by saying this.	
<div></div>	
Describe what insight this gives you for the project	
<div></div>	

Assignment 2 - comments on the process	
Quote from the data:	
Customer	First of all he told me that maybe they have to give more technical knowledge for their drivers, but their drivers currently they are like full of routes and they are not fancy with the idea of receiving technical knowledge.
Describe in your own words what you think this person is saying/ means by saying this.	
<div></div>	
Describe what insight this gives you for the project	
<div></div>	

Figure 3.23 - Two examples of the quotes on the template provided for the second exercise

The third exercise of the workshop dived deeper into how the interviewees talked about the service value that is created processes in the four touchpoints discussed during the second part of engagement 01. In the assignment, the project team compared the comments and feedback from the interviewees with the service value that they had identified themselves, in order to see where they matched, differed and/or conflicted. Figure 3.24 shows two examples of quotes provided during this assignment, one related to the touchpoint *remote troubleshooting by Helpdesk* and one related to *vehicle to workshop or vice versa*. I changed the composition of the groups compared for this exercise, so that the groups could build on, learn from and refer to the discussions that either of the two groups had had during the earlier exercise.

As in the previous exercise I provided each participant with seven quotes (each relating to one of the four interactions) and asked them to begin by filling out the template individually. The question that they were asked to answer in relation to the quote was: *What does that mean given the values and*

qualities that we defined during workshop 2? I provided the qualities and values that the participants had discussed during the first engagement on a separate sheet (see Figure 3.25). Moreover, I provided a printed copy of the flow-type visualisation of the envisioned service process for remote and workshop guided troubleshooting that the project team had developed during the first engagement, so that they could use it as a reference.

When the participants had individually gone through their quotes, they presented their work to the others. As in the previous assignment, my intention was that presenting the quotes would expose the participants to a wider selection of quotes in their group and allow them to discuss the interpretations, whether they agreed or had a different interpretation.

<div> </div> <div> <p>Remote troubleshooting by helpdesk</p> </div> <hr/> <div> <p>Customer Based on the fault codes and the experience of the mechanic and the workshop you can determine whether it is a serious problem or whether you can drive on. It is important to have a trustworthy/secure advice whether you can continue or not.</p> </div> <div> <p>What does that mean, given the values and qualities that we defined during workshop 2</p> </div> <div> <div></div> </div>	<div> </div> <div> <p>Vehicle to workshop or vice versa</p> </div> <hr/> <div> <p>Assistance operator #2: [the mechanic] really has to sit down at the computer and check. Okay, it may not take that long, but... I don't know...the time will be a bit longer, before a physical person is on site.</p> </div> <div> <p>What does that mean, given the values and qualities that we defined during workshop 2?</p> </div> <div> <div></div> </div>
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Figure 3.24 - Two examples of quotes provided during the third exercise, one for the remote troubleshooting interaction and one for the handover from Helpdesk to workshop interaction

Figure 3.25 - Sheets with the qualities and values for the interactions that were defined by the project team during the second part of the first engagement shift focus from functions of the technology to value of the service

Finally, the workshop concluded with a discussion regarding what the members of the project team had learned from the data and what this meant for further development and successful implementation of the guided troubleshooting service concept. They discussed the ways in which the views from interviewees changed the project team's conception regarding what should be implemented and how to optimally support the actors involved in the service practice (such as customers, workshop personnel, drivers, etc.). To support this discussion, the participants first filled out a template (see Figure 3.26) that asked them:

- What the three most valuable insights were from the workshop?
- What are consequences of these insights? what would change to the image of the service?
- Who is/are needed to realise the required change?
- What would be the first step towards realising these change(s)?

Having filled out this template, each of the participants presented their three main insights to the rest of the group.

What are your three most valuable insights from today's workshop?			
What are consequences of these insights? What would change to the image of the service?			
Who is/are needed to realise the required change(s)?			
What would be the first step towards realising the required change(s)?			

Figure 3.26 - Template for the last assignment, where the participants had to summarise their main insights from studying and discussing the data from the interviews and the resulting consequences for the project

3.2.7.5 Continual engagements throughout the project

In addition to the planned and designed engagements discussed above, there were several engagements during my involvement in the project were of a more ad hoc nature. These continual engagements included dialogues around presentations during project team meetings or internal presentations at Truck&Bus, as well as conversations during meetings with people outside the project team. Of these engagements, the following are worth mentioning in particular:

- Meetings with employees from the roadside assistance department, once for an introduction to their work in the troubleshooting service and once to discuss a paper prototype of the guided troubleshooting software for the garages.
- A meeting with two people from the commercial operations department, during which remote and workshop guided troubleshooting was discussed in general and a paper prototype of the software tool for the garages was addressed in particular.

- Presentations during the project team meetings, where people from the different work packages presented their work for the project team.
- Conversations with James and Ferdinand that took place during the visits to the different countries for interviews (engagement 03), and while travelling and in-between interviews.
- Conversations with Michael and Paul. Michael was a UX-designer in the project, who replaced Diane when she left the project. Paul was a UX design consultant who was hired to develop paper prototypes and clickable prototypes for the software for the garages. The conversations that we had related both to the development of those two prototypes and the development of service level prototypes.

It was not possible or, in some cases, not desirable to video and/or audio record the continual engagements. Instead, I made entries in my diary about these engagements as soon as possible after the engagement took place, in order to capture the content from the engagement in as much detail as possible, along with any thoughts about service transformation that the engagement had triggered.

In addition to using the research diary to document continual engagements and to set up, implement and evaluate discrete engagements, I have written entries 1) whenever a meeting, seminar, discussion, conference presentation, etc. triggered new thoughts about service transformation and 2) to capture insights that came when reviewing literature related to service transformation. Altogether, the diary consists of 487 pages of entries that were made over the course of 2,5 years⁹. Some entries describe a whole week in a few paragraphs due to limited time for reflection, whereas other entries report my reflections on a single meeting over the course of several pages.

3.3 Data analysis

As can be seen in Figure 3.4, the discrete engagements took place in close succession during the first half of my time on the project. Therefore, the analysis of the outcomes of the engagements happened largely collectively.

Analysis of the video recordings from the workshops (engagements 01, 02 and 03) happened in several steps. I first watched the entire video and then transcribed the parts that addressed service transformation. Where needed,

⁹ I did not keep a diary during the first six months of my involvement in the project.

I made translations to English. Once the dialogues were transcribed, I printed the transcripts, read them several times and coded the conversations regarding how service transformation was addressed in the dialogues.

In the analysis of the interviews (engagement 03) I first listened to the entire interview once and then transcribed the interview. I made rough transcripts of the parts of the interview that were about the remote and workshop guided troubleshooting service and transcribed in detail the parts that addressed service transformation. After finishing each transcript, I read it several times and coded how service transformation was addressed. In European countries, only a few of the interviews could be conducted in English. Most of the informants answered the interview questions in languages in which I am not fluent, which meant that I was largely dependent on translations from a representative from the garage. Therefore, I focussed more on the topics that were addressed in relation to service transformation than the precise wording of the responses.

When analysing and coding the transcripts, I looked at how service transformation was addressed and which consequences of implementation of the service concept were mentioned. I started from what I expected given type 1 service transformation and the framing of the program *implementation during design*. I listened to the back-talk from the engagements to understand how service transformation was addressed by the informants. Outcomes (i.e. back-talk) from the engagements (i.e. move-testing experiments) have helped to further develop knowledge about service transformation (see Figure 3.27).

I started out with a hunch about design for manufacture and assembly as a generative construct for the program *implementation during design* and studying type 1 service transformation. The theoretical foundation of the program developed over time as reading of literature on design and service innovation helped to further articulate *implementation during design*. I tested data from the design engagements against the framework of type 1 service transformation, which lead to a reframing (see Chapter 5) to accommodate for data which was incompatible with the initial framing. As a researcher, I was part of this process of abductively developing type 1 and type 2 service transformation: in my inquiry, I built on my prior knowledge and previous experiences (Dewey, 1998).

Figure 3.27 - Examples of the mapping that I made regarding how service transformation was addressed in the engagements

The outcomes from the engagements helped me to develop type 1 service transformation from a hunch into a perspective that was grounded in the existing literature. The back-talk that did not fit type 1 service transformation and the program *implementation during design* formed the starting point for type 2 service transformation, which I will elaborate on the next chapter. I have tested different theoretical perspectives in order to develop knowledge about how service transformation was framed in the cases that did not fit the framing of type 1 service transformation. Type 2 service transformation was then developed in more detail through further reading of the literature and testing this theory against the data.

The analysis has thus been an abductive process, which has moved back and forth between empirical data from the engagements and theory (see Figure 3.28 and Figure 3.29 below). I have used a hermeneutics approach for analysing the data from the engagements (Alvesson & Sköldberg, 2017). More specifically, I have approached service transformation and how it was addressed in the engagements using the initial understanding (i.e. type 1 service transformation) that I had developed from the literature and other sources. The back-talk from the engagements has helped me to develop my understanding of service transformation, providing me with an evolved pre-understanding (ibid.) with which to approach the data from other

engagements. I have listened to the data from the engagements (i.e. empirical data) and tested different ways of framing back-talk about service transformation (i.e. theory), abductively developing knowledge of how service transformation was addressed in the service development process of remote and workshop guided troubleshooting.

I have used a design diary to reflect on the engagements and my reading of literature regarding service transformation during the project (Alvesson & Sköldbberg, 2009; Maxwell, 2005). Having the diary allowed me to talk about my research on two levels: that of the individual engagement and that of the project as a whole.

Figure 3.28 - Exploring framing service transformation as the moving towards each other of the existing service and the envisioned service, over time

Chapter 3

Figure 3.29 - Exploring ways of framing service transformation on paper. The overview of the exploration (top) and some details (middle, bottom)

3.4 Research ethics

The Swedish Research Council has defined a number of rules and guidelines for research in the humanities and social sciences (Vetenskapsrådet, n.d.). These rules and guidelines regard the:

- information requirement (*informationskravet*)
- consent requirement (*samtyckeskravet*)
- confidentiality requirement (*konfidentialitetskrav*)
- use requirement (*nyttjandekrav*)

The information requirement states that the researcher should inform participants about the aim of the activity in question and the role of the informant in the activity. In addition, informants should be told that participation is voluntary and can be terminated at any time.

In the research, I provided information to the participants in the engagements about the technology development project, the research study that I performed as part of this project and the aim of the study. I explained that the engagement in question was part of research into service transformation and the development of remote and workshop guided troubleshooting technology. I provided information about who the researchers were in the project, who would get to see the data and explained that the data would only be used for the development of remote and workshop guided troubleshooting as well as research into service transformation. Finally, I explained that participation was voluntary and that the informant could stop participating at any time.

The consent requirement states that participants in the research have the right to determine whether they want to participate. The researcher has to collect the informed consent of participants. Those who participate should have the right to determine independently how long and under what conditions they participate. They should be able to terminate their collaboration at any point, without any negative consequences. In their decision to participate or not, participants may not be put under pressure.

In the research, informed consent was gathered from those who participated as informants in the engagements. For the project team and people who participated from the side of Truck&Bus informed consent was managed through the project agreement that was signed by the different organisations involved in the project. Still, at the start of each engagement, I informed participants about the research and their participation in the way

described above. I gathered informed consent verbally. Before the start of each interview, the informants were told about the research in the way described above both verbally and in writing, through an informed consent form. It was only after participants had given their informed consent that the recording of the interview was started. At that point I also explicitly said that I had started the recording. For the interviews at garages and with representatives from transportation companies, informed consent was gathered through an informed consent form. Moreover, the content of the consent form was explained to the informant verbally.

The confidentiality requirement states that information about all persons that are part of the research must be communicated as confidentially as possible. Personal information shall be stored in such a way that unauthorised people cannot access it. All information about identifiable persons shall be saved and communicated in such a way that individual people cannot be identified.

In the research, data that has been collected during the engagements has been stored on an encrypted hard drive on a computer that was password protected. Backups of the data have been stored on a university server and in a locked drawer in my office. When data from the engagements was published, confidentiality was considered. Informants from the interviews were anonymised and only addressed through their position at the garage or as customer. Members of the project team have been pseudonymised, using fictional names when referring to them. Since the text regularly refers to the members of the project team, fictional names rather than fully anonymised labels for referencing make the text easier to read. The research presented in this thesis was part of a collaboration with industry. Therefore, all material that was due for publication was first sent to the project leader, to ensure anonymity of informants mentioned in the work or shown in images and to make sure that no trade secrets of the organisation were revealed.

The use requirement states that the information that was gathered about individual people may only be used for research purposes. They may not be used for commercial or non-scientific purposes. Information gathered for research purposes may not be used in decisions that affect the individual.

In the research, I have only used the information that was gathered for research regarding service transformation. It has not been used for commercial purposes, nor have I used the information in decisions affecting the informants.

3.5 Chapter summary

In this chapter I introduced programmatic design research as the approach for studying the realisation of service transformation, as well as the way in which design and trained designers relate and contribute to it. Programmatic design research is a form of pragmatist inquiry. Pragmatism rejects the idea of one universal, objective truth. Knowledge development takes place by testing possible explanations to determine if they are useful for explaining a phenomenon in a specific context. A pragmatist inquiry thus uses abductive reasoning: it suggests possible frameworks and testing the data against such conceptual frameworks, in order to refine the framework as a starting point for the evaluation of new data.

In programmatic design research the program provides the conceptual framework and design engagements are used to substantiate and test this framework suggested by the program. Programs develop in two ways: Firstly, through design engagements in the form of exploratory and move-testing experiments. The outcomes of these engagements provide back-talk that is used for reflection-in-action, to determine what would be a relevant next move to make within the framing that the program provides, to explore this program further (i.e. what could be a next engagement to undertake). A program develops by reflection-on-action: reflecting on the outcomes of the design engagements in relation to the outcomes that are to be expected given the framing that the program provides. If outcomes of the engagements are not in line with what the framing (i.e. the program) suggests to be expectable results, this can be an indication that the program needs to be developed.

Research questions lie neither on the level of the program nor on the level of the individual engagements, rather they encompass both program and engagements. Research knowledge is developed in the dialogue between program and engagements. The research knowledge is meant to contribute to the discourses in the academic field(s) in which the program is grounded. Programmatic design research, like pragmatism, does not aim to provide universal theories. Given the contextualised nature of the knowledge development and the changeable nature of the situation that is being studied, pragmatist inquiries such as programmatic design research cannot provide universal theories. Instead, they aim to provide concrete, actionable and context-specific knowledge for researchers and practitioners. The quality of the outcomes from programmatic research efforts should be evaluated in terms of novelty, clarity and usefulness. Reliability of the research is achieved by being open about the research process and the theoretical stances that

have been taken. Validation strategies include providing thick descriptions of the situation that has been studied, long-term involvement in the situation and constantly comparing any hypotheses that are developed from one case to other cases.

In the research presented in this thesis, the program *implementation during design* formed the starting point from which to explore type 1 service transformation through design engagements. More specifically, to explore 1) service transformation as the implementation of a service delivery system for a service concept, 2) addressing service transformation during the design of the service concept, 3) the contribution of Service Design to the development of such a service concept in a people-centred, holistic and iterative way and 4) the contribution of trained designers to the realisation of service transformation.

I explored these topics through a series of design engagements in a project that was part of a service development process aimed at improving the service of troubleshooting trucks and buses. The project in which I have been involved aimed to develop technology for remote and workshop guided troubleshooting. The idea behind the project was that this technology would improve the troubleshooting service because it would make it possible to determine the root cause of a problem earlier in the troubleshooting process and with more precision. It was expected that this would speed up the process of troubleshooting, leading to a decrease in vehicle downtime. Although this project was set up as a technology development project, it can also be framed as being part of a service development process that is aimed at improving the service of troubleshooting. This project formed the context for exploring *implementation during design* by means of move testing through design engagements.

As a design researcher, I have collaborated with the project team to help them in the development of the service on the one hand and I have explored service transformation on other hand. Since the project was part of a service development process, I expected that the development of the guided troubleshooting service would adhere to the phases that are typical for service development process models. Furthermore, I expected that realisation of service transformation would consist of building a service delivery system to deliver the guided troubleshooting service concept. Finally, I expected that it would be possible to frame this service process for the delivery of the service concept as a series of dyadic interactions.

The project was not intended to reach the implementation phase of new service development, where the service concept is realised through the assembly of a service delivery system. Therefore, the project provided a fitting context for exploration of type 1 service transformation through the program *implementation during design*. Firstly, I expected that it would be possible to address the consequences that the design decisions for the service concept might have on the assembling a service delivery system. Secondly, I expected that involving frontstage and backstage service actors in the service of troubleshooting would contribute to finding those consequences for service transformation. Thirdly, I expected that the identified consequences would be considered by the project team when redesigning the service concept before assembly of the service delivery system. Fourthly, I expected that it would be possible to refine the adapted service concept of remote and workshop troubleshooting by specifying elements of the service delivery system associated with this service concept. Finally, I expected that it would be possible to develop an implementation plan for the service concept.

Regarding the contribution of design and trained designers, I expected that Service Design would consist of the application of a holistic, people-centred perspective to the design of the service concept. Furthermore, I expected that Service Design would take place through a typical Service Design process that would end with the delivery of a prototyped and tested service concept. I expected that my role as trained designer would be to apply implementation strategies and facilitate handover to others at Truck&Bus, who would continue service development by implementing the service concept of remote and workshop guided troubleshooting.

These expectations formed the basis for designing engagements as part of programmatic design research, in order to explore type 1 service transformation. In total there were four discrete engagements, which were specifically planned and designed up front. These consisted of workshops and interviews with service actors. In addition, there have been several continual engagements that were of a more ad hoc nature. The discrete engagements initially aimed at developing a shared view of the service concept among the members of the project team and making a flow-type visualisation of the service process for this concept. This flow-type visualisation was then used in dialogues with service actors, which were aimed at uncovering possible consequences of the service concept for service transformation. Finally, the consequences that were identified by actors in the frontstage of the service

were used as input for the project team, who then made changes to the service concept of remote and workshop guided troubleshooting.

Each of the discrete engagements were intended as substantiations of the program *implementation during design*, all aimed at exploring different aspects of the program. I have presented the aims for each engagement, and I have also discussed how each engagement was set up (e.g. the exercises that were part of a workshop) and what materials were used during the engagement. The discrete engagements have focussed on articulating the service process of guided troubleshooting and articulating the consequences for service implementation, and they have also aimed to facilitate a dialogue, both with service actors who operated more on the backstage and with actors who are active on the frontstage of the troubleshooting service.

I have analysed the design engagements and the back-talk of the material that these engagements elicited in order to develop my understanding of the realisation of service transformation. I have used a hermeneutic perspective in the analysis, which has taken place through an abductive process: my pre-understanding of (type 1) service transformation has steered the development of the design engagements and provided the starting point for my analysis of the data. As a researcher I have thus been part of the method and analysis rather than approaching the results as a *tabula rasa*. I developed my understanding of service transformation by comparing the back-talk from the engagements with my pre-understanding of service transformation during the analysis of the outcomes of the engagements. I have documented my thinking and reflections-on-action in a research diary. In the next chapter, the outcomes of the discrete and continual design engagements are presented in terms of what was expected and what seemed incompatible with type 1 service transformation and *implementation during design*.

Chapter 4 Results

As covered in the previous chapter, the aim of the technology development project at Truck&Bus was to research if and how technology for remote and workshop guided troubleshooting might work. It seemed that, from the perspective of type 1 service transformation, this project could be framed as part of the design phase of a service development process. The project did not extend into the implementation phase of service development, so it was not possible to study the realisation of service transformation as the implementation of the guided troubleshooting service concept. Yet the program *implementation during design* suggested that it would nonetheless be possible to address service transformation as a concept. These assumptions regarding the positioning of the project as a type 1 service transformation, along with the applicability to the project of the program *implementation during design*, led to a number of outcomes that were expected from the design engagements. In other words: I expected a certain kind of back-talk from the move-testing engagements, given how the project was framed as a type 1 service transformation. In this chapter, the outcomes of the design engagements are addressed in terms of whether they were in line with those expectations or not. First, I address the outcomes that were expected given the framing of the project as a type 1 service transformation and based on the program *implementation during design*. The unexpected outcomes of the engagements are presented in the second half of this chapter. These unexpected outcomes have led to the formulation of type 2 service transformation, which is addressed in Chapter 5.

4.1 Expected outcomes given the framing of the project as type 1 service transformation

This section addresses some of the outcomes of the engagements that were introduced in Section 3.2.7. More specifically, it addresses the outcomes that were listed as expected outcomes in Section 3.2.6, given 1) the assumed disposition of the project as a type 1 service transformation and 2) the scaffold that the program *implementation during design* provided for the engagements. The outcomes are discussed thematically, across the different engagements, rather than for each engagement individually.

With respect to the perspective of service transformation, I expected that guided troubleshooting could be framed as a service rather than solely as technology development. It turned out that this could indeed be done, which is explained in Section 4.1.1. Secondly, the framing of service as a type 1 service transformation suggested that the service could be depicted as a service concept being delivered through a series of touchpoints. This was possible in the engagements as well, which is addressed in Section 4.1.2. The same section also addresses how the development of the guided troubleshooting service was similar to the framing of service development in type 1 service transformation. It addresses the fact that concept and accompanying technology had to be developed first, followed by a decision about whether or not to implement it and that service transformation could be defined as the implementation of a service delivery system.

Regarding the program *implementation during design* it turned out that it was possible to discuss the service concept with the service actors to identify the consequences of the service concept for service transformation. In these dialogues, the service actors' knowledge of the existing troubleshooting service allowed them to identify potential consequences of the service transformation to guided troubleshooting. This is addressed in Section 4.1.3 and Section 4.1.4.

Regarding the contribution of design, Service Design could be applied as a holistic, people-centred perspective to the design of service concepts. The consequences mentioned by the service actors could be used to identify how to improve the service concept before a handover to those who would implement it. These aspects are explained in Section 4.1.5.

4.1.1 Guided troubleshooting was addressed as a service

Originally, the project was framed as a technology development project that aimed at developing the technology needed for remote and workshop guided troubleshooting. However, as addressed in Section 3.2.3, remote and workshop guided troubleshooting can be framed as a service. By extension, the project can be framed, from the perspective of type 1 service transformation, as part of a service development process, more specifically the design phase of a service development process. By framing the project as a type 1 service transformation the program *implementation during design* suggests that implementation as a concept could be addressed during the phase of service development that the project was in.

There were several instances in the outcomes of the design engagements where it was possible to discuss guided troubleshooting as a service. At these moments, the following aspects were addressed:

- The value of the service concept of remote and workshop guided troubleshooting.
- Whether service functions would be realised as part of the technology or as part of the work of human service actor and how the two can complement each other.
- The importance of having contextual information in order to provide appropriate support, and the responsibility of acquiring that contextual information.

The project team addressed examples service value of remote and workshop guided troubleshooting for the service customer during engagement 01. For example, James and Maria discussed how transport companies would benefit from the time estimates that the guided troubleshooting software would give for repair actions. The software would be able to use standard times for repairs (as introduced in Section 3.2.1) to estimate how long a repair would be likely to take. In turn, the transport company could determine whether and how the repair would affect their planning for deliveries. They also discussed that being able to perform troubleshooting remotely would, more make it possible for a mechanic to drive out with an assistance van to the vehicle and make a roadside repair in more cases. This would save the cost of towing the vehicle, and it would be convenient and comfortable for the driver, they reasoned. Ferdinand, Olivia and Mathew discussed, for instance, that a quick first reply by the Helpdesk would make the driver feel cared about and that

accurate results from the remote troubleshooting would mean that driver and owner would get less downtime.

For the introduction of the project during the evaluation of the service with frontstage and backstage service actors, the value was summarised in two points. First, being able to determine the root cause of a problem earlier and with better precision. Secondly, lowering costs related to the repair, by reducing the time needed for troubleshooting as well as the downtime of the vehicle. Besides confirming these values of the service, the informants in engagements 02 and 03 also addressed other ways in which the service would be valuable. For instance, workshop manager #1 mentioned that the guided troubleshooting service would communicate to the customer that the garage is taking care of the vehicle from the beginning to the end. Having better chances to get an assessment of whether or not it would be possible to drive on with the remote troubleshooting was considered valuable as well. Finally, the software developer who participated in engagement 03 mentioned that sometimes the value of the service lies in the fact that you have the information that is needed to decide to *not* continue troubleshooting to resolve the problem, because the expected costs outweigh the benefits.

During engagement 01, the project team also addressed the question of whether functions in the service would be realised as part of the work of a human service actor or as a function of the guided troubleshooting system. In one of the scenarios that Ferdinand and Maria had worked on simultaneously during the same engagement, there was a three-hour window to do repairs, because the truck was needed for another assignment in three hours. When the two groups presented this scenario to each other, James and Ferdinand discussed whether such contextual information would be considered by the software or by the person interacting with the software. That is, whether it would be included in how the software determined the prioritised list of suggested next actions or whether contextual information would be used by the human service actor (e.g. the Helpdesk operator) interacting with the software, to weigh the alternatives that were presented by the software and decide on the best course of action:

James Euh...no, it was just the aspect that we included here, that it's important that the system gets...has the possibility to get...retrieve that kind of information on...I think currently it's unclear how information is...

- Ferdinand** That there is a new assignment in three hours?
- James** Yes.
(...)
- Ferdinand** When I thought about this, I didn't think the system had this information. That was, like, the Helpdesk who knew this.

This discussion addressed the *service* of remote and workshop guided troubleshooting rather than only the *technology* that it would require. It was about how a certain function of the service (i.e. giving advice on the best way to continue troubleshooting, given the situation at hand) would be implemented, either as a functionality of the software or the as a responsibility of human actors in the service (see also Overkamp & Holmlid, 2017b). Another example of such a dialogue about whether a certain service function should be implemented in the software or in the actions of a human service actor took place during engagement 04. In this engagement, the project team went through the feedback on the service concept that had been given by informants during in the interviews (engagement 03), to determine how to continue the development of the remote and workshop guided troubleshooting system. The team members addressed what the troubleshooting software could and could not provide and how that would affect the service. For instance, whether being able to tell how long the vehicle could continue to drive was part of the project:

I don't know if it is the project or not in this case, but at least better prediction and much more thorough models and data regarding how things behave when they are on their way to breaking. – Mathew (my translation to English).

While the troubleshooting software may not be able to provide such predictions about the consequences of a part being broken, such predictions could be given by mechanics if they combined their own experience with the information provided by the software:

[Y]ou can understand the problem better with the help of the diagnosis and then a human can do this lifetime assessment. But in the project the lifetime assessment is not included – Olivia (My translation to English).

This is an example of how a service actor and the software can complement each other in cases where the service function is not entirely performed by either the software or the service actor. Rather, the guided troubleshooting and mechanic can complement each other to achieve a type of support that neither can provide alone.

What these examples have in common, is that they address the need for contextual information, in order to fulfil the service function. The project team was aware of the fact that the context of the case affects the interactions with the guided troubleshooting software. That troubleshooting cannot be seen as solving a technical problem with a vehicle, in isolation, but that it should be considered in a larger context, which also has an influence on would be the best way to continue with troubleshooting:

I think there are a lot of things outside there; you have to take care of the cargo, and then the driver, and if you are towing...then we tow it and maybe they have to order a new truck, rent a truck or something. You have a lot of decisions to do there. – Ferdinand

During engagement 04, a similar discussion took place when addressing one of the interview comments. Receptionist #3 had said that it would be good if the software would allow the garage to give the customer more specific information: to be able to say earlier whether the garage could provide help and thus whether the transport company could still make their delivery on time. When discussing this comment, Maria and Ferdinand were aware that it might be difficult to provide an estimated time for the repair through the guided troubleshooting software. They said that it would be difficult to make

time estimates because of factors in the context of the troubleshooting (emphasis mine):

Ferdinand They want someone to be able to tell the customer: the truck will be up and running again at this time. Within a timeframe. That was my interpretation of this quote. And I thought it was interesting for the project, because...yeah...*will it be possible for the guided diagnostics—that we are looking on in this project—to give this approximation of when the truck will be repaired.* If the support system could deliver this kind of information, that would be helpful in solving this quote or helping in this situation.

Maria I think it will be really good, but I think one tricky part is: *is there a system to see what workshop will have the parts?* Or do they need to call? You have central system for that?

Ferdinand No, some markets have it, but...I think it's a very difficult question. Because *you to have a workshop, you have to have a mechanic, you have the spare parts and a lot of stuff.* But maybe the guided diagnostics system can give you some...some part of it.
(...)

Ferdinand But maybe the...to be able to deliver this [approximation of when the truck will be repaired] really good, you have to *have lots of information about all of the surrounding of the truck. Where it is and where are the workshops and where are the mechanics* and it is a very difficult problem, but...

During engagement 01, the project team addressed different ways in which the required contextual information could be acquired. In a scenario that Olivia, James and Mathew had been working on, a truck had frozen shrimps as cargo. This meant that the repair was somewhat urgent. They discussed how such contextual information would be included in the suggestions that the guided troubleshooting software provided:

- James** Yes. Well, the thing that we need to get into is how does the system learn that we have frozen goods?
- Olivia** Yeah.
- James** We need to ask that, I guess. And, of course, being able to input and...do something useful with it.
- Mathew** But that...euhm...the driver must tell Helpdesk that.
- James** Yes. Euhm...because otherwise the software support will not consider this.

Later, while still working with what the guided troubleshooting service should look like in the given scenario, they suggested that the Helpdesk operator would pose questions to the driver to collect information about the cargo (and thus determine the level of urgency of the troubleshooting case):

- James** If we have...if the system correctly knows that it's urgent, it would recommend sending out the assistance vehicle. It's hard to know for sure, but...
- Tim** And how does the system in this case know that it's urgent?
- James** It's magical. Euh...[laughs]. It is...somewhere we need to [to provide this information that
- Olivia** [With these questions. So helpdesk asks the driver and the driver says 'Oh, I got the frozen shrimps in the cargo' and then they just...they check that box. Helpdesk checks that box

These results are examples of how it was possible to address the development and implementation of the guided troubleshooting *service* in this project. The project team could address the service concept and the value that this service concept would provide.

4.1.2 Service development followed NSD process models

I had framed the project as being part of the design phase of a service development process as it is depicted in process models that are typical for New Service Development. This meant that I expected that it would be possible, during the project, to define a service concept and related service process for remote and workshop guided troubleshooting. In turn, the program *implementation during design* suggested that it would be possible to

address the implementation of this service concept by refining the service delivery system that would be required for the delivery of the service value of remote and workshop guided troubleshooting. During the project:

- It was possible to define the service process for guided troubleshooting service concept as a series of touchpoints.
- Service Design tools such as visualisations and scenarios helped to apply a people-centred and holistic perspective on the design of the guided troubleshooting service.
- Further development of the service concept and the service delivery system would be needed after the project, in order to implement the guided troubleshooting service.
- The implementation of the service concept would be done after this project, in collaboration with the local distributors of Truck&Bus;
- I was able to apply some implementation strategies during my time in the project and work to facilitate the handover of the service concept.

In this project, it was possible to define the service concept and the value that the guided troubleshooting service would deliver. Taking the service process for the guided troubleshooting service as a starting point, the members of the project team could define the activities of the envisioned process through which the service concept would be delivered (see Figure 4.1). Using a flow-type visualisation as structure helped to consider the activities in the service, the actors that would be involved and what these actors would need for their work in a holistic way. I was able develop this outcome of engagement 01 into both summarised representations (Figure 4.2) and more elaborate ones (Figure 3.14, Figure 3.15, Figure 3.17, Figure 3.18 and Figure 3.19).

Figure 4.1 – Process diagram developed during engagement 01, where the project team defined, among other things, the activities of the service process (highlighted)

The flow-type visualisations of the service were also used to evaluate the service concept with service actors in the front and backstage of the service. Furthermore, the scenarios that were used in engagement 01 helped the project team to take a people-centred perspective on the service and address the needs of the service actors, in addition to the logistics of the service process. For instance, when addressing a scenario where a vehicle with frozen food experienced a breakdown, James mentioned that the driver would be stressed, or at least concerned. When Maria and Ferdinand addressed a scenario in which they thought the customer was demanding, they mentioned that it would be important for the Helpdesk and garage employees not to mention the times and costs indicated by the software, because the customer would likely take those numbers as fixed and refuse to pay for any additional time and costs that would be required. In these respects, the project resembled the design phase of a service development process as depicted in typical NSD process models. Moreover, the holistic, people-centred and visual nature of the Service Design approach to the design of services that was addressed in Section 2.3.1 was present in the project. However, the typical Service Design process was not used. This unexpected outcome is addressed in more detail in Section 4.2.5.

The project aimed at developing the hardware and software needed for the guided troubleshooting service to a pre-production level. More specifically, the aim of the project as stated in the project description was to advance the technology readiness level from technological research (the level that was achieved in the preceding project) to technological validation and demonstration in a relevant environment. The intention was to begin by researching and developing the technology on a small scale, before deciding whether it should be taken into production. This project would provide input for that go/no-go decision regarding the continuation of the development of the technology and the guided troubleshooting service.

If the work done during this project were to be continued, the next work would include the development and implementation of touchpoints for the envisioned service process, such as making sure that there is a Helpdesk. One of the decisions that would have to be made would be whether to develop this Helpdesk touchpoint on a local (individual garages), regional (distributor) or global (at Truck&Bus head office) level. This was addressed by Michael during engagement 04:

And where is the main contact point? Is that the...say that we have...this is the global Helpdesk and we got the local workshop with a customer and is it the global Helpdesk that starts the communication with the customer or diagnose the problem and then discuss it with the workshop? Or should the customer contact the workshop directly and then they contact the global helpdesk? – Michael

The effects of this decision were also discussed during engagement 04. The location of the Helpdesk has consequences for the interaction between the Helpdesk and the transport planner or the driver. If the Helpdesk is located at a regional level or higher, it can have an overview of the garages in the region, and can suggest which garage would be most appropriate to visit given the situation at hand:

If the Helpdesk function has a better view on workshops coverage and spare parts stock, then they can say: 'Go to that workshop. That is a bit further, but there they have space available now and they have the spare parts in stock, probably.' – Mathew (my translation to English)

While the project team thus discussed possible effects that the position of the Helpdesk might have on the service delivery, the decision of where to locate the Helpdesk was considered a management decision. During engagement 04, the members of the project team discussed that this decision was not up to them. They could, however, influence the decision by presenting the different alternatives as well as the advantages and downsides for each alternative:

We can get sort of pros and cons, I mean: if you go we put all responsibility on the local workshop, well then we got sort of on business hours. If you got [Helpdesk on a market level or global level],

then we've got round the clock coverage and, I mean, if you've have a customer that is...sort of does its business locally, well that might look like a good idea. But you got someone who does long haulage, well, he might be quite a long way from his own workshop. And so on. (...) Then you can give that as a material for those who give decisions. – Michael

The project team also discussed the business model for the service as something that was relevant to consider before implementing the service concept. For instance, the type of service contract would affect the service, because it would determine how much the owner of the vehicle might want to be involved in the process. James had pointed this out when the project team defined the service concept in engagement 01, and Olivia and Michelle discussed whether the driver would be part of the service process once the vehicle had arrived at a garage:

It depends. We haven't discussed the economy here at all. Because it could be the case that this is some kind of contract so it's a flat rate for everything so no-one pays anything. Well, it's already prepaid. Or you can have everything by the hour or by the tool and then the owner or driver needs to be involved in almost every decision that is made in the workshop. – James

In addition, Ferdinand said during engagement 04 that whether or not a garage would be willing to get involved in remote troubleshooting depended on the business model for the service. It is often difficult for the garage to get paid for the part of the troubleshooting process that is aimed at finding the root cause of the problem. So, if the guided troubleshooting service were to use a business model where payment was related to repairs, it could be difficult to get paid for the remote troubleshooting. However, if you have a contract where you pay for the time you are able to use a vehicle, there would be more of an incentive to do remote troubleshooting.

- Ferdinand** Maybe again, it is...if just you look at it [as] different transactions, it is quite difficult to define involvement here, for the troubleshooting, because it's difficult to get paid for troubleshooting. But if you have a contract, then someone is looking at the overall economy and then it is easier to get a workshop involved.
- Tim** Do you mean a contract between Truck&Bus...
- Ferdinand** Like a service contract or an after sales contract, something like that. You pay your monthly fee to be able to use the truck. If [Truck&Bus] can't get it up and running, then [Truck&Bus] has to pay to the customer.
- Tim** So you don't pay for the truck, rather for the [the access to the truck.
- Ferdinand** [the use of it. Yeah.

Yet, the project team did not take any decisions regarding what type of service contract would be offered, because they did not consider it to be a decision that was theirs to make. Instead, they believed that this would need to be determined by the distributors, on a regional level. During the interview with transport company representative #2, James said that decisions regarding the pricing of the service would be left up to the distributor:

- Representative from distributor** They are asking about the cost. It's related with this.
- James** That's you, that's the distributor. We do the technical stuff. Pricing that is you.

Furthermore, during engagement 04, Ferdinand mentioned that the guided troubleshooting service should be developed as a flexible solution, to cater to different needs. Also, he mentioned that the roll-out of the service should take place in collaboration with the distributors:

I have some insights, which are overlapping some of the others...put up. One is that it's important that euh...we have flexibility in the solution. And that is, for example, not integrating into [the existing

troubleshooting software] or diagnostic tool and just having the...we have to be able to utilize this functionality in different markets, in different environments and different tools. You have to be flexible there. And we really need to work together with the market representatives when we try to roll this out. – Ferdinand

Clearly, if the guided troubleshooting service were to be developed further and implemented, the service contract and the way in which the remote and workshop guided troubleshooting technology would be integrated in existing routines would be aspects of the service that would still need to be defined. At a later point in the service development process, the service concept would be handed over to the regional distributors for implementation. They would then determine, among other things, the pricing for the service and would roll it out in the markets for which they were responsible.

During the project, I was able to apply some of the strategies that have been suggested for trained designers (see Section 2.3), to support implementation of service concepts. By facilitating the project team to design the service concept for remote and workshop guided troubleshooting, I have aimed to place the ownership over the design of the service concept with the project team. Moreover, I have invited actors from the frontstage and backstage of the troubleshooting service during engagements 02 and 03 as well as in separate meetings with the roadside assistance department and commercial operations department. I have done this for two reasons. First, to explore consequences of the service concept and detail the prerequisites for the service delivery system (see Sections 4.1.3 and 4.1.4 for more on this). These evaluations helped me and the project team to determine how to design the service concept in such a way that it would be realistic to implement (i.e. assemble the required service delivery system). By involving actors in the troubleshooting service, I have also aimed to facilitate the handover of the service concept to those who would continue the development and implementation of the guided troubleshooting service. First, I believed that the evaluations of the service concept by these service actors would help me and the project team to consider ways to assemble the service delivery system for the service concept which would work for Truck&Bus, thus making it easier for others to perform the implementation. Second, I believed that these

meetings could create connections between members of the project team and departments of Truck&Bus that would likely be involved in the implementation of the guided troubleshooting service. I expected that these connections would help the handover of the service concept if service development would be continued after this project.

To summarise, the project that I have worked in could be seen as part of a service development process in accordance with typical process models in New Service Development literature. The project itself could be seen as part of the design phase. Implementation would take place later, if it were to be decided that the project would be developed further. During the project, it was possible to define the service concept as well as the service process through which it would be delivered. In that sense, the project can be seen as part of the design phase of a New Service Development process, in which some aspects of a Service Design approach were used. In several of the engagements, the project team addressed aspects of the service concept that would have to be refined after this project was finished, such as the location of the Helpdesk and the business model for the service. Since the project did not stretch into the implementation phase of service development, it was not possible to study type 1 service transformation as the implementation of the service concept. However, it was possible to address the possible consequences of this service concept design on service transformation.

4.1.3 Potential consequences of the service concept were identified

In a product context, applying the construct of design for manufacture and assembly involves discussing the design of a product concept with production engineers in order to optimise it for production and assembly. In the development of guided troubleshooting, the service equivalent was to have dialogues with service actors, to identify potential consequences of the service concept for service implementation. Such consequences include both prerequisites for successful delivery of the service concept (service process and service delivery system) and effects on the existing troubleshooting service. In an existing organisation, service concepts build on and must relate to service infrastructure that is already in place, such as software architecture, buildings and organisational culture. Therefore, it is not possible to define touchpoints or service system elements with complete freedom. These two types of consequences—prerequisites and effects—were addressed by the people who were part of the design engagements. The

anticipated consequences that were addressed by the project team and service actors included:

- That the self-learning software would require mechanics to provide feedback about troubleshooting cases and that this data would then be analysed, in order to improve the algorithms that determine which suggestions are the best fit in a certain situation.
- How mechanics would be able to prepare for their work to a greater extent, because they would have more information about a troubleshooting case up front.
- That mechanics would not have to drive back and forth to the garage as much as they currently do to collect the correct parts when making a repair at the side of the road.
- That the support of the guided troubleshooting software would provide the mechanic with backup, especially at times when colleagues were unavailable.
- That the suggestion to follow instructions in the software would go against the training that mechanics receive today and that getting the mechanics to follow the instructions in the software would require them to trust the software in the first place.
- That troubleshooting work could be planned better at the garage but that this would require mechanics and workshop managers to spend additional time behind a computer.
- That the new system would lead to an increase in the number of calls by drivers or transport planners to the garage, to ask whether it was safe to drive on.
- That the garage might push the part of the troubleshooting work that could be done remotely onto the Helpdesk.
- That it would become easier to find suitable mechanics, because experience would be less important when the software became available, but at the same time troubleshooting could become less interesting.
- That the roadside assistance would get access to more detailed log files about the troubleshooting case, but if they had to do remote troubleshooting this could lead to more work, possibly work that the operators would not feel comfortable doing.
- That drivers would not have to go to a workshop for initial troubleshooting nor would they have to first tell their story to the roadside assistance and later on to the garage.

- That involvement of drivers in the remote troubleshooting process would increase, thereby changing what would be required from them.
- That a transport planner would save time and have a lower risk because they would know whether or not a vehicle needs to go to a garage for repairs, given that they would have the information about risks and costs that they need in order to make an informed decision.

As discussed above, the design of the service concept of remote and workshop guided troubleshooting was addressed when the project team defined what they envisioned the service would look like during engagement 01. The guided troubleshooting service builds on the idea that the guided troubleshooting software is continuously improved using data from troubleshooting cases. For instance, suggested actions that are chosen often *and* that prove effective for finding the root cause of a problem in certain cases can receive a higher priority among the suggested actions in the future. In order to achieve such continuous improvement, mechanics need to document their work and provide this documentation to those who work on the software. Another prerequisite, which James and Maria discussed during engagement 04, was that in the beginning you need people who can monitor the data in the case logs that are used for improving the software algorithms. This requires the involvement of people who can analyse the data. The same prerequisite was addressed during engagement 02, when the participant who worked with on-board diagnostics commented that the service would lead to an increase in the amount of troubleshooting case data that would need to be analysed, and that the people who currently perform these analyses do not have the resources to scale up those analyses:

Maintenance of all the data you have here. The isolation, the statistics, decisions, and so on. And you should do...make that work. In the long run. And we have...I don't think anything says there, (...) but I think it should be added there, at least. – On-board diagnosis expert

And:

Because, it will be more and more offline work. More and more statistics and follow up. And that takes a lot of time. More than you know. You should think about [that]. We have...we don't really have the resources to just look on the field trials right now. – On-board diagnosis expert

The effect of the service concept on the existing service infrastructure would thus be that more data would be fed back to engineers who work with providing manuals for troubleshooting. In order to be able to successfully process this additional data and improve the algorithms of the guided troubleshooting technology, these engineers would either need to be given time to analyse the additional data or it would be necessary to hire more people to perform the analyses.

Various consequences for the frontline staff were also addressed during the different engagements, in particular during the interviews (engagement 03). One effect is that mechanics would have more information when they started their work, compared to the current situation. At the moment, if mechanics do not have all the tools and parts required for a repair in the field with them, they may have to drive back and forth from the vehicle to the garage. Knowing more about the possible root cause before leaving for a repair would reduce the likelihood of unnecessary driving. This was mentioned by informants at the garages and by one of the roadside assistance operators:

I think that it would be much easier for the workshop to know what they need to take with them. Today, it can happen that they have to drive out and take a look and then drive back to the workshop, get parts. So, I think it can save time for them – Roadside assistance operator #1, my translation to English

Mechanic #1 highlighted another effect. When you have to make a roadside repair during the weekend or at night, having step-by-step guidance in the software makes the troubleshooting process less risky. Currently, mechanics are on their own in these situations because it is not possible to consult with a colleague. Another anticipated effect of having step-by-step guidance is that an inexperienced mechanic would be able to find the cause of a problem more easily. In addition, having information from the remote troubleshooting session before driving out with an assistance vehicle would mean that mechanics would be better prepared for what they would have to deal with. However, mechanic #5 mentioned that following suggestions from the software would go against their training system, which tells them to start at the beginning and not skip steps or change parts too quickly.

Another effect would be that mechanics would be required to spend more time behind a computer than they commonly do today. A prerequisite for successful implementation would thus be that mechanics were able to spend this extra time. Other prerequisites for the mechanics to use the software concerned both practical and people-related factors. Practically, mechanics would need to have access to the software (e.g. user name and password) and the software would need to have clearly formulated instructions. The latter type of prerequisites would require that if the remote troubleshooting was done by someone else mechanics would have to trust the information that had been collected earlier.

Garage employees considered receiving cases from the Helpdesk beneficial for planning the work at the garage. They would know about the expected work before a vehicle arrived at the garage. This would help in planning, such as assigning the work to a mechanic and preparing the spare parts that would likely be needed. However, receptionist #2 expected a negative effect from receiving cases forwarded by the Helpdesk. According to him, it would likely lead to an increased workload for the workshop manager, or require the garages to hire additional personnel. A garage would thus have to have more employees in order to deal with interpreting the forwarded cases and preparing the workshop (ordering and picking parts, deciding which mechanic to assign to the job, etc.) and performing additional remote troubleshooting if necessary.

At the same time, it was suggested both during engagement 02 and during interviews (engagement 03) that the guided troubleshooting software might make it easier for garages to find suitable mechanics. Since the software provides suggestions for the root causes and next actions to take, mechanics

can “go along a rope”, as service manager #3 expressed it. In engagement 02, the fleet uptime manager mentioned that experience and training could become less important criteria for workshop managers when hiring mechanics if the software is available. At the same time, troubleshooting could become less interesting if it became a matter of following the suggestions given by the software.

Furthermore, garage employees expected that drivers and transport planners might call more often to get an answer about whether they could drive on or not. Such additional phone calls would conflict with customers that showed up at the garage. Receptionist #3 wondered who he should prioritise in those cases: A customer whose vehicle is at the garage or a customer requesting remote troubleshooting. In the latter case, the vehicle could continue and the garage might not get paid. Workshop manager #3 mentioned that it becomes interesting for the garage to be involved after the decision point, when most of the troubleshooting would have been done. It is not always easy for garages to charge for the work that goes into assessing the problem and finding the root cause; some customers only want to pay for the time and parts that were needed to resolve the root cause of the problem.

Since it is difficult for garages to receive compensation for the remote troubleshooting, they might push this work onto the Helpdesk. During engagement 02, the fleet uptime manager mentioned that the garage might contact the Helpdesk and instruct them to do the additional troubleshooting rather than doing it themselves:

Also, that there might be a risk that for everything [the garage] will start to call the Helpdesk, to...to do the diagnosis of a vehicle. Because then they don't have to put their workshop resources on that. So, they say 'Yeah, I am not going to spend three hours on isolating a fault, I just call the helpdesk and they do it for a fixed fee.' – Fleet uptime manager

The roadside assistance operators expected that they would benefit from the structured way in which the case would be logged and documented. It would be easier for them to follow up on how a case had proceeded. However, if they were expected to do the work of the Helpdesk and perform remote

troubleshooting the effect would be that they would have to spend more time on the phone than they do today:

And if you get many cases and get much to follow up then it can be very stressful. And you don't really have time—if you understand what I mean—to be on the phone such a long time. I have to try to close the call quite quickly, because I have many different things at the same time that I need to do. – Roadside assistance operator #2 (my translation to English)

With their current training as communicators, some of the roadside assistance operators would also feel uncomfortable to perform remote troubleshooting and providing advice on how to proceed. When performing remote tests, they might not be able to answer questions from the driver, because they do not have any technical knowledge about the vehicle or the layout of the cabin. Providing them with training to learn about the cabin and operation of the truck could help to make them feel more comfortable to perform remote troubleshooting.

One expected effect for the drivers discussed by the project team was that the drivers would be on their way more quickly, because they would not have to go to the workshop for initial troubleshooting. In the case of a non-native driver, either the driver or the Helpdesk operator would need to be able to talk in a foreign language during the remote troubleshooting. This was discussed when the project team defined the service process, during engagement 01:

Olivia But if he is in a different country and he has no idea where the workshops are and he doesn't speak the language, and so on.

There is a need of assistance with also this thing of actually booking an appointment. So who does that? Who assists in that? And that also goes for the manager. I mean...

Ferdinand They could also pay the Helpdesk to do that, but...

- Olivia** But that is not normally, in the way we think about Helpdesk, that is not included, or? Because the way I viewed it was like...
- Ferdinand** Because Helpdesk, they are people and they want to help the customer, so they do a lot of stuff. Today. But maybe we shall try to...have it more clear.

In his last comment, Ferdinand referred to what is currently known as roadside assistance. In the future it could be extended to become the Helpdesk, which would also do remote troubleshooting.

Furthermore, an effect for drivers is that they would not have to tell their story twice—once to the roadside assistance operator and once to the receptionist or mechanic at a garage. Instead, the garage would have access to all of the information about the case that was collected by the Helpdesk:

this information should be handed over all the way so, the idea is that you have a session for the vehicle and then you have a history of what the vehicle has done, so when you start interrogating, this information goes into the system and is handed over. So, the driver doesn't need to have...to restate everything – James, during the interview with workshop manager #1

During engagement 01, the project team established that drivers would be expected to be involved in the remote part of the troubleshooting, whereas today drivers are not always involved. This involvement is a prerequisite for moving forward with the remote troubleshooting. During engagement 02 this was addressed as well, by one of the method engineers. He mentioned that sometimes a visual inspection would be required in order to be able to do the next remote test:

[T]here might be instances where we have a remote test and to see if that remote test is successful or not, you need to do a visual inspection on the vehicle, or, like, see what the outcome is. And then we can continue to do other remote tests. So there is kind of a block...a

mechanical block in the middle. And it would be helpful for the Helpdesk to get some feedback, maybe photos being sent from the driver, driver takes photos, or we discussed, like, an iPad with information of how...what to inspect and how to do it, so it becomes kind of a support for the Helpdesk. From the driver. – Method engineer.

During the interviews, informants mentioned that involving the drivers in this way would require basic technical knowledge from those driver; that they know what is in the driver manual that is in the truck. Several transportation company representatives mentioned that they expected that they would have to train their drivers as a prerequisite for being part of the service. Customer #1 mentioned that it might prove to be difficult to combine such training with the full schedules of drivers; in order to optimise the use of the legal driving times, most drivers are either driving or resting. Customer #6 mentioned that clear instructions must be given to the driver; if a driver, for instance, has to refill the oil, it has to be specified exactly how many litres of oil they need to add. In addition, it requires a willingness to cooperate.

For the person planning the assignments of the vehicles, the expected effects are that they will have more information about whether it is safe to drive on. In some cases there might not be a need to visit a workshop for initial troubleshooting, which saves time and decreases the risk of delays in the delivery. For transport companies that do their own repairs, the remote troubleshooting could tell them whether or not to make the repair themselves. During engagement 02, a method engineer and someone working with on-board diagnostics mentioned that in order to make an informed decision about whether or not to do remote troubleshooting, a customer has to know the estimated costs of the repair and the risks involved in performing tests on the vehicle remotely. They suggested that such a cost function should include the labour cost, uptime cost, spare part costs and Helpdesk costs. The software developer that participated added that this cost function should also include information about the alternative costs of deciding not to troubleshooting the vehicle.

The instances discussed above are examples of prerequisites for and speculations about potential effects of the service delivery system for guided troubleshooting. This was expected, given the program *implementation during design*, which suggests that implementation as a concept can be addressed earlier in a service development process, before arriving at the implementation phase. In this project, it was possible to address some of the prerequisites for the implementation of the service concept, as well as anticipating some of its effects, even though the development of the guided troubleshooting service had not yet reached the implementation phase.

4.1.4 Knowledge about existing service required in order to identify consequences of service transformation

In design for manufacture and assembly, a product concept design is discussed with production engineers, because their detailed knowledge about the production processes helps to determine how to optimise the design for manufacture and assembly. The equivalent of production engineers in a service context are those who support the delivery of the existing service. Their detailed knowledge about how the existing service is delivered allows them to evaluate consequences of the service concept design for implementation. In turn, this helps to determine whether and how to adapt service concept for successful implementation. As presented in Section 4.1.3 above, in the evaluation of the service concept and process, different service actors addressed different consequences of realising the service concept. Not all of these consequences were taken up by the project team when they defined the service concept and process in engagement 01. In the identification of consequences, the service actors contributed with their knowledge of the troubleshooting service as follows:

- They built on their understanding of what is common practice in the troubleshooting service today.
- They were able to articulate specific characteristics of the troubleshooting service for the region or country they worked in.
- They identified consequences that the project team had not brought up yet, both for their own work and the work of other service actors.
- They complemented knowledge that the project team had about the existing service.

The service actors that were involved in the evaluation of the service concept and service process built their feedback on their knowledge about the existing

service of troubleshooting. For instance, during engagement 02, the fleet uptime manager referred to what he knew about common practices in the transportation sector:

You see now in the large transport companies: they buy drivers as cheap as possible. And, yeah, they have the instructions 'if it's a yellow light, keep on going and when it's red you stop and then you call me.' So, the knowledge of the drivers might not be the one that we need for the guided troubleshooting. – Fleet uptime manager.

The fleet uptime manager also mentioned that garages today can have a hard time finding good mechanics and that the guided troubleshooting software could help to reduce some of the current demands for the skills and experience of a mechanic. During the same engagement, a method engineer and the on-board diagnostics expert addressed the issue that it can be hard to analyse the data that comes back from the garage:

Right now, it can be quite unclear what they really did on the workshop, when you read the workshop history, today, it is really, really hard to understand what they did. So, you just have to guess, depending on what they changed. And then, as [the method engineer] said, it could be that they used the wrong ID for a part and then we are just confused. – On-board diagnostics expert

During the interviews, (engagement 03) the informants were able to address both consequences for their own work as part of the troubleshooting service as well as that of other actors in the service. For instance, garage employees were able to mention effects for drivers and transport planners and roadside assistance operators were also able to mention consequences for the work of mechanics.

Consequences for the driver that were taken up by the garage employees included the fact that drivers would not have to drive to a garage as well as

additional requirements for the drivers, as a result of their involvement in the remote troubleshooting process. For instance, drivers would need basic technical knowledge about the vehicle.

Consequences that were mentioned for the transport planner were 1) having more detailed information about the problem (e.g. estimated time for the repair) earlier, 2) being able to determine whether or not the load could be delivered before visiting a garage and 3) being able to request that initial troubleshooting be done remotely rather than to send the driver to a garage immediately.

Prerequisites for the Helpdesk that were mentioned during the interviews included 1) having technical knowledge about the vehicle, 2) being familiar with the work situation of the driver and 3) being able to talk with a driver. The last point related to being able to communicate what you want the driver to do as part of the remote troubleshooting process. Transport company representative #2 suggested that it might be a good idea to let someone who had been a driver themselves do the remote troubleshooting dialogue with the drivers.

Informants could articulate consequences most clearly for their own work, arguably because they know more about their own daily work than that of other actors in the service. In this project, it was thus beneficial to evaluate the service concept with a variety of frontstage and backstage service actors. Since the consequences that were mentioned complemented each other involving different kinds of service actors made it possible to collect as many of the expected consequences for service implementation as possible.

The involvement of service actors who had knowledge about the existing troubleshooting service helped to complement the knowledge that the project team had about this service. The members of the project team were experts on the technical aspects of troubleshooting. For instance, which symptoms would occur for which problems. However, they knew less about the elements of the troubleshooting service that surround this process of going from symptoms to a root cause, such as how garages plan for troubleshooting and how the communication with the driver and transport planner take place, as well as how these routines differ from country to country. During engagement 01, the project team asked Michelle, who was present during the workshops as an observer, about the existing troubleshooting service. Michelle had visited numerous garages in different countries as part of her work as a UX designer at Truck&Bus. She could therefore provide more detailed

information about the reality of troubleshooting in different places. Besides, not all members of the project team had first-hand knowledge of the troubleshooting service. For example, James mentioned during the first interview trip that it was his first time in the field. He had previously worked with data and stories that were collected by people like Michelle (who had had performed interviews and observations at various garages) to develop his understanding of what happened in garages. He also mentioned that he had no knowledge about transportation companies. He thus found the interviews at garages and transportation companies very informative, because they provided him with primary data and a first-hand understanding about the troubleshooting service.

In other words, at the start of this project, the project team did not have the all knowledge about the troubleshooting service that was required to evaluate the consequences of implementing the service concept. Involving those who support the delivery of the existing service allowed the members of the project team to make a more complete assessment of the prerequisites for and effects of the service concept of remote and workshop guided troubleshooting. Some of the consequences that the informants addressed had not been addressed by the project team when defining the service concept and process during engagement 01. In particular, problems with the involvement of the driver that several informants foresaw were not previously known by members of the project team. Both in the preceding project and at the start of this project the project team had assumed that the driver would be actively involved in the remote troubleshooting process.

Hence, in this project it seemed that in order to be able to identify consequences, knowledge about the existing troubleshooting service was required. The project team did not know the existing service of troubleshooting well enough to evaluate all of the consequences of the service concept and process of remote and workshop guided troubleshooting that they had suggested. This became clear in two ways: Firstly, through the questions that team members raised about the service of troubleshooting during engagement 01. Secondly, through the feedback from service actors that engagements 02 and 03 provided. The service actors that would be part of the guided troubleshooting service addressed consequences that the project team had not discussed during engagement 01, such as the involvement of the driver in remote troubleshooting process. In other words: in this project the consequences of a service concept for implementation

could not be identified entirely by the designers of the service concept (i.e. the project team and I). Other actors, who were familiar with the service of troubleshooting, had to be involved as well. People who had different positions in relation to the service (i.e. mechanics, receptionists, engineers, roadside assistance operators) differed in terms of what they knew about the troubleshooting service. Involving people who were related to and/or familiar with different aspects of the existing service therefore helped in this project to develop a better overview of the consequences than the project team could have done alone. This is in line with what the program *implementation during design* suggests. The program draws on design for manufacture and assembly (DFMA) as a generative construct, where designers discuss concept designs with production engineers, in order to optimise the design for manufacture and assembly. The idea behind this concept is that production engineers have a more detailed understanding of the production process than designers. Therefore, production engineers can identify consequences that a designer has not considered. In the development of the guided troubleshooting service, the frontstage and backstage service actors were the equivalent of such production engineers. Their knowledge of the troubleshooting service helped to identify consequences of the service concept that the project team (i.e. the designers) had not addressed.

4.1.5 Feedback regarding consequences provided input towards implementation

In evaluating the guided troubleshooting service concept, feedback was gathered regarding the consequences (effects and prerequisites) for frontline staff and other service actors that support the service process (see Section 4.1.3 and Section 4.1.4). This was in line with what the program *implementation during design* suggests: that it would be possible to address consequences of the implementation of the service concept during the design phase of a New Service Development process. The feedback regarding consequences for service transformation was used in engagement 04 and throughout the remainder of the project, as the service was developed further in preparation for implementation of the service concept. Firstly, the feedback could be used to address undesired consequences of implementing the service concept of remote and workshop guided troubleshooting and to make changes to the service concept in order to prevent issues during service implementation. Secondly, the feedback could be used to add further detail to the service concept and define prerequisites for the service delivery system.

During engagement 04, I asked the project team to indicate how the feedback from the interviews affected their view on the continued development of the guided troubleshooting service. The members of the project team discussed:

- How to address involvement of the driver in the remote troubleshooting process.
- How the position of the Helpdesk would affect the service.
- How they needed to continue to develop the interface for the remote and workshop guided troubleshooting software.

Firstly, when addressing the involvement of the driver, the members of the project team discussed the limits of driver involvement. Some of the participants wondered whether it might be possible to adapt to drivers with different levels of knowledge. For instance, Maria suggested developing the software in such a way that it would adapt the questions to the knowledge level that the driver seemed to have. Each question asked during the remote troubleshooting would be determined by the software, based on the response that the driver gave to the previous questions. Others thought it best to not involve the driver at all:

[M]y insights for...when reading these kind of information is that the tools that we build and sell or promote, they can't rely on having a driver to do something. So even if the driver doesn't want to cooperate, okay then it's fine, then you can still use the system. But we just don't use the driver. – Ferdinand.

Michael had the same opinion and related his view to the introduction of self-driving vehicles that would not involve drivers at all. According to him, the software must be adaptable to the absence of drivers in the future:

[W]e cannot rely on the driver to either tell us something or do something. I mean, in the short term we have drivers who (...) can't or don't want to provide feedback and who (...) can't or don't want to do stuff for us as well. And [in the] long term we get self-driving cars; we

don't even have a driver, so, you need to make sure that the design is not reliant on drivers to do stuff. It's a nice bonus if we can get information from the driver, or [have a driver involved in the remote troubleshooting] who maybe can do stuff, but that should not be a need or a must. – Michael

Secondly, the project team discussed who would perform the remote troubleshooting, which would affect the service concept. If the remote troubleshooting was decentralised, and happened on the garage level, this would mean that it would only be available during the opening hours of the garage. If the remote troubleshooting were to be available around the clock, it should be positioned more centrally in the Truck&Bus organisation. During the first engagement, when the project team had specified the service concept and service process, it had not been clearly defined who would be responsible for the remote troubleshooting. As a result, the interviews had ideas about how to realise the Helpdesk. Informants evaluated the scenario where remote troubleshooting took place at the level of individual garages as well as placing it on a regional level, as an extension of the current roadside assistance. In further development of the service concept, the benefits and drawbacks of these alternatives would have to be considered, when deciding how to realise the Helpdesk.

The decision regarding whether to realise the remote troubleshooting locally or centrally is likely to affect how efficiently this remote troubleshooting will take place. Positioning remote troubleshooting at the level of individual garages would mean that remote troubleshooting would take place less often, from the perspective of those who perform it, than if all remote troubleshooting cases for a country or region were handled centrally. If the software for remote guided troubleshooting was not used regularly, the threshold for using it would become higher and that using it would take more time:

I think it's because we have visited the workshops. (...) [T]hey have some users that use them frequently, but if you don't use it that frequently, it's quite hard: 'yeah, how do I do this again?' and 'what

was the password?’ and stuff like that. It’s more complicated. It’s a big step to start using something that you don’t use every day. – Maria

Since the responsibility for the remote troubleshooting (i.e. Helpdesk) was not clearly defined in the flow-type visualisation of the service concept, several informants asked who might take care of the remote troubleshooting. The answers given by people at the garage and roadside assistance operators revealed that none of them was willing to perform the remote troubleshooting, as Maria noticed:

[A]s I see it, in a lot of comments, they want somebody else to do it. In the workshop they want the [roadside assistance] to do it and in the [roadside assistance] they wanted the...it to be done in the workshop. And think that is something that we need to address, and see how we should solve this. Because, as I think, we build the tool now, you need mechanic skills and stuff like that, in a little way. So, maybe it should be in the workshop. But if they are total negative to it, it will be...it would be hard to launch it and get them to really use it. – Maria.

One of the reasons that informants at the garage gave when declining to perform remote troubleshooting was that they would risk not getting paid. Currently, as mentioned in Section 3.2.1, garages get paid if a customer visits the garage or asks the garage to make a repair at the side of the road. It is difficult to invoice any work that is done before the creation of a work order. Hence, if someone at a garage spends time on remote troubleshooting and finds that the driver can continue, they may not receive compensation for the time spent on remote troubleshooting. When Ferdinand and Michael discussed this, Michael suggested that in order to involve the workshops in remote troubleshooting there would have to be a direct benefit for them. Ferdinand suggested that by changing the contract to a form where someone looked after the uptime of a vehicle there would be more of an incentive to take the overall economy into account. That is, it would be preferable to not have contracts that are tied to specific garages and that compensate for

individual repairs. This, according to Michael, would still require that money was distributed from the party who received the income for such contracts to the individual garages that did the work. The new contract form and redistribution of financial resources are thus prerequisites that need to be considered as service development continues, in order for the garage to be willing to perform remote troubleshooting.

Finally, during engagement 04, the project team discussed prerequisites regarding the design of the remote and workshop guided troubleshooting software. They primarily addressed prerequisites that 1) would make that service actors willing to use and trust the suggestions made by the software and 2) would make it possible for feedback about the repair cases to be collected in log files at the end of each case. Developing trust in the software meant being clear about the probability that the root cause suggested by the software was actually causing the problem:

And that was a bit what you, James, mentioned: how can we get the user, in part to trust the tool but also present some kind of confidence level for the tool that "I am 80% sure that it is this, but do not trust it entirely" or "it IS this fault. – Mathew, my translation to English

And:

Instead of us saying "this is the solution", saying "well, you said this, this and this and we think this, this is our solution", sort of more humble way. – Michael

Towards the end of engagement 04, when addressing one of her three main insights from the interview data, Olivia summarised this as giving the software the right 'attitude':

One that we discussed (...) was the need for the system to have a good attitude. To sort of in the same vein as...as...that Amazon does not say 'you bought this, so I'm SURE you will like this', instead, it says 'well, those who bought that, also bought this' So it is exactly the same thing, but it is a different attitude. And that is something that I sort of like; [that] the system is not self-righteous, more humble and leaves the decisions to somebody else. – Olivia

These issues could be solved by making the software transparent regarding how certain conclusions are reached and correlations are made:

And that gave me the insights that we must be able to inform how the troubleshooting system arrived at its reasoning. So that a mechanic can judge the weight he should add to it. (...) And in some way, a mechanic should have the chance to critically assess the system, when it throws you in the wrong direction. – James (my translation to English)

An added benefit of being transparent about the reasoning of the software is that the software would be educational for the mechanics:

Explain[ing] why we have come to this conclusion will have multiple advantages. Both that we build trust on the user side; this is our conclusion, based on 'because you said this, this and this, and we think this' (...) and besides that we also provide sort of education to the workshop, because we are explaining 'this is our hypothesis, because this, this and this' which means [that the mechanic may think] 'Ah! There is a connection between these symptoms.'. So if we do that, we also increase the technical progress of the mechanic. – Michael

The extent to which the software is perceived as stable also affects user trust. If the software starts going back and forth between different suggestions with every new answer or new piece of information entered by the mechanic or Helpdesk operator, it does not contribute to developing trust, argued Ferdinand:

Even though it's maybe...it's statistically optimal to have the other solution, but the user will see it as strange, will not really...it will be very difficult to understand. And in those cases, maybe it is better to not go so far. In the guided diagnostics. If the system sees that: okay, now I will start to, like, flip around, depending on small changes in input, maybe we should stop there and say: 'Okay, we have that solution or that'. – Ferdinand.

Even though it makes sense based on the calculation of the probability for different possible root causes, going back and forth between alternatives would look strange to the person using the software and would likely affect their trust in it. The same goes if the software claims things that are not true:

And then I had something similar, because there I wrote as insight for the project that the system should not say 'the problem is solved', because here there is a foreman/workshop manager who said that 'you make a diagnosis: yes/no, yes/no' and then [the diagnosis software] says 'the system is okay', but the system does not work correctly. And that is exactly such an example. You should not claim things that you cannot substantiate. – Olivia.

During a later exercise in engagement 04, Ferdinand mentioned that the limitations of the software should be clear to those who use it:

So, it is important that you succeed to inform what the system does and what the limitations of the system are. Do you send in somewhat wrong things? Then you get the wrong [thing] back out. You cannot trust it. You can trust that it does what it should do, but not on that the entire flow will be correct. If you send in wrong [information] then it will be wrong. – Ferdinand (my translation to English)

Knowing the limits of the system would help those who use it to know the extent to which they can rely on the suggestions made by the software.

It is about building confidence in some way. If we're always right, then it's no problem, but...euhm...if we lead them down the wrong path and sort of make things worse for them, then they might not be...I mean, stop using this or...we need to be careful when we state things. – Michael

These different aspects of the *attitude* of the software are thus prerequisites that need to be fulfilled in order for the service to be delivered. If mechanics do not use the software because they do not dare to trust its suggestions, there will be no guided troubleshooting service in the way that the project team had defined it during engagement 01.

An alternative to this problem would be to set the guided troubleshooting service up in a similar way that is similar to the current warranty system of Truck&Bus. As James and I learned during one of the interviews, garages get reimbursed for warranty repairs as long as they minutely document all the information regarding the repair that is required from the warranty department at Truck&Bus. The prospect of being reimbursed by the Truck&Bus head office could thus provide an incentive for garages to instruct their mechanics to provide feedback about their work in the software:

If it's a warranty, this...if they do exactly as they say, then you're free. Then someone else will pay. And that gives an incentive to actually do this, regardless of what it is actually saying. And that's one other...other ways where we're very enforcing with...yeah. Then you will be happy regardless of whether you trust it or not. – James

In addition to creating trust in the software, it is also necessary that mechanics use the software to document their work in order for the service to work properly. Only if the mechanics document their actions is it possible to improve the algorithms that provide suggestions for additional troubleshooting actions. Another prerequisite for the services is thus to make sure to get feedback about the repair cases from the mechanics. The results from the interview made it clear to the project team that they could not assume that mechanics would simply provide this feedback. Therefore, the project team discussed several options for achieving this, such as 1) making it easy to leave feedback by integrating the provision of feedback into the routine interaction with the software and 2) providing a clear incentive for the mechanics to document their work, such as showing how mechanics get a direct benefit in their own work from leaving the feedback.

To summarise, the consequences of the initial service concept articulated by the informants during the interviews could be used by the project team to determine how to continue to develop the technology and the service. The team could make informed decisions about which effects of the service concept to prevent and which prerequisites to realise in order to successfully implement the guided troubleshooting service concept. Hence, the input from the interviews helped the project team both to consider changes that would need to be made to the service concept, in order to improve it, and to design the details of the service delivery system that would support the service concept.

Sections 4.1.1 to 4.1.5 have discussed how the points where back-talk from the move-testing engagements was in line with the framework for service transformation established by the program *implementation during design*. These outcomes highlight how service transformation was addressed in the

project in the way it is framed in the New Service Development as well as how the contribution of design and trained designers was in line with discourses in Service Design literature. However, there were also outcomes from the engagements where service transformation was addressed, albeit not in the way it is framed in type 1 service transformation or the related program *implementation during design*. In the remainder of this chapter, these anomalous instances are presented.

4.2 Unexpected outcomes given the framing of the project as type 1 service transformation

While the engagements provided outcomes that were expected, there were also a number of outcomes that were unexpected for type 1 service transformation and *implementation during design*.

Firstly, through the dialogues with the service actors, it became clear that the guided troubleshooting service could not be seen as one service experience that would be delivered through a service process. Nor were service interactions always dyadic. Rather, the service was a collaboration between service actors, wherein multiple actors would sometimes work together and contribute to the service at the same time. The value of these collaborations depended on the context in which they took place. These topics are addressed in Sections 4.2.1 through 4.2.3.

Furthermore, it turned out that service transformation would probably not take place as a phase where the service delivery system was assembled. While service transformation does require the technology for remote and workshop guided troubleshooting to be developed, service transformation is more likely to take place gradually. This is explained in Section 4.2.4.

Lastly, while design was used as an approach in the project, it did not take place through the typical Service Design process consisting of an analysis phase followed by a synthesis phase. Rather, design was used as an inquiry, to learn about the existing and envisioned troubleshooting service. This is discussed in more detail in Section 4.2.5.

4.2.1 Variations in the guided troubleshooting service process and consequences of realising service transformation

During the project, it turned out that there would likely not be *one* service process that would support the delivery of the guided troubleshooting service concept. During engagement 01 we thought that the service could be delivered through one process as it was possible to let the members of the

project team define generic activities in the service process of remote and workshop guided troubleshooting (see Figure 4.1). However, the project team's discussions of the different scenarios that they were given to assess the generic service process showed that there would not be one way in which the service would play out as a series of touchpoints. For instance, Maria and Ferdinand worked with a scenario that involved a truck owner who wanted to be involved in all the steps of the troubleshooting and decide which repairs should be made and which should be postponed. During their work with this scenario they discussed how to communicate the information from the software:

Ferdinand But since [the costs for the repair are] just an approximation, I guess that's not what you want to tell this kind of customer. Because that person will take it as a fixed level. And if the workshop haven't fixed it until that level, then they won't pay anymore. So I guess here you just don't want to answer.

Maria Yeah, but shouldn't it be that the troubleshooting tool should say "shouldn't we do this next level, it will cost you this"?

In other words, the interactions in the touchpoints would change depending on whether the vehicle owner you interact with wants to be involved in every step or whether the owner would let the garage do its work and pay the bill afterwards. During the interviews with representatives from the transportation companies in different countries we learned that this involvement of the transport company in decisions regarding the repair would, amongst others, be determined by the type of contract that the transport company has.

Another scenario that was addressed during engagement 01 was whether the truck that had broken down was transporting frozen goods. Olivia, James and Mathew envisioned what the service would look like in this case. Their discussion suggested that if there is a deadline (i.e. if the cargo is melting) you would need to proceed in a different way than if there is no time pressure involved. James suggested that if the repair is urgent, remote troubleshooting might not continue until the root cause was found. Instead, it would be worth it to stop earlier, decide which of the remaining causes is most likely the root cause of the problem and perform the related repair. That way, it is possible

to act quicker and therefore have a chance to save the frozen cargo. However, the flow-type visualisation of the envisioned service on a generic level did not contain this notion of taking a risk in order to have at least a chance to save the cargo if the repair is urgent. Instead, the generic service process was defined as doing remote troubleshooting as far as was possible and then deciding which garage to contact for further assessment of the problem and repair.

The feedback on this service process during engagement 02 and 03 also suggested that the service could not be expected to take place according to the series of touchpoints that the project team had envisioned. During engagement 04, the project team addressed realised that the service of remote and workshop guided troubleshooting would likely not take place in the way it was represented during engagement 01. When discussing the insights from the interviews, Olivia, James and Ferdinand realised, based on the data, that the service would not always take place as depicted in the flow-type visualisation. The remote troubleshooting service should instead be seen as a collaboration, where the way in which the collaboration would play out would differ from case to case. Ferdinand mentioned this during the second exercise:

Maybe, a like, lesson for the project is that we can't really assume that the flow will be in a specific way. – Ferdinand.

When summarising their insights during the last assignment, James and Olivia referred back to a discussion they had had during the same exercise, but in the other group, where they had addressed the nature of the troubleshooting service:

James (...) and then one discussion we had earlier this morning that...euh...or an insight is that we have many roles that interact collaboratively and maybe not necessarily fully linearly. You have different roles that needs to come in at different times and come back later and discuss with each other, so it's...

Olivia More collaboration than handover, I wrote. So it's not just one person handing over to the next, to the next, to the next; it's a collaboration.

In such a collaboration, the software would support the possibility for different service actors to step in and out, as Olivia suggested. Since all information about a troubleshooting case would be stored centrally, different actors would have simultaneous access to all of the information that was saved about the case in the software.

Hence, it was not possible to view the guided troubleshooting service as one particular flow with a standard set of touchpoints and activities that would take place in a certain order. As a result of the multiple ways in which the service can be enacted, it became difficult to determine all the possible consequences for service transformation. There were too many variables to make it feasible and useful to explore and address consequences of the design of the service concept for the assembly of the service delivery system. In this project, these variables included:

- The extent to which drivers are willing and able to be part of the remote troubleshooting process.
- Whether the remote troubleshooting, as a service function, would become part of the work of individual garages or the regional distributor, or whether it would be realised on a global level.
- The business model for the service, especially how to charge for the remote troubleshooting part of it.
- Variations in characteristics of the markets in different countries.

When it came to the drivers, it seemed that the consequences of the realisation of the remote troubleshooting would differ depending on their willingness to be involved, technical knowledge and their skills. The level of technical knowledge among drivers and their willingness to be part of the troubleshooting and seemed to vary between countries. In the African country that we visited, most drivers were said to be technically skilled. The informants also expected the drivers to be willing to help in the troubleshooting process if that meant that they could drive on to the safety of the next village. In Europe, however, the informants mentioned that there was a wide range among drivers in the level of technical knowledge and willingness to be involved in the troubleshooting service.

In addition, not all aspects of the service concepts were defined and decided upon. The position of Helpdesk was not defined by the project team during engagement 01; it was not clear who would be responsible for performing the remote troubleshooting. As a result, this function could be realised on a global level, a national level or even the local level of individual garages. These options have been discussed by the project team at different times in the project. During engagement 01, James suggested that the Helpdesk could be an extension of the roadside assistance, which is positioned at a regional level. Similarly, during engagement 01, Maria mentioned, based on her experiences, that transport companies often contact their home dealer in case of any issues. Firstly, because they trust the people who work there and secondly because the home dealer has all the information about the vehicle and the customer:

Yeah, maybe the Helpdesk can be another workshop. Because as I see it, when we have this remote diagnostics out and a lot of the users say that they call the home workshop. They call their own workshop because there they have the trust, there they have everything. They download the fault codes and then they [decide:] you need to contact the nearest workshop, because you won't be able to get to our workshop with this fault. – Maria

During engagement 04 she mentioned this as well:

Just a small...because when we visit...when we look at remote diagnostics they rather call their home workshop than the nearby workshop. They would like to have their home workshop to look at fault codes and see if they can continue. And also, the local workshop to call the nearest workshop and see for spare parts and stuff like that. So, they usually...so this will be if we have a good tool...they could call their home and local workshop, wherever they are. And I think that is really good to take in. – Maria

Later during the project, when Michael had become involved as UX designer instead of Diane, he suggested that mechanics on 24-hour duty could perform remote troubleshooting in between responding to calls. Each of these strategies for assembling the service delivery system have their own consequences and since the location of the remote troubleshooting was not defined, the identification of consequences would need to take all of these alternatives into account.

Even if the position of the Helpdesk had been defined, there could still be variations in the remote troubleshooting touchpoint. As James had pointed out during engagement 01, the type of contract would influence the extent to which the transport company would need to be involved in decision-making. If the transportation company pays a fixed fee each month, they only want the vehicle to be repaired as quickly as possible. However, if the company pays for each repair separately, the costs of the repair are also a factor that is important to them. Therefore, in the latter case, the transportation company wants to be more involved in decision-making during troubleshooting. Transport companies that had their own workshop would want to know whether the problem in question was an issue that they could handle in their own workshop. In that case they could order the parts and perform the repair themselves, to save money. During engagement 02, the fleet uptime manager mentioned that the home dealer could also be the one that calls the Helpdesk, rather than the owner of the vehicle as the project team envisioned it during engagement 01:

I think that the fleet manager might also be somebody that will call in. And when they...when the fleet manager calls with the home dealer, it can also be the home dealer that is actually giving the call to the Helpdesk or assistance. Often you have the relation between the fleet manager and the home dealer. – Fleet uptime manager.

The scenario where the home dealer calls the Helpdesk seems especially likely if the transport company whose vehicle has broken down has signed a flat-rate repair contract with their home dealer. In that case, the transport company pays a monthly fee to the home dealer rather than paying for each

repair separately. If there is any troubleshooting done at other garages, the home dealer then pays that garage for the work that was done. Since the home dealer will pay for the troubleshooting done by another garage, it makes sense that the home dealer would want to be involved in decisions regarding the troubleshooting.

The project team did not make any decisions regarding the business model and types of contracts that would be available for the guided troubleshooting service. They would let the distributors for the different markets decide upon what types of service contracts to support when they would implement their service in their respective markets. Therefore, the contract types and their pricing were not known at the time the interviews (engagement 03) took place with frontstage service actors. As a result, different contract types were brought up and reflected upon during those interviews. These contract types included paying for each remote troubleshooting session individually, having the service included as part of an existing service contract or offering a service contract where people pay for access to the vehicle (uptime). Each alternative would have different consequences for realising service transformation. For instance, transport company representative #5 mentioned that if they would pay a fixed fee per month for the service, they would be willing to let other people make decisions about troubleshooting than if they had to pay for each case separately. Transport company representative #7 said that if a separate payment was required in addition to their current monthly contract fee, that it might be hard to convince his boss to opt for this extra service. He believed that the number of times per month that a situation occurs where the remote troubleshooting would be beneficial to their organisation was too low to justify the additional costs of the remote troubleshooting service.

Finally, in engagement 01 the project team discussed how variations in the situation could influence what would happen specifically. For instance, if a driver is abroad you have a different situation and related way that the process would play out than if the driver and workshop employees speak the same language.

Not only being abroad in general affects the service experience, but also which country you are in. There are differences between countries in terms of how troubleshooting takes place. At several occasions during engagement 01, the participants asked Michelle, who had visited garages in various countries, to understand differences between countries in the way the

garages work. During engagement 02, a method engineer said, when giving feedback on the idea of providing recommendations for next steps in the troubleshooting process:

They might want to do...take a unit apart and replace a little thing in one market, but in another market they would just like to replace the entire thing, or send it away to a third party for servicing. There are different approaches on different markets. – Method engineer

The interviews helped to make clear how the context for the troubleshooting service differed from country to country. This led to additional variety in the consequences of realising service transformation. As discussed above, the technical knowledge of drivers and their willingness to be part of the remote troubleshooting differed between countries. Furthermore, informants in Africa mentioned that knowing more about the problem could increase the safety for the driver and the mechanic was mentioned. Having an initial understanding of the problem through the remote troubleshooting may enable a temporary repair that allows a driver to continue to a village, which creates a safer situation for the driver and—during the troubleshooting on site—the mechanic. Moreover, the road conditions and driver behaviour in the African country differed from the countries we visited in Europe, leading to differences in the types of vehicles that can be used and the type of issues that occur with those vehicles. The garages in the African country we visited are also further away from each other than garages in Europe, making it more difficult to source parts from other garages, something which European garages can do. In Europe, language issues due to international transportation routes or as a result of workforce migration were mentioned in the interviews as something that would likely affect the service as drivers may not speak the same language as the mechanics at the garage. Additionally, the setup of the work done at garages seemed to vary between different countries: at some garages the receptionist was a former mechanic and had detailed knowledge about the vehicles, whereas in other countries, receptionists only made appointments for maintenance work and forwarded questions that were too technical in nature to the workshop manager. Lastly, there will arguably be

differences in legislation between different countries that will have varying consequences for the realisation of the guided troubleshooting service.

Altogether, in this project, there would likely not be one way in which the service concept and service process would be implemented and not one way in which service transformation would be realised. As a result, *implementation during design*, as the service equivalent of what is design for manufacture and assembly (DFMA) in a product context, did not prove to be universally useful as a generative construct to address service transformation. The usefulness of DFMA builds on the idea that you know what the consequences of design decisions in a product concept are for its production. This requires that you know what the manufacturing and assembly process looks like. As mentioned above, there would likely not be one service process for the remote and workshop guided troubleshooting service. Therefore, there would not be one way in which the service delivery system would be assembled. In turn, there would not be one set of consequences of that design decisions would have for realising service transformation (i.e. assembling the service delivery system).

4.2.2 Interactions in the guided troubleshooting service are networked

Type 1 service transformation suggests that service can be defined as a service concept, and delivered through a service process that consists of dyadic interactions taking place in touchpoints. During our project, it became clear that the remote and workshop guided troubleshooting service would not exclusively contain such dyadic interactions. As addressed above, the work in the service would be a collaboration between different actors. Below, examples are discussed that did not contain a dyadic interaction between service provider and service customer, but rather were collaborations between service actors, in a network constellation:

- The decision point would be a conference call with multiple parties involved.
- The service provider is not one entity but has a complex internal structure.
- People who are not a direct part of the service process still benefit from it.

During engagement 01, the decision point was depicted as a dyadic interaction. The project team saw it as the point in the process where a decision is made, based on the outcome of the remote troubleshooting, regarding how to proceed, based on the outcome of a remote troubleshooting session. For example, a decision might be made regarding whether it is recommended that a vehicle can drive on and, if so, which workshop they should visit. When defining the decision point, the project team suggested that this would be a decision between the Helpdesk operator and the owner of the vehicle:

And then...well, you cannot make that decision (whether and to which workshop to go, ed.) without involving the workshop. But you cannot involve all the workshops. So, the Helpdesk, together maybe with manager might select workshop first. And then contact it. – James

In engagement 02, the fleet uptime manager mentioned that the home dealer would most likely want to be involved in making decisions about how to proceed after the remote troubleshooting was completed:

[T]he decision point is more or less, you make a decision on an action plan. What we will do. And that involves the customer, the Helpdesk, home dealer and also the one that actually does the repair. – Fleet uptime manager

The home dealer is the organisation with whom the transport company may have signed a repair contract. If possible, the transport company will take their vehicles there for repair. However, if this is not possible and repairs are done at another garage, the home dealer may want to be involved, because they have historic information about the vehicle, which may be relevant for the troubleshooting. Furthermore, the home dealer will receive the vehicle for scheduled maintenance in the future. Therefore, it may be useful for the home

dealer to know about the issue with the vehicle. Finally, the home dealer may have to reimburse the garage that performs the repair for their work.

In his comment, the fleet uptime manager suggested that it would not be likely that there would first be an interaction between the driver and the Helpdesk (remote troubleshooting), followed by a conversation between the manager and the Helpdesk (decision point) and finally an interaction between the manager (or the Helpdesk) and the garage. At a later point in the project, the project team replaced the dyadic interaction between the manager and Helpdesk in the decision point with a conference call in which the Helpdesk operator, the owner of the vehicle and the garage that was selected to continue the work are all involved. The conversation would thus no longer be a one-on-one interaction between customer and service provider. This change was reflected in a redesign of the flow-type visualisation of the remote and workshop guided troubleshooting service concept (see Figure 3.18 and Figure 3.19).

In this project, there were thus more possibilities for how interactions could take place in the service than there were in touchpoints that were defined in engagement 01. Firstly, it is not just the driver who is likely to call to the Helpdesk. Secondly, the driver or customer will not necessarily call the Helpdesk. Thirdly, it is not just the Helpdesk and the owner of the vehicle that will likely want to be involved in making decisions about how to proceed. The transport planner may also call the Helpdesk, or may call to the home dealer rather than the Helpdesk. Besides, it is not just the customer and the Helpdesk that are involved in the decision. The home dealer and the garage that will perform the repair will likely want to be involved as well.

Moreover, it was not possible to define touchpoints in the service process for the guided troubleshooting service as customer-provider interactions, because it proved difficult to frame the service provider (Truck&Bus) as one entity. For instance, the distributor and garage are to some extent independent from the head office. If a garage is owned by Truck&Bus then these garages still act as individual units under the regional distributor. Some of the garages are not owned by Truck&Bus and act completely independent organisations. The garages are responsible for their own financial health and thus have certain targets that they have to meet in terms of the revenue that they produce. Flat rate contracts are paid for at the home dealer, and if a vehicle visits another garage, the home dealer compensates that garage. In those cases, income is redistributed between garages. If a customer pays

separately for each repair, the garage can usually only charge a customer for the time when the vehicle is in the garage (or a mechanic is working on the vehicle at the side of the road). In those situations, remote troubleshooting involves a risk for the garage: if the remote troubleshooting leads to the conclusion that it is possible to drive on, it will be difficult for the garage to charge the customer for the time spent on diagnosing the problem:

[W]e need to distinguish what the Helpdesk does and what the workshop does. [The workshop manager] is not interested in supporting a customer for a couple of hours and then it turns out he doesn't come to his workshop. Because...that truck or that...that person is not his customer before he books a visit to his workshop or has a service contract. So, you need to have a smooth handover and transition from assistance to the workshop, so that we don't dump more workload on the workshop that they're not getting paid for. - Michael

In the examples above the dyadic view of provider and customer interacting with each other was not applicable. This was also true in the project team's discussion of people who are not part of the service process but who are still affected by it. These actors are neither providing the service as part of the service provider organisation, nor are they customers, but they still benefit from the service. In engagement 01, Ferdinand mentioned that the information about cases that is saved will be useful for the factory:

Ferdinand All information in this chain is the feedback.
Tim Ah, okay. Yeah.
Ferdinand But of course, somewhere you can collect it into a report or something like that. Some way for the factory to learn from this experience.

Moreover, James mentioned that, as software engineer, he would benefit from the log files of a troubleshooting cases that are created as part of the troubleshooting service. Being able to analyse those logs would help him to improve the guided troubleshooting software.

Additional examples of value in "Handover from helpdesk to workshop"		
Names of those in the group:
Description of the (inter)action	Type(s) of value it addresses	Valuable for which actor(s)
Handing over all information (with a click)		(all but mostly for the) receiving part
Speedy handover		society - less road congestion, safety

Figure 4.3 - Value of the service for actors beyond those directly involved: in the second row of the 'valuable for which actor(s)' column society as a whole was mentioned as actor who benefits from the guided troubleshooting service

Even beyond the provider organisation there are people who benefit from the service. During engagement 01, James mentioned that being able to tell drivers whether they can drive on would mean that drivers would wait by the side of the road for less time. He reasoned that this would benefit the family of the driver as well. Another example from the same engagement came from the group of Ferdinand, Mathew and Olivia, who mentioned that getting a truck off the road quicker would minimise congestion and increase safety on the road, which they reasoned would be a benefit for society (see Figure 4.3).

4.2.3 Different service experiences for actors in the guided troubleshooting service

As discussed in Section 4.2.1, the guided troubleshooting service will not be delivered through one process. It is as a collaboration that is enacted in different ways depending on the situation at hand. As a result, there would not just be one customer experience in the remote and workshop guided troubleshooting service. It is also difficult to isolate who the customer is. Although transport companies would pay for the service, the intention is that both the driver and the transport planner would also benefit from it. In addition, the intention is that mechanics would benefit, both from having the step-by-step guidance during troubleshooting and from having the ability to perform parts of the troubleshooting process remotely. All service actors, including, for instance, the mechanics, roadside assistance operators, workshop managers and receptionist, will have a certain experience as a result of being part of guided troubleshooting service. If the transformation to the guided troubleshooting service is realised, this changes the way in which service actors would collaborate during the troubleshooting process. In turn, this would affect their experiences in the troubleshooting service. For instance:

- The experience for the transport planner and owner would be affected by the ability to perform troubleshooting remotely as well as how monetary risk and decision-making power are distributed.
- The experience of the drivers would be affected by the possibility of remote troubleshooting and by the central storage of information.
- The experience for the mechanics would be affected by changes in how they would work with software during troubleshooting.
- The experience for workshop managers would be affected by changes in how troubleshooting cases would be assigned to different garages.
- The experience for roadside assistance operators would be affected if they had to perform remote troubleshooting.

For the transport planner, their experience in the troubleshooting service changes if the transformation to guided troubleshooting is realised. Since it would be possible to perform parts of the troubleshooting remotely, time would not be lost because a vehicle had to drive to a garage before the problem could be assessed. Furthermore, the transport planner would have more information earlier in the process. This would improve their opportunities for long-term planning, because transport planners would know earlier than they currently do whether or not they should reschedule deliveries and drivers. However, transport company representative #2 mentioned that the extent to which the remote troubleshooting would be helpful would depend on whether the person performing the remote troubleshooting is able to communicate with the driver and interpret the symptoms and feedback from the guided troubleshooting software.

In addition, the experience of transport planners is affected by how financial risk and decision-making power are distributed through the contract for the guided troubleshooting service. If this service contract comes with a fixed fee, there is less financial risk for the transport planner, allowing them to opt for quick solutions, which might be expensive, and delegate work to the garage. If, on the other hand, the service contract requires the transportation company to pay for each repair separately, transport planners would likely want to be more involved in decision-making. Otherwise they might have the experience of having little control or influence in the guided troubleshooting process. Moreover, during engagement 01, James mentioned another aspect that would influence the service experience: whether the transport company would be responsible for paying for towing and repair if the advice to drive on that was given by the Helpdesk would prove to be

incorrect. If the contract that a transport company signed were to state that the Helpdesk (i.e. Truck&Bus) would take responsibility in case their advice turned out to be incorrect, drivers and transport companies would be more willing to follow the advice, James reasoned. If, however, the Helpdesk would not take responsibility, the driver and transport company would have to trust the advice (and have positive previous experiences with the advice given by the Helpdesk) in order for the advice to be of value for them.

The experience of the driver in the guided troubleshooting service would be affected by the ability to perform parts of the troubleshooting remotely. During the remote troubleshooting, they would have to make sure that the vehicle was properly prepared for running tests remotely (i.e. park the vehicle, apply the handbrake, put the gears in neutral) and confirm that the test that the Helpdesk sent could be performed.

Since drivers are expected to call to the Helpdesk, this also changes the relationships between the transport company and their home dealer. Currently, as Maria and the fleet uptime manager had suggested, transport companies call their home dealer if they require remote troubleshooting. However, in the envisioned service, this would be done by the Helpdesk. If the service function of the Helpdesk were to be added to the existing roadside assistance department, the relation between the driver and the roadside assistance operator would also change, affecting their service experience.

Another example of how the implementation of the service concept shapes collaboration between service actors is in the handovers. Currently, when drivers arrive at a garage they hand over the vehicle (i.e. the keys to the ignition) and their account of the symptoms of the problem at the same time. In the remote and workshop guided troubleshooting service this handover is divided into two parts. The symptoms of the problem and results of the initial remote troubleshooting are handed over to the garage through the case log and only the vehicle is handed over when the driver arrives at the garage. Ideally, the driver does not have to repeat the description of the symptoms of the problem, because the garage has already received (and understood) this information from the case log in the remote and workshop guided troubleshooting software.

The collaboration between the troubleshooting software and the mechanic would influence the mechanic's experience as part of the service: Firstly, because the software would suggest follow-up actions rather than solely

providing information, as is currently the case. The nature of this relation was initially addressed by Mathew in engagement 01:

And I think this one is really important, actually, because we had a long discussion—or not so long, but—with James after his presentation about if the system should be just to tell the mechanic what to do or if it is some kind of interaction. And I think to me, [to be] successful it should be some kind of interaction. – Mathew

For the mechanic to have a positive experience of being part of the guided troubleshooting service, it is important that they can decide what to do. This topic was also addressed during engagement 02 and engagement 04. During engagement 02, the fleet uptime manager and the software developer discussed that having guided troubleshooting might remove the need for having experienced mechanics, but that it might also make troubleshooting boring for the mechanic. During engagement 04, Mathew mentioned an anecdote from when he had visited his car dealer and heard from a mechanic about the troubleshooting software that they used at that garage. This software forced mechanics to complete all of the steps in the troubleshooting, even if they already knew what the problem was (my translation of the conversation to English):

Mathew So that can also be a thing that people in their case think, that ‘then we press you into the system instead and then we can employ whoever as long as they follow the system.’ But when you get skilful people than you don’t use them.

Olivia It is even worse; they become very angry. Stop to use the system entirely.

Mathew And for us, I don’t really know, we also have a hard time to find mechanics with competence and all, but that is what you must work with instead then.

In addition to the risk that the guidance in the troubleshooting software could become a straightjacket for the mechanic, there is also a risk that mechanics

might experience mixed signals in terms of how they are expected to do their work. Mechanic #5 thought the step-by-step guidance would not be good because it would go against the training that mechanics receive, which tells them to always start at square one and not take shortcuts.

Moreover, if the Helpdesk were to share the estimates of the repair times that the troubleshooting software provided with the driver or transport planner, this could put pressure on the mechanic who had to perform the repair. For this mechanic, the time estimate would become a deadline that they had to meet, which could cause stress, especially if the standard times that were used to calculate the time estimate were incorrect. James addressed this when he and Maria formulated interactional qualities and value for service interactions during engagement 01:

Some of these standard times are, of course, incorrect. And they use these to give the bill. And [the mechanics] get stressed sometimes, when some of these times are off. Or if the truck is configured in such a way that it is impossible to reach these standard times. They feel that they cannot bill more than the standard time and then they try to race against these standard times, if it's wrong or difficult to succeed. So if the IT system would be giving a forecast, that forces the mechanic, that could force the mechanic to...try to fulfill that forecast, even though the forecast is not realistic – James

For those who prepare the work at the garage, the possibility of remote troubleshooting could lead to both positive and negative experiences if the transformation to the guided troubleshooting service were to be realised. Receptionist #2 mentioned that the workshop manager would not have the time to screen the troubleshooting cases that were forwarded by the Helpdesk and prepare for the continuation of troubleshooting work at the garage. The garage would need to hire additional employees because otherwise the workshop manager would drown in work. Similarly, the workshop manager would have a negative experience as a result of taking part in the guided troubleshooting service if people were to call the garage more often than is currently the case to request remote troubleshooting in order to know whether or not it would be safe to drive on. Workshop manager

#3 expected that unless he was involved after the decision point he would have a negative experience, because he would have to spend his time on the phone, rather than getting work done in the garage.

At the same time, several employees at garages mentioned that it would be a positive experience to know in advance what kind of cases would be arriving at the garage. Receptionist #3 mentioned that it had happened that they had sent a mechanic home because there was not enough work, just before a customer arrived whom this mechanic could have helped. During engagement 02, the fleet uptime manager suggested that the guidance in the software would be a benefit for the workshop manager who has to hire mechanics, because it would put fewer demands on the technical skills and knowledge of a mechanic.

The experience for roadside assistance operators would change if they had to perform remote troubleshooting. When defining the service concept during engagement 01, James suggested that Helpdesk should be built on the existing infrastructure of roadside assistance call centres. Extending the roadside assistance to include remote troubleshooting would change the way in which drivers and roadside assistance relate to each other. Instead of only connecting a driver with a garage and providing language support where needed, the roadside assistance operator would have the additional work of performing remote troubleshooting. Roadside assistance operator #2 mentioned that she would not feel comfortable if she had to do the remote troubleshooting and give advice on whether it was safe to drive on or not. In addition, performing the remote troubleshooting could require roadside assistance operators to spend more time on the phone with a driver. However, at the moment the operators are expected to do the opposite and close calls as quickly as possible. If this expectation were to remain the same while operators also had to spend more time on the phone to perform remote troubleshooting, their experience in the guided troubleshooting service would be stressful.

Finally, since the guided troubleshooting process is collaborative, the experience of service actors is also dependent on the work of other actors in the service. The experience of employees at a garage is affected by the way in which the Helpdesk performs remote troubleshooting and whether the information gathered by the Helpdesk is useful for the remainder of the troubleshooting process. Olivia addressed this during engagement 04. When

she addressed a quote from an interview with a receptionist, she mentioned that there would be a need for a feedback loop:

I also got a view on someone...a receptionist, here, who said that...who was a bit like... "He has some doubts about how efficient will the information that arrives to the mechanic be?" and "Is the information good enough to transmit what has happened here for the technician to have a good view of what happened previously." And there here is also some kind of need for some kind of feedback to the Helpdesk: "do I ask the right questions?" "Do I do things right?" "Did this work?" And that is related to this that you actually together...that it is a collaboration to solve the problem. – Olivia

For the service actors who were informants in this project, their own situation and their understanding of how the guided troubleshooting service would affect their collaboration with other service actors seemed to form the basis for how informants evaluated potential consequences of the guided troubleshooting service.

4.2.4 Service transformation is realised in a continuous way

The program *implementation during design* builds on an understanding of implementation as a phase in a service development process. In this project, there were several situations where this notion that implementation is one distinct phase did not seem to fit informants' expectations of how realising service transformation would take pace:

- The self-learning system of the guided troubleshooting was expected to develop continuously.
- Not all the parts of the service process will be realised in one go.
- Service transformation was considered to be affected by how much mechanics would trust and thus use the guided troubleshooting software.
- The introduction of self-driving cars was expected to create changes in the context of troubleshooting that would affect the service.

For instance, Maria and James, during engagement 01, talked about value that would be delivered in the interaction in which the vehicle is handed over to the garage. One of the points they addressed here was that the estimate of the time needed for the repair could lead to negative service value for the mechanic. They were aware that time estimates given by the software might not always be correct, which could mean that mechanics would feel stressed if they had to work to meet an unrealistic time estimate for a certain repair job. In response, Maria suggested that:

*Maybe the system should be able to get 'how long did it actually take?'
So it will learn. – Maria*

Maria was addressing a situation that would occur after the implementation phase in a service development process in type 1 service transformation. The service would be in operation, but as improvements are made based on information from previous repair cases, changes will still be made to the service. The information about these cases is stored in what the project team referred to as *logs*. As Ferdinand mentioned, these logs would collect the information from the troubleshooting cases, and could also help the factory to learn from issues that occur with the vehicles.

The notion of a self-learning system was addressed in a similar way during engagement 04, when Maria suggested that updating algorithms based on data from troubleshooting cases and creating self-learning algorithms would be required as part of the guided troubleshooting service:

And it was just this that the system needs to be...self-learning in some way, so that we can build better and better diagnosis. – Maria

When James asked how this would take place Maria replied that is the imagined it would begin with a task team analysing the data and updating algorithms accordingly and that this would transition into a fully automated process of updating algorithms (i.e. machine learning).

This is another example of a situation that would occur after the implementation phase in type 1 service transformation, that is, logging algorithms would come after the touchpoints and service delivery system were in place. However, it would still be related to service transformation, because the continuous updates of the software algorithms affect the troubleshooting service. These updates are meant to improve guided troubleshooting service, by providing better support for troubleshooting.

Similarly, if the feedback loop from the garage employees to the Helpdesk employees that Olivia suggested would be realised, this would become another way in which the service is constantly developed after what is considered its initial implementation in type 1 service transformation.

In several discussions about the guided troubleshooting service it was stated implicitly or explicitly that service transformation would not take as implementation of the service concept. For instance, when asked by informants during several of the interviews, James and Ferdinand said that the service would not be implemented all at once. James said explicitly that the envisioned service would not be rolled out in its entirety all at one time:

And if this is...well if...because everything here will not be done immediately [laughs]. If this becomes that you have the same as the remote diagnostics today, but as instant. – James, during interview with workshop manager #1

In addition, Ferdinand asked which part of the represented process they thought should be prioritised in further development of the remote and workshop guided troubleshooting service:

Here we have a complete process with a lot of steps. Which one, or where in this step do you think it is most important to start? What should we focus on and start developing first? – Ferdinand, during interview with mechanic #5

At the end of engagement 04, Michael also addressed this idea of realising service transformation in steps rather than as a one-time effort. He said that the envisioned service process would be realised one step at a time:

We may want to focus on the value that we are adding in each step of the process. (...) we're not gonna launch the big bang, this is the entire everything, but we pick instead the good stuff: well this is good value; this is one small step of the process where we can add quite a lot of value on its own. And then we keep adding value until we got something that looks nice. – Michael

After engagement 04, Michael mentioned that he wanted to focus on solving small problems first. He wanted to begin by looking at the conversation between the receptionist or mechanic and the driver, to determine what these actors would need during remote troubleshooting. At first, he wanted to address uncomplicated cases, such as a situation that takes place during the day, where the vehicle is close the home dealer that has the necessary parts in stock and where the repair costs stay within the guarantee of payment. Once the software could support this type of cases in a good way, he wanted to involve more actors and move on to address more complex situations. In other words, Michael's approach was not to address implementation of the service process in its entirety from the start. Instead, he suggested examining the different parts of the service process one step or interaction at a time.

Furthermore, the project team did not consider service transformation as something which would take place by specifying standards for the way in which touchpoint interactions were to take place. For instance, the project team did not dictate the way in which mechanics were intended to use the software in different touchpoints. Instead, the project team discussed how to develop the software so that the service actors would trust the software and how to incentivise mechanics to use the software. During continuing development of the software after engagement 04, UX consultant Paul developed a paper prototype and a clickable prototype. We discussed these prototypes with mechanics and receptionists at garages in different countries in order to understand how people would use the software as part of the

troubleshooting service. These prototypes were not used to instruct people on how to interact with the software. On the contrary, Michael was aware that it was not possible to tell others how to do their work, especially beyond the troubleshooting work that is done by mechanics in a garage.

Finally, changes in the context for remote and workshop guided troubleshooting in the future will also affect the service. For instance, during engagement 04, Michael mentioned that the introduction of self-driving vehicles would mean a change in remote troubleshooting:

[In the] long term we get self-driving cars; we don't even have a driver, so, you need to make sure that the design is not reliant on drivers to do stuff. – Michael

The introduction of self-driving cars is a change to the context of the remote and workshop guided troubleshooting that we could anticipate, but other changes, such as new legislation) cannot be predicted. Nevertheless, these changes affect the context of troubleshooting and thus contribute to a transformation of the troubleshooting service.

4.2.5 Designing facilitated learning for service transformation

Given the framing of the project as type 1 service transformation, I had expected that the design of a service concept could take place according to the typical Service Design process that was introduced in Section 2.3.1. That is, that the development of the service concept would start by exploring and defining the problems related to the existing service of troubleshooting (analysis), before designing a service concept for the remote and workshop guided troubleshooting that would address some of these problems (synthesis). Since the project team had already selected to work with developing technology needed for remote and workshop guided troubleshooting in the preceding project, my estimation was that it would have been difficult to convince them to use this typical Service Design process. Such a Service Design process would started with a thorough analysis of problems in the existing troubleshooting service that could be addressed, which would have felt to the project team as taking a step backwards, because

they had already selected certain problems to address, based on their understanding of the troubleshooting process. Therefore, I decided not to opt for the typical Service Design process.

In the service development in this project, design was not only about the development of a service concept, but also involved learning about the future service situation and facilitated learning about realising service transformation:

- Representations of a future situation of service allowed the project team to learn about remote and workshop guided troubleshooting service.
- Representations of the guided troubleshooting service allowed service actors to imagine changes to the troubleshooting service as a result of the transformation to the remote and workshop guided troubleshooting.
- Representations of the guided troubleshooting service allowed me to articulate where knowledge about expected consequences of service implementation had been developed and where it was still lacking.

As discussed above, making the flow-type representation during engagement 1 asked the project team to specify how they envisioned the guided troubleshooting service working. Previously, the engineers of Truck&Bus had made visualisations describing the remote and workshop guided troubleshooting (see Figure 3.2 and Figure 3.3). However, these were not as detailed as the flow-type visualisation made during engagement 01. As part of defining what would happen in the service, the project team addressed multiple alternative designs. In their evaluation of which of these options, they noticed when their knowledge of the existing service was not sufficient to determine which options were most suitable. In these moments, they asked Michelle about the reality of the existing troubleshooting service.

By defining the service concept, the project team also found where they needed more information about the current troubleshooting service. There were three examples of this during engagement 01. Firstly, in defining the service process for remote and workshop guided troubleshooting Maria asked a question about whether garages currently determine what parts to have in stock based on the frequency at which different parts break.

- Maria** Yes. But I don't know if we have that already. Do you know, Ferdinand? Does the workshop calculate what to order?
- Ferdinand** No, not in an organised way. The workshops know that some parts are considered good to have. Then they will have that as a spare part in the workshop. But it's very different between different workshops

The second example is from the exercise where the project team defined the interactional qualities and service value for different touchpoints of the service. The scenario card that Mathew, Olivia and Ferdinand were given described an example of a case where a vehicle broke down in temperatures of minus 30 degrees Celsius:

- Mathew** If it's speedy? Hm. And I don't think the repair is easy in minus 30, so they have to tow it somewhere.
- Olivia** Yeah, I was thinking that too; that they may need a tow truck anyway.
- Ferdinand** Some problems they solve. Changing a wheel is. Filling in diesel.

The case description prompted Mathew and Olivia to consider what would actually happen at temperatures of minus 30 degrees. Finally, during the same engagement, Maria and James discussed a case where the Helpdesk had not been able to resolve abnormal vibration that the driver experienced. Maria wondered out loud what the garage would do, in order to pinpoint the cause of such a vibration.

The instances from the engagements described above are examples of how design, as an approach, supported me and the project team in learning what we did and did not know about the current troubleshooting service and, in turn, what would be possible in the guided troubleshooting service.

Another example where design supported learning was the use of service representations in dialogues with people outside the project team. The representations of the guided troubleshooting service supported people outside the project team to interpret project team's vision of the guided troubleshooting service and how realisation of service transformation to this guided troubleshooting would affect the existing troubleshooting service.

Firstly, the flow-type representation was used in the evaluation of the service concept with frontstage and backstage service actors, to learn about the consequences that they would encounter in their own work and the work of other actors in the service.

Secondly, the paper prototype and clickable prototype that Paul, the UX consultant in the project, had developed helped the project team to learn about how the roadside assistance operators, receptionists at garages and people from the commercial operations department thought about using the software. Representatives from the roadside assistance department commented, for instance, on the legal restrictions for reading the GPS data from the vehicle and how different contract types affect how much information can be downloaded from the on-board computer. The former comment was a response to one of the screen designs in the prototype that showed a map-view to indicate where the truck was located. The latter comment was a response to the information about the vehicle that was shown in the paper prototype. Only the more extensive (and expensive) types of contracts would allow roadside assistance to provide the level of detailed information about, for instance, the fault codes that were visible in the screens of the paper prototype. The comment about the position data of the truck was also made by representatives from the commercial operations department.

Evaluating the clickable prototype with receptionists at garages in Europe taught the project team that garage employees would be hesitant to run certain diagnostics tests remotely. Since garage employees had to rely on the driver to make sure that the conditions for safely performing the tests were met they would, for instance, not run tests that would raise the temperature of the engine and exhaust system. If the vehicle was not properly prepared for such a test, there would be a risk of overheating and damaging these systems.

Thirdly, the representation that I had made for an internal presentation of the outcomes of the interviews illustrated both the current process of troubleshooting and the process of remote and workshop guided troubleshooting (see Figure 4.4), allowing those who came to the poster presentation to learn about the changes in the service that would follow from service transformation.

Lastly, the flow-type representation of the remote and workshop guided troubleshooting service also helped to highlight how the different evaluations with service actors had provided insights about how different parts of the guided troubleshooting service could work if service transformation would

Services based on diagnostic support

- Methodology and Tools for Model-Based Guided Remote and Workshop Diagnostics

This work looks at how guided remote and workshop diagnostics should be rolled out as a service, in order to optimally help the people who are involved in this service, such as workshops and customers.

Contact

Contact person services based on guided diagnostics
Tim Overkamp, PhD student, Linköping University, tim.overkamp@liu.se

This poster focusses on how the deployment of guided diagnostics can affect today's service flow.

Today's service flow for repair

Service flow with guided diagnosis

Figure 4.4 - Poster showing the current service process of troubleshooting (above) and the service process for remote and workshop guided troubleshooting (below)

be realised. It also highlighted the parts of the guided troubleshooting service where such knowledge was still missing. Developing the representations in engagement 01 made the vision of the project team for the remote and workshop guided troubleshooting more explicit than the visualisations that they had made before (see Figure 3.2 and Figure 3.3). In turn, this helped service actors to imagine how the guided troubleshooting service would work and allowed them to provide specific feedback on the (design) decisions that the project team had made. This feedback subsequently helped the project team understand which service transformations would be possible and which would not, given the current troubleshooting service.

Finally, the flow-type visualisation helped to highlight where knowledge had been gathered as part of the inquiry into the service transformation to guided troubleshooting. During a project meeting I used the redesigned flow-type visualisation of the guided troubleshooting service (Figure 3.18) to highlight where the paper prototype evaluations had developed knowledge that would help with the realisation of the transformation to the guided troubleshooting service. I greyed out the parts which we had not yet learned about (see Figure 4.5). I suggested to complement our knowledge in two steps. The first step would be to explore the conversation after the remote troubleshooting (see Figure 4.6). Furthermore, I suggested to walk through the entire service process (see Figure 4.7), so that knowledge would be developed about the remote troubleshooting, the conversation after it and the continuation of the troubleshooting at the workshop until the problem is resolved. This would include knowledge about how the parts of the service connect to each other and, what it would mean for a mechanic to continue with information gathered during the remote troubleshooting. For me, it was useful to have the representations when trying to make my point about developing knowledge on a service level. And without the visual representations, I would not have been able to pinpoint in so clearly where the knowledge was located.

In this project, design was not only developing a service concept in a people-centred and holistic way. Design was used to make the vision of the remote and workshop guided troubleshooting visually explicit in different representations. In turn, those representations helped us to learn about the existing service of troubleshooting service and offered valuable information for the transformation of the existing troubleshooting service to the guided troubleshooting service.

Figure 4.5 - Slide from the presentation showing where the paper prototype had developed knowledge about the troubleshooting service (the part that is highlighted)

Figure 4.6 - Slide showing the aspects of the service that prototyping the conversation after remote troubleshooting would develop knowledge about (blue rectangle)

Figure 4.7 - Slide from the presentation at the project meeting showing aspects of the service that a service walkthrough would develop knowledge about (blue rectangle)

4.3 Chapter summary

This chapter presented the outcomes of the move-testing experiments in the program *implementation during design*, which is framed in type 1 service transformation. The first half of the chapter discussed the results that were expected, given the framing by this program.

Firstly, the outcomes confirmed that remote and workshop guided troubleshooting could be considered a service. The hardware and software developed during the research and development project during which the engagements took place supports this service. In the engagements, the participants addressed how the technology would be integrated with the remote and workshop guided troubleshooting *service*. For instance, whether service functions would be implemented as part of the technology or become the responsibility of human service actors.

Secondly, the project could, as expected, be framed as part of the design phase of the service development process models in type 1 service transformation. Further development and implementation of the guided troubleshooting service concept would take place after this project, in part by the distributors for different regions. During the first engagement, it was

possible for the project team to design the service concept of remote and workshop guided troubleshooting, including its service value. During that same engagement, the service process through which the service concept would be delivered could be defined as a process of touchpoints where dyadic interactions between provider and customer take place. Service Design provided a holistic and people-centred perspective on the development of the service concept and process, via the application of tools such as the flow-type visualisation and scenarios.

Thirdly, it was possible to address consequences of the service concept that was designed by the project team. The project team itself had discussed these consequences during the first engagement, where they defined the service process and service encounters (i.e. when designing the service concept). Additional consequences were addressed by the frontstage and backstage service actors, during engagements that focussed on articulating consequences of the service concept for implementation (i.e. when evaluating the service concept).

Fourthly, the involvement of the equivalent of production engineers (i.e. frontstage and backstage service actors) was beneficial. Most members of the project team were software engineers who did not have a detailed and first-hand understanding of the existing troubleshooting service. Therefore, they did not and could not foresee all the consequences that their design decisions would have for implementation of the service concept. The knowledge about the troubleshooting service that the project team lacked was in part compensated for by inviting frontstage and backstage actors from the existing troubleshooting service to comment on the service concept. In this way, consequences that the project team did not address during engagement 01 were introduced into the project and addressed. During engagement 04, the project team went through some of the feedback that informants had given during the interviews. For instance, issues relating to the envisioned involvement of the driver in remote troubleshooting were discovered during the interviews. The service actors that were involved in the evaluation mentioned both consequences for their own work and for the work of other service actors. In the same way that the knowledge of production engineers about manufacture and assembly is useful in finding consequences of a product concept for production, actors who had detailed knowledge about the existing troubleshooting service made it possible for the me and project team to learn about consequences for the implementation of the service concept that the which we had not previously considered.

Finally, the consequences that had been mentioned during the interviews proved useful for adapting the guided troubleshooting service, in order to support the implementation of this service concept.

In addition to these expected outcomes, service transformation was addressed during the project in ways that were unexpected given the framing of the project as type 1 service transformation. This chapter addressed five types of such unexpected results.

Firstly, the data from the interviews made several members of the project team realise that the service would likely not take place in one set way. There would not be one specific order for the touchpoints and handovers between service actors. Rather, the guided troubleshooting would likely be a collaboration between service actors, where different actors step in and out of the collaboration at different moments.

Secondly the service is networked, rather than dyadic. Depending on the specifics of the situation, there might be four people who are involved in deciding about how to continue the troubleshooting process after the initial remote troubleshooting. Furthermore, the provider (Truck&Bus) is not one entity but a network of actors in itself and people outside the service process also benefit from the guided troubleshooting service.

Thirdly, given the previous two points, it would be difficult to deliver one service experience. What transportation companies consider valuable in a service experience is affected by factors such as characteristics of the geographical region, the type of transportation work and the type of repair contract that a transportation company has. Moreover, other service actors will have an experience by being part of the service as well. For instance, the experience of garage employees and roadside assistance operators is affected by who will have the responsibility for doing remote troubleshooting. As a result of this variability, it was difficult to map all the consequences for service transformation during this project. Another factor that complicated mapping all consequences of implementing the service concept was the fact that the service concept was not fully defined. For instance, it was not clear who would perform the remote troubleshooting (i.e. where the Helpdesk would be positioned).

Fourthly, in this project, service transformation would likely not take place by assembling a service delivery system in its entirety during an implementation phase. The project team did not think that the entire service would be realised in one go but rather in smaller steps, evaluating the effects

that follow after each step before moving on. The service transformation is to a large extent dependent on whether mechanics trust and use the guided troubleshooting software. In addition, the distributors and garages can shape their way of working largely independently. Therefore, it will not be possible for Truck&Bus to centrally dictate how the service should be delivered.

Finally, during the project, design was used not only to define the service concept in a holistic and people-centred way, but also as an approach for learning. When the project team designed the service concept for guided troubleshooting in engagement 01 they learned where they had questions regarding the existing troubleshooting service. The resulting flow-type visualisation of the service concept was used in combination with interviews to learn about how the completed service might function. The paper prototype and clickable software prototype that were used had a similar function.

These instances were unexpected given the framing of the engagements in the program *implementation during design*. The unexpected outcomes are examples of how realising service transformation was not addressed as implementing a service concept, but highlight that service transformation would change relations between service actors. Implementing the remote and workshop guided troubleshooting service would change the way in which driver, owner, mechanic and roadside assistance operator and other service actors would relate to each other. These outcomes were incompatible with type 1 service transformation and called for a theoretical reframing of service transformation. This reframing also includes the definition of another 1) generative construct for addressing service transformation and 2) way for design and trained designers to relate and contribute to service transformation. In the next chapter, the unexpected outcomes that I presented in Section 4.2 are taken as the starting point for this theoretical reframing.

Chapter 5 Theoretical reframing: Type 2 service transformation

The outcomes of the design engagements presented in the previous chapter were partly in line with what I expected given the framing of the engagements in type 1 service transformation and the program *implementation during design* (see Section 4.1). However, there were also outcomes of the design engagements that were incompatible with type 1 service transformation and the program (see Section 4.2). Hence, there was a need for a theoretical reframing to address these outcomes, type 2 service transformation, which I explore in this chapter. I begin by presenting the service ontology of type 2 service transformation, which is service as value-in-use. Then, I discuss how services are developed in type 2 service transformation, which builds on the synthesis perspective in service innovation. Service transformation is framed as an iterative process in which value co-creating relationships between service actors are formed. Service transformation is realised by enabling value co-creating relationships. I suggest that design relates and contributes to type 2 service transformation by supporting inquiries into service transformation. Designing allows service actors to learn how value co-creating relationships between service actors can be shaped in reality. Trained designers are in a position to facilitate and support this inquiry by service actors.

5.1 Service transformation through enabling value co-creating relations

This section presents the service ontology of type 2 service transformation and related perspectives on service development and service transformation. Type 2 service transformation builds on service logic, which posits that service value is co-created. Realising type 2 service transformation is a continuous process.

5.1.1 Service as co-creation of value-in-use

As addressed in Sections 4.2.1 through 4.2.3 the service value of remote and workshop guided troubleshooting would likely not be delivered through a service process consisting of dyadic interactions between service provider and service customer. A service ontology that views service as a value-in-use makes it possible to address these unexpected outcomes from the design engagements

As discussed in Chapter 2, if a service is seen as artefact, service practice is framed as the delivery of a service experience (or service concept) through a process consisting of touchpoints or service encounters. On the other hand, if a service is seen as something that provides value-in-use, service practice is framed as the co-creation of this value-in-use. This perspective is present in two streams of literature: service logic (SL) (e.g. Grönroos, 2006) and service-dominant logic (SDL) (e.g. Vargo & Lusch, 2004; Vargo & Lusch, 2008). SL and SDL provide an alternative to a goods-dominant logic and the dichotomy of products and services. They suggest that service provision is the basis of all economic exchange (Vargo & Lusch, 2004). In a goods-dominant logic, value is considered to be stored during production and released upon purchase of products and services (referred to as value-in-exchange (*ibid.*)). A service logic posits that value is created collaboratively when using a product or service, which is also referred to as value-in-use (Vargo & Lusch, 2004). Both SDL and SL emphasise a perspective of service as value co-creation and that value should be considered from the perspective of the beneficiary and not as defined by the provider, which is often the case in a value-through-exchange view. However, these two streams of literature also differ from each other (see e.g. Grönroos & Gummerus, 2014 for a comparison). SL focuses on using the perspective of value co-creation to shed new light on marketing (Grönroos, 1978; Grönroos, 2006), while SDL uses a metaphor of markets to analyse value co-creation as actors exchanging and integrating resources

(Vargo & Lusch, 2008). Exchange and integration of resources take place within service systems (Maglio, Vargo, Caswell, & Spohrer, 2009; Maglio & Spohrer, 2008). These service systems are also referred to as service ecosystems (Vargo, Wieland, & Akaka, 2015), actor-to-actor networks (Vargo & Lusch, 2011), or value constellations (Normann & Ramirez, 1993). Actors in a service system can be people, such as employees and customers, but can also be rules, or a government. In the guided troubleshooting service these actors are, for instance, the driver, the transport planner, the workshop manager, the mechanic, the legislation regarding driving and resting times and service contracts.

Service (without an s) is the application of skills and knowledge (Vargo & Lusch, 2004) and “the fundamental basis of exchange” (Vargo & Lusch, 2008, p.6), taking place when engaging in services (with an s) and when using products. By exchanging knowledge and skills with each other and integrating them with their own skills and knowledge, service actors can achieve things that they cannot realise alone. Service thus becomes a collaborative process of doing something with and for someone else. For instance, in the troubleshooting service, mechanics use their knowledge of the vehicle to find the root cause of a problem and their skills to replace the broken component. In this process, the mechanic may use the driver’s knowledge about how the problem manifested itself (i.e. the symptoms of the problem) and also use the knowledge about the different systems on the vehicle that engineers at Truck&Bus have collected in the diagnosis software that mechanics use.

The actor receiving the benefit is called the *beneficiary*, the actor providing the resource(s) is the *provider* (Vargo & Lusch, 2004; 2008). The beneficiary is the one who determines whether or not the exchange and integration of resources resulted in a valuable outcome, because “value is always uniquely and phenomenologically determined by the beneficiary” (Vargo & Lusch, 2008, p.7). Value co-creation is thus successful if the beneficiary feels that they are “better off” after the exchange of resources (Grönroos, 2008, p.303). Service providers “strive to support users’ everyday processes in a way that facilitates (or contributes to) users’ value creation” (Grönroos & Gummerus, 2014, p. 208). The labels *provider* and *beneficiary* are not fixed to a specific actor, but indicate the position of two actors in relation to each other in a specific interaction (Grönroos, 2012). An actor can be a beneficiary in one interaction, while being a provider in the next. In the guided troubleshooting service, for instance, drivers can have both a provider and

beneficiary role. Drivers take on a provider role when they perform actions during the remote troubleshooting process that help the person performing the remote troubleshooting (i.e. Helpdesk operator or mechanic) to collect data about the problem. When the remote troubleshooting helps the garage to prepare for the exchange of broken components, drivers are a beneficiary of the knowledge and skills of mechanics, spare part managers and the software. Their service resources make it possible to determine which parts will be needed and make sure that those parts are available when the vehicle arrives at the garage, helping a driver to be en route again quickly.

What is considered valuable by beneficiaries depends on the practice of the beneficiary and the context in which the resources are exchanged and integrated (Edvardsson, Tronvoll, & Gruber, 2011). For instance, while leaving a tip is a common practice in the United States of America, it is considered inappropriate to leave money on the table when you leave a restaurant in Japan. Therefore, value should not be considered in isolation, but as value-in-use (Grönroos & Gummerus, 2014), where social and cultural context are taken into account as a factor that influences the possibilities for value co-creation (Edvardsson & Tronvoll, 2013)¹⁰. Value-in-use is not limited to physical use of a resource and can, for instance, also refer to mental use (e.g. thinking about using a car for a road trip holiday). In the guided troubleshooting service, there were several contextual factors that were expected to affect value-in-use and value co-creation between service actors (including non-human actors). These factors included the type of transport, the type of repair contract, the skills and knowledge of the mechanic that would use the software, the technical knowledge of the drivers and their willingness to collaborate.

It is not possible for an actor in a provider role to provide value directly. A provider can only provide potential value, or value propositions (Lusch & Nambisan, 2015) and work to help the beneficiary to realise this potential value by interacting with the beneficiary (Grönroos, 2008). The service provider is thus a “creator of potential value-in-use and a facilitator of real value-in-use.” (Grönroos & Gummerus, 2014, p. 216). Whether the potential value is realised depends on the context in which the resources are offered

¹⁰ Other authors have referred to this as value-in-context (Chandler & Vargo, 2011) and value in social context (Akaka, Vargo, & Lusch, 2013). I adopt the term value-in-use in the remainder of this thesis when referring to a view on value co-creation as something that is contextualised.

and the possibility for service actors to integrate resources with existing resources. For instance, a car as a transportation resource is not valuable if the beneficiary does not have a driver's license. Beneficiaries evaluate value propositions not only based on what the provider offers, but also how well those resources complement the resources that they already have access to (Macdonald, Kleinaltenkamp & Wilson, 2016). It is even possible that the offering and integration of resources could lead to the co-creation of negative value or value co-destruction (Echeverri & Skålén, 2011).

Having access to resources does not necessarily mean that resources are owned. For example: you do not have to own an airplane in order to be able to use it for travelling. The access to resources is determined by the network of actors that someone is part of, both directly (you have access to the resources of the actors in your network) and indirectly (the people you know can indirectly provide access to their respective network of actors and the resources that actors in those networks have at their disposal) (Chandler & Vargo, 2011). Although owning a resource is not a prerequisite for value co-creation, ownership can be the basis for value co-creation in itself, for instance in the case of status symbols.

To further articulate the dynamics of the value co-creation process, Grönroos and Ravald (2011) introduced the notion of the provider sphere, customer sphere and joint sphere, which was later used to make a distinction between value co-creation and value creation (Grönroos & Voima, 2013). Value co-creation takes place in the joint sphere, where providers can actively influence the customer's value creation through direct interaction with the customer. Successful value co-creation thus requires joint activities in direct interactions between provider and customer (Grönroos, 2012). Besides co-creating value, customers can also create value for themselves in the customer sphere, but this sphere is closed to the provider (Grönroos & Voima, 2013). Direct interaction between provider and customer is thus not possible in the customer sphere, which means that the provider cannot influence any value that is created there. Instead, in the customer sphere customers create value for themselves by integrating resources that are provided by the provider (potential value-in-use) with their own resources, without interacting with the provider (Grönroos & Ravald, 2011). An example of this is when you use a car to drive from A to B: you integrate the resource 'car' with your resources (skills) to drive a car and navigate to your destination. This is also referred to as value formation (Grönroos, 2012). In the context of troubleshooting trucks and buses, value co-creation takes place if a vehicle is

Table 5.1 – Overview of the service ontology of service as value-in-use

Key concepts	Resource exchange & integration Co-creating value-in-use Value propositions
Service interactions are viewed as	taking place in a network (constellation) of service actors
Value is	created or co-created, through exchange and integration of resources
Role of context	Influencing (possibilities for) co-creation of value-in-use

brought to a garage. Value formation takes place if the owner of the vehicle instead decides to perform the repair at their own garage, using third-party tools and parts.

In Table 5.1, the service ontology of service as value-in-use is summarised.

5.1.2 Service development as shaping value co-creating relations

The ontology of service as value-in-use suggests a view of service development that is different from service development in type 1 service transformation. Type 2 service transformation is related to the systemic and experiential archetypes of service innovation (Helkkula et al., 2018) and the stream of service innovation literature that takes a synthesis perspective on service innovation (Coombs & Miles, 2000). The synthesis perspective uses value-in-use to overcome having to distinguish between product and service innovation. Service innovation from a synthesis perspective takes a service logic perspective, emphasises value (Skålén, Gummerus, von Koskull, & Magnusson, 2015) and looks at how actors co-create value in a systemic way, in networks of actors in a service (Rubalcaba, Michel, Sundbo, Brown, & Reynoso, 2012).

In the synthesis perspective on service innovation, the process and outcome of innovation in services are considered to be intertwined (Toivonen & Tuominen, 2009). Innovation research should thus develop integrative theories and should not create a dichotomy between product and service or process and outcome innovation. When viewed from a synthesis perspective, service innovation takes place as a result of a recombination of resources to

enable changes in value co-creation (Snyder, Witell, Gustafsson, Fombelle, & Kristensson, 2016), which builds on the definition of innovation as the recombination of existing knowledge (Gallouj & Weinstein, 1997). Skålén et al. (2015) suggested that service innovation from a synthesis (i.e. service-dominant logic) perspective can be divided into four categories, which are *adaptation*: a new way of integrating existing resources in existing practices, *resource-based innovation*: integration of new resources in similar, or somewhat different practices, *practice-based innovation*: the integration of existing resources in new practices or *combinative innovation*: the integration of new resources in new practices. Such service innovations take place as a result of changes in the institutions that govern the exchange and integration of resources (Koskela-Huotari, Edvardsson, Jonas, Sörhammar, & Witell, 2016).

The remote and workshop guided troubleshooting service falls in the practice-based innovation category. While the service resources are mostly the same, the technology facilitates new ways of integrating these resources. For instance, it will be possible to do troubleshooting remotely, yet almost as if the vehicle was in the garage. The garage will also be better able to plan and prepare for upcoming work. The centralised documentation about the case will give different service actors simultaneous access to the same information. In turn, this will affect the practice of the engineers at Truck&Bus, who have more detailed information about which parts commonly break and how to troubleshoot for those issues.

Service transformation from a synthesis perspective shapes what I call the *value co-creating relationships* between actors in the service. For instance, if the remote troubleshooting is to be done by what is currently the roadside assistance department, the value co-creating relationship between the driver and the assistance operator will change. In addition to connecting the driver to a mechanic at a nearby garage, the operator will perform initial troubleshooting. The value co-creating relationship between actors at the garage and at the transportation company also changes. For instance, according to workshop manager #1, the remote troubleshooting would make it seem as if the garage is taking care of the vehicle from the moment a driver notices a problem. Furthermore, the garage will be able to provide information about estimated repair times earlier in the troubleshooting process, which allows a transport planner to factor in both these estimated repair time and the legal driving times when making changes to the routes of

a driver earlier as well. Another change that was addressed was that garages may receive more calls about whether or not it is safe to drive on.

The fact that all information about a troubleshooting case will be saved centrally in the software, shapes the relations of service actors to each other and to the troubleshooting software. For instance, with remote and workshop guided troubleshooting, the mechanic may take on a case that has been started by someone else who stored data that was collected in the journal for the case. In such a case, a mechanics would have access to the fault codes on the vehicle, which they currently do not. A mechanic can combine this information with their own knowledge and experience to make an initial estimation of which parts will be required for the repair. However, this also means that a mechanic will have additional work to do.

Previous service innovation research has considered service transformation as part of a firm- or output-centric view on innovation (Koskela-Huotari et al., 2016). Models for service transformation focus on the provider side: What prerequisites (i.e. elements of the service delivery system) the service provider needs to develop in order to deliver the service. When it comes to changing routines, the focus is directed at changes in the service provider organisation. However, it is likely that there will be changes that (need to) take place for other actors in the service as a result of the shaping value co-creating relations. These changes in behaviour, which require service actors outside of the provider organisation to develop new skills and knowledge in order to take part in the transformed service, are often left undiscussed.

Service as value-in-use takes a network perspective. This makes it possible to consider all actors in the service practice, how intended changes in value co-creating relationships will likely affect them and how they can prepare or be prepared for these transitions. Framing service development in the service ontology of service as value-in-use highlights the way that service practices contain a variety of actors in a network constellation. Furthermore, it acknowledges that the needs of these actors differ between contexts for value co-creation. They may vary, for instance between different times or geographical locations. It addresses not only what changes in the organisation with service transformation, but also what changes for actors outside of the organisation.

In the dialogues about service transformation to guided troubleshooting service in the engagements, there was not a dichotomy between service provider and service customer. As the project team realised during

engagement 04, the service would be a collaboration between various actors. Moreover, changes would take place throughout different levels of the organisation at Truck&Bus, which would then affect relationships between actors on those different levels. One of these aspects related to compensation for the remote troubleshooting. As Michael and Ferdinand discussed during engagement 04, having a contract where you pay for vehicle uptime and not for repairs would increase the incentive to do remote troubleshooting. This would still require a redistribution of money internally at Truck&Bus, because the flat rate for such a contract is likely paid to the home dealer, whereas another garage might perform the actual repair. Besides that, there would be changes not only for service actors that are related to Truck&Bus, but also for the driver and the transport planner, for instance, in the ownership of the vehicle data. When data about the active fault codes of the vehicle is continuously pushed to a server that is owned by Truck&Bus, who owns the data? New contracts or updated terms of use that address these issues are likely necessary in order to realise the service transformation.

5.1.3 Service transformation as enabling value co-creating relations

As discussed above, the synthesis perspective frames service innovation as changes in the exchange and integration of service resources. While previous works have addressed factors that affect the invention of such innovative ways of resource exchange and integration (e.g. Patrício, Gustafsson, & Fisk, 2018; Koskela-Huotari & Vargo, 2016), the realisation of service transformation from a synthesis perspective is not well understood yet. Based on the outcomes of the engagements discussed in Section 4.2 I suggest that realisation of type 2 service transformation takes place by enabling value co-creating relations between service actors. The way in which this process of shaping value co-creating relations was addressed in the project suggested that it would be an evolutionary process. For instance, the software would not be developed and rolled-out once, rather the algorithms would be updated based on the data from historic troubleshooting cases that would be provided by mechanics. This self-learning element of the software was intended to increase the accuracy and correctness of the suggestions provided by the guided troubleshooting software over time. The project team expected that this, in turn, would increase the trust of mechanics and other service actors in the technology, facilitating the realisation of the service transformation to the guided troubleshooting. Furthermore, during the interviews (engagement 03), James mentioned that the entire service would not be realised at one time

and Ferdinand asked what informants thought should be prioritised in further development. During engagement 04, Michael said that the service would likely be realised in steps, to see what emergent behaviours might arise. An example of such unintended behaviours would be that garages let the Helpdesk do remote troubleshooting, as the fleet uptime manager anticipated during engagement 02. During continued development after engagement 04, Michael did not want to address the service process in its entirety when working towards realising service transformation. Instead, he wanted to begin service transformation on a small scale, focussing on interactions between a limited number of actors, in straightforward situations. Once issues with guided troubleshooting in these situations were solved, the scope could be expanded, according to him. At that point, he also imagined that departments at Truck&Bus that are responsible for supporting other parts of the troubleshooting process than the software solutions that Michael's group supports could be involved. These are examples of how service transformation to guided troubleshooting was addressed as a continuous process.

In this continuous process, the evaluation of the effects of earlier service transformation efforts would affect future efforts to make changes. As mentioned, these changes would enable certain value co-creating relations and emergent behaviours. Service transformation then becomes a matter of enabling the envisioned value co-creating relations while preventing value co-destructing relations. During engagement 04, for instance, the project team discussed how to enable a value co-creating relation between driver and the person doing remote troubleshooting. Maria suggested to enable this by adapting the questions with which the guided troubleshooting software prompts the remote troubleshooter to the level of knowledge of the driver. If a driver seems more knowledgeable, the questions could be more advanced and vice versa. Another solution they discussed was to develop the software in such a way that involvement from the driver was possible, but not required for the remote troubleshooting to work properly. An added advantage of not requiring support from the driver, as Michael mentioned, would be that the guided troubleshooting service would be prepared for changes that come with the introduction of self-driving cars. Another option for realising a value co-creating relationship between the driver and the person doing remote troubleshooting would be to educate drivers to increase their level of technical knowledge about the truck. However, this might not be easy, because the drivers have rather tight driving schedules and little time to

attend courses. At the same time, educating roadside assistance operators would enable these operators to take a role that would lead to a value co-creating relationship with the driver if the roadside assistance operators needed to do remote troubleshooting. Finally, value co-creating relations during remote troubleshooting could be achieved by enabling either a central Helpdesk role, with people that have the technical expertise required for troubleshooting, or enabling remote troubleshooting at the local level of individual garages. These examples show that for the guided troubleshooting service there were different ways of enabling value co-creating relationships, such as through contracts, software development or providing training to service actors. The flow-type visualisation of the service turned out to represent the generic model, or shell, of the service, which would need to be adapted by service actors, depending on the specific service context, to form value co-creating relations with other service actors. In the examples above, envisioned value co-creating relations are achieved by enabling service actors to enact certain roles in the guided troubleshooting service. Therefore, the concept of roles was found to be a generative construct for exploring how type 2 service transformation can be realised.

5.2 Generative construct: enactment of service actor roles

This section first introduces how the concept of roles and Role Theory have been used in service design research in general. Then, it addresses 1) how the concept of roles was present in the outcomes of the design engagements and 2) how Role Theory vocabulary helped to articulate how service actors in the engagements talked about anticipated effects of service transformation for their value co-creating relations.

5.2.1 Roles from a dyadic or systemic perspective

In service research, roles have been considered from both a dyadic perspective and a systemic perspective. The dyadic view builds on a symbolic interactionism and the works of Erving Goffman (1959) and George Herbert Mead (Mead & Morris, 1972). Goffman (1959) used a theatre metaphor to suggest that everyone performs a role in society. During those performances people could be an *actor* or part of the *audience*. As actors, people try to maintain a certain front or façade in relation to the audience of their performance. This may mean that people display behaviour that is not their natural behaviour, in order to maintain an image that they want others to have of them. Roles are considered to emerge and develop during the

enactment of interactions. Through their actions, people provide cues, they give an impression (Goffman, 1959), that suggests a certain role both for themselves and the person they interact with. This other person interprets these cues and forms a response that indicates whether or not they accept these roles. For instance, if we see someone a friend crying, we accept a role of offering consolation, but if we notice that they are crying crocodile tears we will not. It is through these actors and reactions that roles are formed during an interaction. Furthermore, Goffman (ibid.) suggested that we need a *backstage* where we can practice our role before our performance and relax between performances, which take place in the frontstage.

The latter, systemic perspective builds on a combination of this symbolic interactionist perspective with structural and network approaches to roles (Baker and Faulkner, 1991). This view addresses roles not only during interactions, but also addresses how roles exist as part of a system or network of roles and how they are shaped over time. The development of roles beyond interactions is affected by which roles are considered valuable in a certain context. People can develop specialisations or take different roles together into one position depending on what they consider gives them an advantage in the social system they are part of. For instance, artists may focus on producing artworks and hire someone else to promote and sell their work, or they decide to manage all of that themselves. This is in line with type 2 service transformation, where service is seen as the co-creation of value-in-use and where service transformation is framed as the continuous process of shaping value co-creating relationships between service actors.

5.2.2 Analysing roles in existing services

In service marketing, research on roles in services started with the introduction of the drama metaphor for framing service situations—including the concepts of scripts, frontstage, backstage—by Grove and Fisk (1983). This metaphor has, amongst others, been used to distinguish between the visible and invisible parts of a service (e.g. Shostack, 1984) and to introduce the servicescape as a part of the frontstage for the service (Bitner, 1992), where scripts are used to steer the interactions in that frontstage, as a performance (Bitner, Booms, & Mohr, 1994). Pine & Gilmore (1998) have written about *staging experiences* as a best practice for delivering services.

To continue with the theatre metaphor, then, the concept of roles is used to analyse dynamics between service provider and customer in service encounters, mostly from a dyadic, symbolic interactionist perspective. Such

analyses address, for instance *customer variation* (Edvardsson et al., 2005), which is the variation in roles that customers might take on in a service encounter. Customers can take on different roles, depending on context and the personality of the customer (Moeller, Ciuchita, Mahr, Odekerken-Schröder, & Fassnacht, 2013). These discussions about customer roles have framed customers in a general sense, as a productive resource (Lovelock and Young, 1979) or as partial employees (Cova & Dalli, 2009), as well as for specific service situations (Moeller et al., 2013; Åkesson, Edvardsson, & Tronvoll, 2014). In these works, the concept of roles is used to develop an understanding of the dynamics in interactions between service customer and service provider during a service encounter.

A second way in which service marketing literature used the concept of roles builds on work by Baker and Faulkner (1991), who combined this interactionist perspective on roles with structural and network approaches to roles. They suggested that a role should not only be viewed on the level of individual interactions, but also as part of a social system. Moreover, Baker and Faulkner (ibid.) posited that roles should not be seen as tied to one person necessarily, but that different roles can be combined. One person can acquire multiple roles and the related responsibilities over time or a combination of roles that one person used to perform can be distributed across multiple actors through specialisation. According to Baker and Faulkner (ibid.), practices develop if different roles are combined into one position in a network or if people specialise instead. They suggested that the process of combining different roles or specialising in one role is affected by the context in which the role is performed. If a combination of roles is considered valuable in a social system, actors will make efforts to integrate those different roles into their position in that social system (ibid.).

Akaka and Chandler (2011) extended this view on roles introduced by Baker and Faulkner (1991) by using service-dominant logic to posit that roles are resources in value co-creation. The roles of service actors in service systems thus become a resource that actors can exchange and integrate (together with other resources) in order to create value for themselves or co-create value with others. And “understanding how value-related processes are intertwined with the social roles of multiple stakeholders can provide deeper insights into how value is co-created and how value networks form and evolve.” (Akaka & Chandler, 2011, p. 244).

This perspective on roles is grounded in the service ontology of service as value-in-use. It is thus in line with type 2 service transformation. As suggested by Baker and Faulkner (1991), the context for relations between service actors influences which relationships are considered valuable. For the guided troubleshooting service, the context of the service system (as a social system) determines whether it is beneficial to develop the remote troubleshooting role 1) as part of the position of the mechanic, receptionist or workshop manager in the service network or 2) as a specialisation at a garage (local level), at the level of the current roadside assistance (regional level) or as a Helpdesk department (global level).

5.2.3 Envisioning possible future roles

Both categories of literature on roles in service marketing presented above use the concept of roles to analyse existing service encounters or existing service systems, respectively. In service design research, the concept of roles has been used for existing and *envisioned* service situations. On the one hand, different tools have been developed to map existing roles in services (Sangiorgi, 2009). On the other hand, theatre-inspired approaches that use roles, such as role playing (Stickdorn & Schneider, 2011), bodystorming (Oulasvirta, Kurvinen, & Kankainen, 2003), experience prototypes (Buchenau & Fulton Suri, 2000) and service walkthroughs (Arvola, Blomkvist, Holmlid, & Pezone, 2012) have been used by service designers to explore roles in envisioned services.

In design research in general, roles and drama have been used for a longer period of time. Enactment of work has been used to form a link between data collection and idea generation (Iacucci, Kuutti, & Ranta, 2000; Halse, 2008). This is related to scenario-based design (Carroll, 1995) and acting out scenarios of future interactions in the user's context provides additional insights beyond those gathered when responding to scenarios depicted on paper (Binder, 1999; Iacucci et al., 2000). Acting out use situations (both existing or envisioned) helps designers to develop empathy for the bodily experiences of users, in their respective roles (Boess, 2008). Theatre-inspired methods are considered to be a useful source of inspiration for methods to design for *embodied experiences* (Macaulay, Iacucci, O'Neill, Kankainen, & Simpson, 2006). In addition to the use of theatre as a means to generate new ideas, it has been used to receive "contextually relevant, personally experiential user feedback for products that do not yet exist" (Salvador & Howells, 1998, p. 251; see also Sato & Salvador, 1999). Recently, postdramatic

theatre forms have been explored that connect “a range of different forms of performance, improvisation, and participatory theatre under the same umbrella term.” (Ryöppy, Ylirisku, Friis, & Buur, 2016, p.462). In other words, the focus on the concept of roles in design literature lies in envisioning and exploring roles, from a symbolic interactionist perspective.

5.2.4 Role Theory in service marketing research and design research

Service marketing research has addressed the analysis of *existing* roles in service contexts, while design research has developed various methods to envision *future* roles. The use of Role Theory in both fields focuses on interactions in service encounters or touchpoints. Role Theory is concerned with how the behaviour of people in social positions is mediated (Biddle, 1979; Dahrendorf, 1973).

A person typically holds multiple social positions, for instance as parent, employee, friend, neighbour, etc. The central forces that shape the behaviour of people who occupy a certain social position or perform a role are expectations (Biddle, 1979). These expectations can be internal, which means that incumbents of a role have the expectation in question towards their own behaviour, or external, which means the expectation for a certain role is held by other people (*ibid.*), see also Figure 5.1. The person expressing expectations for a role is referred to as the subject person (Thomas & Biddle, 1966a) and the person to whom the expectations are directed is called the object person (Thomas & Biddle, 1966b; Biddle, 1979). In the case of internal expectations, subject and object person are the same. Dahrendorf (1973) discussed three different types of expectations: *must-expectations*, *should-expectations*, and *can-expectations*. Must-expectations relate to those behaviours that a role incumbent has to perform, such as abiding the law.

Figure 5.1 – Internal and external expectations for behaviour that are directed at the object person

Should-expectations are less obligatory than must-expectations and include behaviours such as actively participating in a community. Finally, can-expectations refer to behaviours that are appreciated, but not demanded by subject persons. Expectations are based on norms, beliefs and preferences held by the subject person (Biddle, 1986) and can be communicated overtly (demand) or covertly (norm), in verbal or written form (Biddle, 1979; Thomas & Biddle, 1966a). Often, must-expectations, such as laws and regulations, are communicated overtly and in written form. Should- and can-expectations are often communicated verbally and taught as part of socialisation, the process of learning about the expectations that come with a certain role (Biddle, 1979). In an organisational context, the process of teaching and learning roles is referred to as organisational socialisation (Hall, 1987; Maanen & Schein, 1979).

If there is consensus among subject persons regarding expectations for a certain role, there is *role consensus* (Biddle, 1979). If expectations are unclear, there is *role ambiguity* (ibid.). *Role conflict* happens when there are multiple, conflicting expectations for a role (ibid.). If too many expectations are related to one role, this leads to *role overload*. Role overload, role conflict, role ambiguity and a lack of role consensus can lead to *role pressure* (Thomas and Bruce, 1966c). If the source of this pressure is not resolved and the role pressure remains over a longer time, it can lead to *role strain* (ibid.), which causes stress for the role incumbent. Another possible cause for role pressure and subsequent role strain is that the role incumbent is not adequate for the role. *Role adequacy* (Turner, 2001) relates to what a role incumbent needs in order to fulfil a role, such as skills, talent, motivation, time and energy. A lack of role adequacy can be solved through, for instance training or receiving more or better means to fulfil one's role (e.g. more time, a faster computer). For the guided troubleshooting service, Roadside assistance operator #2 addressed potential role conflict when she indicated that she would experience it if she were to be required to handle remote troubleshooting whilst also having to close calls quickly. Receptionist #2 addressed role overload for the workshop manager if they had to receive and process cases from the Helpdesk.

As discussed in Section 5.2.2 and Section 5.2.3, Service marketing research has addressed the analysis of *existing* roles in service contexts, while design research has developed various methods to envision *future* roles. The use of Role Theory in both fields focusses on interactions in service encounters or

touchpoints. In service marketing research, Solomon, Surprenant, Czepiel and Gutman (1985) suggested that Role Theory could be used to study interactions between customer and service provider during service encounters. Broderick (1999) then suggested Role Theory as a way to manage what happens in these service encounters. Role Theory has also been used to analyse the roles that customers take in service interactions (Moeller et al., 2013) and the ways service providers adapt their own role to the type of customer they interact with (Ng, Plewa, & Sweeney, 2016). Moreover, Role Theory has been used to highlight where expectations for the role of frontline staff that service customers and the supervisor of the staff member have can be in conflict with each other (Bettencourt & Gwinner, 1996). Service staff may be expected to have empathy with the customer's issue but at the same time experience friction if meeting that expectation means stepping outside of their organisation's procedures (see e.g. Varca, 2009). Furthermore, customers or supervisors may expect frontline staff to show emotions that the employee does not experience (see e.g. Hochschild, 1983), for instance, when frontline staff are expected to smile, even if they are not feeling happy.

Baker and Faulkner (1991) suggested to combine structural, interactionist and network approaches to roles. This suggestion has been elaborated by Akaka and Chandler (2011), who suggested that the way in which roles are distributed across a network of service actors (i.e. accumulation of roles or specialisations) affects value co-creation. This is in line with the ontology of value-in-use in which type 2 service transformation is grounded and the notion of value co-creating relations. However, both Baker and Faulkner (1991) and Akaka and Chandler (2011) suggested to use Role Theory to systematically analyse existing service practices, rather than envisioned ones. Their work does not address how value co-creating relations can be shaped over time by enabling certain roles of service actors.

As discussed above, the field of design research has developed a great deal of experience with the use of different methods for enactment to 1) develop empathy for actors in existing practices and 2) explore alternative roles and service practices. Role Theory from the symbolic interactionist perspective on roles has been suggested in service design literature as a way to facilitate the design of a stage and *props* (e.g. uniforms) that allow service actors to take on their intended roles during service interactions (Hatami, 2011). However, systematic analysis of roles in such envisioned services is not usually considered as part of these methods.

Table 5.2 – Overview of earlier work regarding roles in service systems (developed from Overkamp & Holmlid, 2017a)

	Existing service	Envisioned service
Systematic analysis of roles	Customer and service provider roles during <i>dyadic</i> service encounters Use of Role Theory to explain and manage role dynamics Roles as resource for value co-creation	[room for knowledge development]
Methods using roles	Activity System Map, Stakeholder maps, Map of interactions Enact roles (based on ethnographic data) to develop empathy	Explore possible futures using theatre-inspired methods like scenarios, role play, experience prototyping, bodystorming, service walkthrough, forum theatre, post-dramatic theatre

In general, then, there is a need for knowledge about systematic analysis of roles in envisioned services (see Table 5.2 and Overkamp & Holmlid, (2017a)) and how value co-creating relations can be facilitated by enabling service actors to enact these roles.

5.2.5 Shaping and enabling value co-creating relations in the engagements

In the project, the roles of service actors in the envisioned service were addressed during multiple engagements, both when defining and when evaluating the service. For example, transport company representative #2 thought that the people at the Helpdesk would need to have both technical knowledge and the communication skills needed to talk with a driver. During engagement 01, Mathew said that he thought it would be good if the mechanics could make decisions themselves when interacting with the software, rather than having the software telling them what to do. Mathew’s expectations for the role of mechanic thus assumed that the mechanic has the experience to make these judgements.

The notion of roles as affecting value co-creating relations and Role Theory vocabulary helped to understand whether a suggested role for a service actor in the guided troubleshooting service was considered

favourable or not. In the project, expectations for the different roles were not only suggested, but were also evaluated in all of the engagements. During engagement 02, the fleet uptime manager mentioned that workshop managers currently have difficulty finding experienced mechanics and that having the guided troubleshooting system would help to solve this. He reasoned that if mechanics could follow the steps, they would not need to rely as much on their experience in troubleshooting. During the same engagement, the on-board diagnostics expert said that a step-by-step approach might make the process of troubleshooting boring. Furthermore, Mathew discussed this during engagement 04, in his comment about pressing mechanics into a certain system and only hiring those who comply with that system. In these examples, the role of the mechanic was addressed, as well as the effects on the mechanics' value co-creating relationships.

Moreover, during the interviews, service actors evaluated the roles suggested as part of the flow-type representation in terms of how they expected the roles would affect value co-creating relations. Mechanic #4 mentioned that he felt that he should not work as much with the software, but rather focus on the mechanical work. Workshop manager #4 said that he would not want to do remote troubleshooting and only wanted to be involved if the vehicle was coming to his garage. Roadside assistance operator #2 said that the remote troubleshooting did not match their current role as an interpreter who then connected a driver to a mechanic at a nearby garage. Mechanic #5 commented that using the software would go against their training, which requires mechanics to start at the beginning and perform troubleshooting according to a standard protocol. This is an example of role conflict for the mechanic, where the training and the software communicate different expectations to the mechanic. Such a role conflict can become a source of role pressure, which is an indicator that the envisioned role is not tenable. Another example of role conflict was mentioned by roadside assistance operator #2, who said that performing remote troubleshooting would go against the current expectation that they should finish telephone calls quickly. The same operator also mentioned another of potential cause for role pressure. She felt that she lacked both the technical knowledge and the knowledge about the inside of the cabin of a truck needed in order to perform remote troubleshooting. In this example, the source of role pressure would be a mismatch between role expectations for remote troubleshooting and role adequacy of the operator. Receptionist #2 mentioned that if the workshop manager would have to process incoming cases that the workshop

received from the Helpdesk, it would lead to too much work for the workshop manager role. This is an example of a potential risk for role overload: too many expectations for the same role. Role Theory vocabulary was useful for analysing how shaping value co-creating relationships were addressed during the engagements.

Role Theory vocabulary also made it possible to analyse how the realisation of type 2 service transformation was addressed as the process of enabling the enactment of service actor roles that facilitate value co-creating relationships. For instance, workshop manager #1 suggested that in order to get drivers to take on their envisioned role during remote troubleshooting, customers (i.e. transportation companies) should tell their drivers that it is important that they collaborate. Receptionist #3 suggested that one way to ensure that mechanics fulfilled the expectation of documenting their work in the case logs would be to create software that prevents mechanics from signing off on the case before they have completed the documentation. These are examples of instrumental role conformity, where service actors are forced to conform to the behaviour of the envisioned role, rather than performing the role because it is in line with the service actor's beliefs norms, preferences or attitudes (Biddle, 1986). Different ways of enabling the enactment of the remote troubleshooting role were addressed during the interviews and during engagement 04. The remote troubleshooting role could be enacted in different ways, leading either to a specialisation of service actors who do only remote troubleshooting or an accumulation of multiple roles, where several service actors are expected to perform remote troubleshooting.

In the examples above, the concept of roles and Role Theory vocabulary provided a generative construct for studying type 2 service transformation in the development of the guided troubleshooting service. This generative construct forms the foundation for a program for exploring realisation of type 2 service transformation, which I call *enabling enactment*. The program *enabling enactment* studies how realisation of type 2 service transformation takes place, by enabling service actors to enact a role that facilitates the co-creation of value-in-use with other service actors. It is possible to enable the enactment of service actor roles through, for instance, legislation, protocols, technology or training. For more factors that facilitate role change, see, for instance, Turner (2001).

5.3 Position of design and designers in type 2 service transformation

Above, type 2 service transformation was introduced, as well as the program *enabling enactment* as a framework for exploring type 2 service transformation. In this section, I address how design and trained designers can relate and contribute to type 2 service transformation. I explore how designing contributes to inquiry by service actors, for incremental approximation of envisioned value co-creating relations. The role of trained designers is to allow design as inquiry to take place. This inquiry should allow service actors to explore alternative possible future scenarios for the service in order to 1) learn how value co-creating relations currently work and 2) learn how envisioned value co-creating relations can be enabled by allowing service actors to enact roles that facilitate those value co-creating relations.

5.3.1 Contributions of designing for service

In outcomes of the design engagements that were incompatible with *implementation during design*, the contribution of design to service transformation was not so much the development and testing of a service concept. The variations in the troubleshooting service made it impossible to map all the potential consequences of the design of the guided troubleshooting service concept for service transformation.

Instead, design contributed as an approach to learning about value co-creating relations in the troubleshooting service. This contribution of design is in line with designing for service (Sangiorgi & Prendiville, 2017). Designing for service sees design in a service context as a way of working rather than as a phase in a service development process (Wetter-Edman et al., 2014; Holmlid, Wetter-Edman, & Edvardsson, 2017). This view started from the notion that it is impossible to design *a* service, but it is possible to design *for* service (Kimbell, 2011; Meroni & Sangiorgi, 2011). Designing a service is not possible because it is difficult to foresee all of the consequences of a service design up front: "Designing for service, rather than designing services, points to the impossibility of being able to fully imagine, plan or define any complete design for a service since new kinds of value relations are instantiated by actors engaging within a service context." (Kimbell, 2011, p. 45). In the development of the guided troubleshooting service this was also the case. As the project team discussed in engagement 04, the service would not take place through one flow. Instead, the way in which the troubleshooting service would take place, would depend on contextual factors in the case at hand.

There would not be one service *experience* but various *experiences*, for different service actors. As a result, it was hard to foresee all of the consequences of service transformation.

Designing for service fits with type 2 service transformation, because it also builds on service logic and its service ontology of service as value-in-use (Wetter-Edman, 2014; Wetter-Edman et al., 2014). It does not consider service a series of dyadic interactions (i.e. touchpoints or service encounters) that are predefined and that can be controlled. This view of design as a way of working thus builds on the same service ontology of service as value in-use and the perspective of shaping value co-creating relationships, as discussed in Sections 5.1.1 and 5.1.2.

Imagining and making plans for all possible consequences of the service concept was complicated further in this project because those who designed the service (i.e. me and the project team) were not involved in the current troubleshooting service. If service designers have to work from an outsider's view of the situation, which may not be complete and/or correct, it is difficult to identify all of the potential consequences of design decisions. This was the case in the development of the remote and workshop guided troubleshooting service. The project team that designed the service during engagement 01 did not have detailed knowledge about the current troubleshooting service practice. They discussed questions about routines with each other and with Michelle, who had been in the field and therefore had a better understanding of the current service practice. For James, the trips to the different markets to do interviews were the first time that he was in the field himself. Previously, James had built on information from people like Michelle to develop his understanding of routines at the garage. He had also never previously addressed the work of representatives from transport companies and their involvement in the troubleshooting service. Finally, for James and Ferdinand, the variation in the technical knowledge of drivers and their varying levels of willingness to cooperate in troubleshooting was a surprising insight that came up in the interviews.

In addition to the complexity of services in general and the limitations of outsider knowledge of service designers, changes in the service context over time also complicate imagining and predicting consequences of service transformation. It is difficult to design and plan for efforts to shape value co-creating relationships in one instance, but arguably impossible to determine

up front what efforts will be needed over an extended period of time. Besides, the situation of use changes over time. The complexity and changeability of the situation of use are reasons why changes are needed after the implementation phase of a service development project. As Shostack (1984) wrote: "Implementation constantly evolves. Schools, for example, once depended entirely on teachers to render the service of education; today computers and television have an important function in the classroom. A service designer must weigh alternate means of execution" (p. 136). Such changes over time are also implied by the notion of shaping value co-creating relationships. The process of shaping value co-creating relationships may never really stop. In the development of the guided troubleshooting service, the anticipated introduction of self-driving trucks is one of these changes to the context of the service that affects value co-creating relationships. Moreover, Ferdinand mentioned that the technological solution that the project team developed would need to have a certain degree of flexibility.

In this project, the complexity and changeability of services made it impossible to make a plan for service transformation up front, that could then be handed over. The project team acknowledged that they could not make a full implementation plan up front. For instance, during engagement 04, Ferdinand commented that further development and service transformation would need to take place in collaboration with the local distributors. James mentioned during the interviews that decisions regarding the business for the guided troubleshooting service would be up to the distributor. Finally, James and Ferdinand (during the interviews) as well as Michael (during engagement 04) pointed out that service transformation would likely not take place all at once, but rather in steps. After each step, the effects of that step would be evaluated and considered when planning the next step.

Service transformation in the project was thus addressed as an *incremental approximation* of the final solution (Gedenryd, 1998). Rather than fully developing a plan first and then switching to executing this plan, the plan develops incrementally and is only finished at the end, when the design is done as well. Gedenryd (ibid.) gives the example of an interview with an accountant about the development of a spreadsheet from a study by Nardi and Zarmer (see Nardi & Zarmer, 1993, p.13 for the interview transcript of the dialogue with Jeremy, the accountant). The accountant explains how he had to work with the spreadsheet in order to learn about how the spreadsheet needed to be designed. Gedenryd used this as an example of incremental

approximation, rather than a process of 1) making a full analysis of the problem, 2) developing the entire solution up front and 3) implementing the solution. Gedenryd (1998) stated that “[the accountant] couldn’t make use of a programmer because it would require that problem setting *could* be separated from problem solving; not only between different phases, but between different *people*, even.” (Gedenryd, 1998, p. 93, italics in original). The transformation of the troubleshooting service towards guided troubleshooting was addressed as such an incremental approximation of the envisioned value co-creating relationships. The entire service concept for remote and workshop guided troubleshooting would not be developed once, based on a complete analysis of the problems in the current troubleshooting service. Instead, the problem and the design solution co-evolved (Dorst & Cross, 2001): by suggesting an envisioned troubleshooting service (from engagement 01) to backstage and frontstage service actors (in engagements 02 and 03, respectively), the project team increased their understanding of the problems in the current troubleshooting service, which lead them make changes to the envisioned service (in engagement 04).

Designing was used in the project as an approach to learning about service transformation. Through the engagements, the project team learned about value co-creating relations in the existing and envisioned guided troubleshooting, both when articulating the vision of the service and when assessing the envisioned service. Presenting the flow-type visualisation to service actors in the backstage (engagement 02) and frontstage (engagement 03) provided insights about how aspects of the current troubleshooting service would affect value co-creating relations in the guided troubleshooting service. These insights gained helped the project team to determine how service transformation would shape value co-creating relations and how to enable service actors to enact the roles that would facilitate the intended value co-creating relations. The knowledge that was developed through these engagements provided input for further service development and transformation of the troubleshooting service.

Designing for service emphasises this nature of design as a constructivist inquiry (Kimbell, 2011) that is “an exploratory process that aims to create new kinds of value relation between diverse actors within a socio-material configuration” (ibid, p. 41). The view of design as inquiry posits that design does not take place through first analysing the design situation to develop a plan for solving the problem at hand and then synthesising a solution (see e.g.

Gedenryd, 1998). Different initial attempts to solve the problem are part of the designer's process of understanding the problem. This relates to how Schön (1983) addressed the way in which professionals frame new problems which they encounter in terms of a problem they have encountered before. Using this problem framing, they make a first move, an attempt at solving the new problem, to see what consequences are of this move. Based on these consequences, they decide what would be a good next move: whether the framing of the problem is useful for developing a solution or whether the problem should be reframed instead (ibid.). Schön argued that "In this reflective conversation, the practitioner's effort to solve the reframed problem yields new discoveries which call for new reflection-in-action. The process spirals through stages of appreciation, action and reappreciation." (ibid., p.132). This process helps to develop a better understanding of the situation at hand. In other words: practitioners learn about the problem through their attempts of first framing the problem (what Schön (1983) calls *problem setting*) and then trying to solve it. In line with this constructivist view, designing for service is considered as wayfinding for service development rather than navigating (Kimbell, 2014). Certain services, like wicked problems (Rittel & Webber, 1973), are too complex to be able to develop a complete overview of them. This makes it impossible to fully analyse them first and then synthesise a service concept that solves issues in the existing service. Instead, design is a learning process that consists of consciously framing a situation, performing an intervention based on that way of seeing the situation and reflecting on the outcomes of that intervention.

In the project, the inquiry that was aimed at incremental approximation of envisioned value co-creating relations was supported by what Gedenryd (1998) calls *situating strategies*. These are representations of a future situation that make it possible to learn about that future situation. Situating strategies make it possible to explore different parts of a situation that do not yet exist. Each situating strategy or representation technique is in essence a window that provides a view of a part of the future (Lim, Stolterman, & Tenenbergh, 2008). Scenarios, for instance, are meant to include aspects of a realistic setting of future use: A scenario "re-creates a future situation of use that is *specific, rich in detail and complete*." (Gedenryd, 1998, p.181, italics in original). Each scenario, however, only covers one situation. By using different scenarios, it is possible to cover a range of situations and decrease

the number of blind spots in the analysis (Gedenryd, 1998). In the development of the guided troubleshooting service, the project team learned about different aspects of the envisioned service practice by working with a range of different scenarios during engagement 01. Furthermore, the flow-type representation helped uncover other aspects of the guided troubleshooting service than those revealed by the paper prototype and clickable prototype. The interface prototypes (i.e. the clickable and paper prototype) triggered specific comments, based on the designs of the screens and what was visible in these interface designs, about what would be possible and what would not be possible in the interaction with the software. For instance, when using the software during the remote troubleshooting it would be against the law to read the GPS data from the vehicle to show the location of the truck. And some data from the onboard computer would not be available during remote troubleshooting, depending on the repair contract that the transformation company has. The flow-type visualisation of the service process provided feedback on the level of the service as well as how different service actors would take part in and collaborate in the service.

If those who work with service development use situating strategies on their own (i.e. without collaborating with other stakeholders in the service), they may not be able to learn about all of the changes in value co-creating relationships. This is especially true if these service developers are not part of the service practice for which they are designing, because in that case designers have an outsider's view of the service practice. This outsider view may not be complete or correct, which affects what designers can learn about shaping value co-creating relationships by using situating strategies. It thus benefits the inquiry if actors in the service are involved. Since they have a more detailed understanding of their service practice than the service designers (if these designers are on the outside of that practice), service actors can foresee things that designers may not anticipate. By involving service actors in a dialogue around the envisioned service, it becomes possible to get a more complete and correct picture of the current state of value co-creating relationships and changes in value co-creating relationships that may occur as a result of the realisation of service transformation. The project team and I learned through prototyping (i.e. using situating strategies to make external representations of the service), which happened both during engagements in which only members of the project team participated and engagements together with frontstage and backstage service actors.

5.3.2 Contributions of trained designers

Changes to value co-creating relationships take place in a continuous way, rather than as the outcomes of service development projects. Design as inquiry is not limited to a design phase. The ongoing nature of shaping the value co-creating relationships that has been addressed above implies that inquiry into how value co-creating relations can be shaped should take place in an ongoing way as well. In order to make such ongoing inquiry possible, service actors need to have tools for inquiry into shaping the value co-creating relationships. Designing for service focusses on the verb *designing* rather than the noun *designer* (Sangiorgi, Prendiville, & Jung, 2017; Junginger & Bailey, 2017) and emphasises that designing can also be performed by people who are not trained as designers (Manzini, 2015; Sangiorgi & Prendiville, 2017). Designers have a variety of such situating strategies at their disposal, where different strategies allow designers to explore different aspects a future situation (Gedenryd, 1998). Gedenryd argues that these situating strategies enable designers to work more effectively towards a solution because they allow them to externalise parts of the problem and potential solutions. In the development or the guided troubleshooting service, the representations helped the project team to learn about the current troubleshooting service and the changes in value co-creating relations that would follow from realising service transformation.

My role as a trained designer in this project has been to support inquiry into value co-creating relations. More specifically, I have done this by:

- Setting up discrete engagements that would allow the project team to learn how realisation of service transformation to the guided troubleshooting would shape value co-creating relations.
- Making representations of the remote and workshop guided troubleshooting at a service level (rather than a technology level or interaction level), to help service actors imagine how value co-creating relations would be shaped if service transformation would be realised.
- Involving service actors in the inquiry, to learn about the existing service and shaping efforts needed to realise the envisioned value co-creating relations.
- Showing the project team where learning had taken place and where it was still needed.

During the project, I supported the project team's inquiry by setting up discrete engagements that helped the project team to 1) find gaps in their understanding about the existing and the envisioned troubleshooting service (engagement 01), 2) learn from service actors (engagement 02 and 03) and 3) develop a new problem framing as well as an idea of what the next steps should be (engagement 04). As a trained designer, I brought situating strategies such as representation techniques and scenarios, as well as interview techniques to the project that supported the learning that took place through these engagements.

Between the engagements I have worked on developing workshop material and on making representations of the envisioned service practice. In these representations I have zoomed out from the idea about the technology for guided troubleshooting to the level of a service. I have made representations on the level of the service to help the frontstage and backstage service actors imagine how the guided troubleshooting *service* could work, in order to help them make sense of how value co-creating relations for them and other service actors would be shaped when realising the service transformation to guided troubleshooting.

By making representations of the guided troubleshooting service and involving actors from the frontstage and backstage of the service it was possible to include their understanding of the existing troubleshooting service and their anticipations regarding how service transformation would shape value co-creating relationships, as part of the inquiry of the project team.

Moreover, I have used the flow-type representation of the service as a way to point out the aspects of the guided troubleshooting service that we had learned about through the paper prototype and which other parts of the service we still had to learn about.

5.4 Chapter summary

In this chapter, I presented type 2 service transformation, a perspective on service transformation that addresses the back-talk from the engagements that was unexpected given the program *implementation during design*. Type 2 service transformation, like service logic (SL) and service-dominant logic (SDL), is positioned in a service ontology of service as value-in-use. Service value is seen as being co-created in collaborations between service actors. In these collaborations, service actors mainly exchange knowledge and skills for the benefit of others; they enact what I call *value co-creating relations* with

other service actors in a network. A service actor can be a facilitator or beneficiary of the co-created value. If service actors provide resource(s) they are referred to as the *provider*, or the facilitator of value co-creation. The service actors who integrate the provided resources with other resources they have access to are referred to as *beneficiaries*. Whether or not value is co-created, is determined by the beneficiary and depends on the context in which resources are exchanged and integrated. In the project, this view of service as a collaborative effort was also visible in the service development project for guided troubleshooting. Based on the comments from the interviews, the project team and I realised that guided troubleshooting would not always take place according to one process, consisting of a series of touchpoints in a specific order. Instead, troubleshooting would take place in a more organic way, depending on the situation in which it would take place.

Type 2 service transformation is in line with the synthesis perspective of service innovation. It is related to the systemic and experiential archetypes of service innovation. Service transformation aims to shape value co-creating relationships between service actors by enabling service actors to take on roles that facilitate the envisioned value co-creating relationships.

The concept of roles is one generative construct for addressing type 2 service transformation. Combining methods to explore future roles with adaptations of Role Theory literature for service contexts allows systematic analyses of the service actors' roles in an envisioned service. In the development of guided troubleshooting service, such analyses provided insights about 1) anticipated changes in value co-creating relationships and 2) factors that would enable roles that facilitate the envisioned value co-creating relationships. In the engagements, the representation of the guided troubleshooting service showed roles for different actors in the envisioned service. The comments from frontstage and backstage service actors regarding these envisioned roles could be analysed using Role Theory vocabulary, to articulate the changes to value co-creating relationships that these service actors expected from service transformation. Therefore, the concept of roles and Role Theory vocabulary were central to the development of the program *enabling enactment*. This program provides a scaffold for design engagements aimed at studying type 2 service transformation through programmatic design research.

The process of shaping value co-creating relationships takes place iteratively and incrementally. The contextualised nature of co-creating relationships makes it difficult to foresee how service transformation efforts will affect value co-creating relationships. It is impossible to develop a full plan for service transformation up front, unless there is a precedent of service transformation in the same situation. In the development of the guided troubleshooting service, the incremental nature of service transformation was addressed during the design engagements. The service would likely not be realised all at once. Instead, service transformation towards guided troubleshooting was expected to take place in steps, where the results and unexpected effects of previous efforts would be used to plan and prepare for future steps.

This incremental nature of type 2 service transformation and the impossibility of making a complete plan up front suggest that design as inquiry can contribute to service transformation. Prototyping activities using situating strategies (i.e. different kinds of external representations of the service) make it possible to learn more about existing value co-creating relationships, how service transformation is expected to affect these value co-creating relations and how service transformation can be realised by enabling service actors to enact roles that facilitate the intended value co-creating relations. In addition to using situating strategies in these prototyping activities, involving service actors supports learning about value co-creating relations. If service designers are not part of the service practice, they have to work with an outsider's view of the service, which is probably not complete. Involving service actors can thus provide additional information about value co-creating relationships that the use of situating strategies alone would not have provided. Trained designers can support learning about value co-creating relations during prototyping activities by providing tools for inquiry.

In the project, articulating the envisioned service in a flow-type visualisation and assessing this generic process using scenarios helped the project team to find gaps in 1) their vision for the remote and workshop guided troubleshooting service and 2) their knowledge about the existing troubleshooting service. Involving frontstage and backstage service actors provided insights about the existing troubleshooting service and the changes in value co-creating relationships that service actors expected as a result of service transformation.

Type 2 service transformation is summarised in Table 5.3, below. In the next chapter, type 1 and type 2 service transformation are placed side by side and discussed further.

Table 5.3 – Overview of type 2 service transformation

Service ontology	Service as value-in-use
Service development	Ongoing efforts to shape the value co-creating relationships between service actors
Realising service transformation	Enabling service actor roles that facilitate the envisioned value co-creating relationships
Streams of literature in service innovation	Experiential and systemic archetypes of service innovation, synthesis perspective
Generative construct	Concept of roles and Role Theory vocabulary
Program	Enabling enactment
Object of design	Enablers for enacting roles that facilitate value co-creating relationships between service actors
Design in relation to realising service transformation	Inquiry through prototyping, to explore value co-creating relations and enablers for roles that facilitate intended value co-creating relationships
Trained designers in relation to realising service transformation	Support inquiry by service actors by providing tools for learning about value co-creating relations
Stream of literature in design research	Designing for service

Chapter 6 Discussion

This chapter discusses the results of the programmatic design research on service transformation. I start the chapter by summarising the results of the research and how these results helped to answer the research questions. More specifically, I address the two perspectives on service transformation (type 1 and type 2 service transformation), the two generative constructs for studying service transformation (design for manufacture and assembly, the concept of roles and Role Theory vocabulary), and the way in which design and trained designers can relate and contribute to service transformation. I then put these results in a larger context of related research on service innovation, realising service transformation and service design. This contextualisation forms the basis of a transition towards the next section, where I address the contributions that the outcomes of my research make to service design research and service innovation research. These contributions have limitations as a result of using programmatic research as a methodological approach and the context in which the design engagements took place. I discuss these limitations using the criteria for assessing the quality of programmatic design research that I introduced in Chapter 3. Part of the assessment of the quality of design research lies in how the outcomes of the research are useful for practitioners. Therefore, I end the chapter by discussing the implications for the practice of service development.

6.1 Summary and discussion of the research results

The research presented in this thesis started out with my desire to better understand service transformation, as well as how design and trained designers can relate and contribute to realising service transformation. I have

studied these topics through programmatic design research in a project that was part of a service development process in an industrial business-to-business service context.

The outcomes of the programmatic design research have led to the formulation of two perspectives on service transformation, with two related ways for designers to relate to service transformation. These perspectives are presented in brief in Table 6.1 and Figure 6.1. In addition, I have suggested two programs for studying type 1 and type 2 service transformation. These programs build on generative constructs that are related to the respective perspectives. The two programs and generative constructs are also included in Table 6.1 and Figure 6.1.

Table 6.1 - The two perspectives on realisation of service transformation side by side

	Type 1 service transformation	Type 2 service transformation
<i>Framing service transformation</i>		
Service ontology	Service as artefact	Service as value-in-use
Perspective on service development	A process consisting of phases or stages, which are addressed in a sequential order	Ongoing efforts to shape the value co-creating relationships between service actors
Perspective on realising service transformation	Assembling a service delivery system to support a service process by rolling out touchpoints according to specifications, which happens during the implementation phase in service development	Enabling service actor roles that facilitate the envisioned value co-creating relationships
Streams of literature in service innovation	Process and outcome archetypes of service innovation, assimilation perspective	Experiential and systemic archetypes of service innovation, synthesis perspective
Object of design	Service concept and touchpoint specifications	Enablers for enacting roles that facilitate value co-creating relationships

Design in relation to realising service transformation	Develop service interface from holistic and people-centred perspective Explore and evaluate service experience using prototypes of the service	Inquiry through prototyping, to explore value co-creating relations and enablers for roles that facilitate intended value co-creating relationships
Trained designers in relation to realising service transformation	Apply implementation strategies during involvement in the project Facilitate handover of service concept and service prototypes	Support inquiry by service actors by providing tools for learning about value co-creating relationships
Stream of literature in design research	Service design	Designing for service
<i>Studying service transformation</i>		
Generative construct	Design for manufacture and assembly (DFMA)	Concept of roles and Role Theory vocabulary
Program	Implementation during design	Enabling enactment

Figure 6.1- The two perspectives on realising service transformation, their related generative constructs, and role of design and trained designers

6.1.1 Two alternative perspectives on realising service transformation

In this thesis I have developed two perspectives for service transformation, type 1 and type 2 service transformation, by combining theory from service research with empirical data from design engagements. Type 1 service transformation is positioned in the service ontology of service as artefact and views realising service transformation as the assembly of a service delivery system. Type 2 service transformation is positioned in the service ontology of service as value-in-use and views realising service transformation as enabling roles for service actors that facilitate envisioned value co-creating relations.

Type 1 service transformation is based on the way service development and realising service transformation are addressed in New Service Development (NSD) and service marketing. It depicts service value as being delivered through a service process, a series of touchpoints, during which dyadic interactions take place between service provider and customer. In NSD literature, service development is typically depicted as a linear process, consisting of phases that address the design and implementation of a service concept (Meiren et al. 2015). Service design is framed as the development of a service concept. Service transformation is realised through the assembly of a service delivery system that supports the service process and the delivery of the value of a service concept to service customers (Ponsignon, Smart, & Maull, 2011). Service transformation is aimed at delivering a certain service experience and the aim is to deliver this experience consistently and repeatedly. The resulting process of service development starts by determining what experience to strive for. Then, the desired experience (i.e. service concept or service offering) is defined and the process required for the delivery of that experience is prototyped and evaluated. Once a prototype of the process that successfully delivers the intended experience has been defined, service transformation takes place by assembling the service delivery system that contains the prerequisites for the delivery of the experience. Hence, the what (service experience) and how (service process) are defined first, before assembling the service delivery system. Service transformation ends when the intended experience is being delivered repeatedly.

In the project, type 1 service transformation was visible in, for instance, the definition of a generic service process during engagement 01. It was possible to represent the service as a process consisting of dyadic service interactions and define how value is provided in these interactions. Moreover,

when involving backstage and frontstage service actors, it was possible to address prerequisites in the service delivery system in order to support this service process. In this project, the project team addressed service transformation as rolling out the service in collaboration with the distributors for those markets. See Section 4.1 for additional examples of where type 1 service transformation was evident in the project.

Type 2 service transformation frames service value as being co-created by service actors that are part of a network (or service system) (Normann & Ramirez, 1993; Vargo & Lusch, 2011). The co-creation of value-in-use is affected by the context in which it takes place (Edvardsson & Tronvoll, 2013). What is considered valuable varies across, for instance, time, place and people. Service actors collaborate in order to co-create value; they enact value co-creating relationships. Service development is framed as a continuous process of shaping these value co-creating relationships between actors in a service and looks at the value-in-use that is intended to be co-created. It thus builds on the synthesis perspective of service innovation (Coombs & Miles, 2000).

Type 2 service transformation is continuous in nature and takes place by shaping the value co-creating relationships between service actors through, for instance, changes in legislations, technology or the coming and going of service actors. Realising service transformation involves enabling service actors to enact roles that facilitate what service actors consider to be value co-creating relationships. Successful service transformation requires that the intended value is co-created and is agnostic to the way in which this happens.

In the project, type 2 service transformation was visible in how transport planners expected differences in their service experience depending on factors such as the repair contract that their transport company has and whether the company had its own workshop for simple repairs. The type of contract the transport company had also affected what the roadside assistance operators were able to see in terms of data from the vehicle (e.g. fault codes, active warning lights) and thus the kind of support that could be provided. Finally, legislation, such as restrictions on accessing GPS data of a vehicle affected the value that roadside assistance operators would be able to co-create in the guided troubleshooting service. On the side of the garages, the division of work differed between countries, which affected how value would be co-created in the troubleshooting service. The more continuous nature of type 2 service transformation was visible, for instance, in the fact that the

project team considered the realisation of service transformation to take place step-by-step. Michael wanted to start with scenarios that were small and straightforward, before considering more complex troubleshooting situations with multiple service actors. Section 4.2 contains more examples of how type 2 service transformation was present in the development of the guided troubleshooting service.

Type 1 and type 2 service transformations are put side by side in Table 6.2.

Table 6.2 – Side-by-side comparison of how the two perspectives on service transformation

Perspective	Type 1 service transformation	Type 2 service transformation
Service ontology	Service as artefact	Service as value-in-use
Perspective on service development	A process consisting of phases or stages, which are addressed in a sequential order	Ongoing efforts to shape the value co-creating relationships between service actors
Perspective on realising service transformation	Assembling a service delivery system to support a service process by rolling out touchpoints according to specifications, which happens during the implementation phase in service development	Enabling service actor roles that facilitate the envisioned value co-creating relationships
Streams of literature in service innovation	Process and outcome archetypes of service innovation, assimilation perspective	Experiential and systemic archetypes of service innovation, synthesis perspective

6.1.2 Two generative constructs to address service transformation

I have related Type 1 and type 2 service transformation to two generative constructs that facilitate working with service transformation in the respective perspectives: design for manufacture and assembly (DFMA) for type 1 service transformation and the concept of roles and Role Theory vocabulary for type 2 service transformation. These generative constructs formed the basis for two programs for studying service transformation: *implementation during design*, which is associated with type 1 service transformation and *enabling enactment*, which is associated with type 2 service transformation.

The framing of type 1 service transformation suggests a linear process model for service development where design and implementation of a service concept take place in two phases and where design precedes implementation. Design decisions for the service concept affect implementation of that service concept. Similar process models and characteristics are found in product development literature. The implementation of a service delivery system then becomes analogous to the manufacturing and assembly of a product: making the value of the product available to a wider audience. Building on this comparison, I have used DFMA from product design (Boothroyd et al., 2011) as a generative construct to explore type 1 service transformation. DFMA in product design serves the purpose of optimising a product concept for manufacture and assembly. In the context of type 1 service transformation, this construct helps to explore consequences of design decisions in the service concept for service transformation. In other words: how design decisions regarding the service concept affect the service process and, in turn, the service delivery system. I used DFMA to develop the program *implementation during design*, in order to explore type 1 service transformation through programmatic design research.

In the project, I used the program *implementation during design* as a scaffold when setting up the discrete engagements. At the point in the service development process at which the design engagements were planned and performed, the development process for guided troubleshooting was in its design phase. The engagements were intended to explore type 1 service transformation during this design phase. More specifically, we looked at how to work with refining specifications for the delivery system during service design and evaluating which consequences the design decisions in the service concept would have for service transformation. These consequences related

to 1) effects for the existing service of troubleshooting and 2) prerequisites for the delivery of the envisioned guided troubleshooting service.

The outcomes of the engagements that were unexpected, given the framing in type 1 service transformation and the program *implementation during design* led to the formulation of type 2 service transformation. The concept of roles and Role Theory served as a generative construct for studying type 2 service transformation through the program *enabling enactment*. This program combines the use of Role Theory by service marketing for the analysis of existing roles in a service with methods that involve roles that have been developed in design research. This combination makes it possible to systematically analyse envisioned value co-creation relationships and the roles that facilitate them. Viewing roles not just from an interactional perspective, but also including a structural and network approach makes it possible to address roles beyond service encounters (Baker & Faulkner, 1991). This generative construct is compatible with the service ontology of value-in-use (Akaka & Chandler, 2011) in which type 2 service transformation is located. The generative construct and program make it possible to explore how envisioned value co-creating relationships can be realised by enabling the enactment of related service actor roles. Role Theory was found to be useful because while analysing of the outcomes of the design engagements, Role Theory vocabulary helped to articulate 1) expectations that service actors had regarding changes to their own roles and those of other actors in the service system and 2) how service actors anticipated those changes would affect value co-creation relationships. For instance, drivers would need a basic technical knowledge about the truck to be able to enact a role that facilitates a value co-creating relationships during remote troubleshooting. For roadside assistance operators, additional technical knowledge and staffing would be needed to enable a role that facilitates value co-creation. Additional staffing would be needed to enable a role for those who analyse the data from troubleshooting cases that facilitates value co-creation. See Chapter 5 for additional examples of how the concept of roles, Role Theory vocabulary and enabling roles that make value co-creating relationships possible were present in the way service transformation was addressed in the engagements.

The generative constructs and programs for studying type 1 and type 2 service transformation are summarised in Table 6.3.

Table 6.3 – Side-by-side comparison of the generative constructs and programs for studying type 1 and type 2 service transformation

Perspective	Type 1 service transformation	Type 2 service transformation
Generative construct	Design for manufacture and assembly (DFMA)	Concept of roles and Role Theory vocabulary
Program	Implementation during design	Enabling enactment

6.1.3 Relation and contribution of design to service transformation

The two perspectives on service transformation suggest two different ways for design and trained designers to relate and contribute to service transformation. In type 1 service transformation, design contributes 1) by developing a service concept from a holistic and people-centred perspective and 2) by using prototypes to evaluate whether the envisioned service experience is delivered to the service customer. Trained designers contribute to service transformation by 1) applying implementation strategies during the design phase and 2) facilitating the handover of the service concept. In type 2 service transformation, design as an inquiry facilitates learning about value co-creating relations. The contribution of trained designers is to support this learning process.

In type 1 service transformation, design is a phase in the service development process (Meiren et al., 2015). In this phase, the service concept is developed. Design contributes to service transformation by providing tools and methods for adopting a people-centred, outside-in approach to the design of service concepts (Patrício et al., 2018). External representations are used for research, ideation and making prototypes of (parts of) the service (Blomkvist & Segelström, 2014). During the synthesis phase of Service Design, prototypes of the service help to test and evaluate service experiences. In type 1 service transformation, service designers work on designing and delivering a service concept. They are often not involved during the implementation phase of the service development project (Almqvist, 2017). However, they can nonetheless contribute to type 1 service transformation. Firstly, service designers can apply strategies to support service transformation during their involvement in the service development process (i.e. during the design phase). This includes developing readiness for implementation of Service Design projects in the organisation (Lønvik et al., 2016; Weisser, Jonas, &

Mager, 2018) as well as applying strategies during their involvement to support service change (Raun, 2017). Secondly, trained designers can contribute by facilitating the handover of the service concept and service prototype. They can help those who will continue working on service transformation to translate abstract service concepts to concrete implementation actions (Almqvist, 2018b; Yu, 2015). I have applied some of the strategies which trained designers can apply to facilitate the realisation of service transformation and support the handover of the service concept. I have aimed to place the ownership over the design of the service concept with the project team by designing *with* them rather than *for* them. In addition, I involved various actors from the frontstage and backstage of the existing troubleshooting service to facilitate the handover of the service concept to those who would work on the realisation of the service transformation.

The program *implementation during design* suggests that designers can address implementation as a concept during the development of the service concept. Trained designers help to determine the consequences that the design decisions regarding the service concept will have for realising service transformation. These consequences include both prerequisites for the assembly of the service delivery system and effects of service transformation on the existing service. In the development of the guided troubleshooting service, articulating and evaluating the service concept helped to reveal consequences for service transformation. In the project, I have set up engagements in order to evaluate consequences of the design of the guided troubleshooting service. When backstage and frontstage actors were involved we presented the service concept and gathered their input for further development of the service. In these situations, the flow-type visualisation of the guided troubleshooting service helped to bring the service concept to life for the service actors. Hence, it was possible to address implementation as a concept during the design phase of the service development process of guided troubleshooting and it was possible to address consequences of the design of the service concept.

In type 2 service transformation, design can help to understand value co-creating relationships, both in the existing service and in future versions of the service as it is envisioned. Design as inquiry contributes to type 2 service transformation because in this kind of service transformation it is difficult to develop a fully detailed plan for realising service transformation. It is difficult to imagine all possible consequences of service transformation (Kimbell,

2011)), especially if the service designer does not personally participate in the existing service. Moreover, changes that happen to the context of the service over time influence the value co-creating relations. Designing for service contributes by providing the tools necessary to learn about what affects value co-creating relations and how to enable the roles of service actors that facilitate the envisioned value co-creating relations. Such learning takes place during prototyping activities with service actors. As mentioned in Chapter 5, situating strategies such as scenarios help service designers to explore different aspects of an envisioned service. By using a variety of situating strategies in prototyping activities, knowledge about value co-creating relations in the envisioned service is accumulated. This knowledge, in turn, supports decision-making regarding how to enable the enactment of service actor roles that facilitate the intended value co-creating relationships. The outcome of such efforts to enable service actor roles also provides insights into how value co-creating relations work in the service. Those insights help designers plan future service transformation efforts. Over time, service transformation thus takes place as an incremental approximation of intended value co-creating relations, as a result of developing knowledge about factors that affect value co-creating relations.

Design in type 2 service transformation is an approach that can be adopted by service actors as a way to learn, rather than a practice performed by trained designers (Sangiorgi, Prendiville, & Jung, 2017; Manzini, 2015). Trained designers facilitate this inquiry by providing situating strategies for learning about value co-creating relations. In this project, a flow-type visualisation of the service and prototypes of the troubleshooting software, used in dialogue with service actors, helped us to learn about the existing value co-creating relations and the changes to these relationships that service actors anticipated as a result of realising service transformation. The flow-type representation of the service helped me to indicate where knowledge about value co-creating relations had been developed and where (additional) knowledge was needed. Creating the flow-type visualisation of the envisioned service in engagement 01 facilitated me and the project team to identify knowledge gaps regarding the existing service. The use of scenarios in that same engagement helped to explore value co-creating relations in situations that could occur in the envisioned guided troubleshooting.

The ways that design and trained designers relate and contribute to type 1 and type 2 service transformation are summarised in Table 6.4.

Table 6.4 – Side-by-side comparison of how design and trained designers relate to service transformation in the two framings of service transformation

Perspective	Type 1 service transformation	Type 2 service transformation
Object of design	Service concept and touchpoint specifications	Enablers for enacting roles that facilitate value co-creating relationships between service actors
Design in relation to realising service transformation	Develop service interface from holistic and people-centred perspective Explore and evaluate service experience using prototypes of the service	Inquiry through prototyping, to explore value co-creating relations and enablers for roles that facilitate intended value co-creating relationships
Trained designers in relation to realising service transformation	Apply implementation strategies during involvement in the project Facilitate handover of service concept and service prototypes	Support inquiry by service actors by providing tools for learning about value co-creating relationships
Streams of literature in design research	Service design	Designing for service

6.1.4 Putting the results of the research in context

The two perspectives, type 1 and type 2 service transformation are different lenses for addressing service transformation. Both can be applied to service transformation efforts and I do not consider one to be better than the other. However, it is good to be aware of which perspective is being used when service transformation is addressed in research or service development practice. As a general guideline, for services that involve a high degree of standardisation and that strive for a consistent and repeatable service outcome type 1 service transformation is more fitting than type 2 service transformation. The notion of developing a concept and translating it into specifications works in a way that is similar to product and interaction design. In product and interaction design, there is an outcome of the development

process (e.g. website, chair) that has to 'work' in a consistent and repeatable way. Examples of such services are going to the cinema or ordering food at a fast-food restaurant.

For services where standardisation is not possible or desirable, type 2 service transformation is a more fitting framing for efforts to realise service transformation. For this type of services, it works better to focus on intended value co-creation relationships and whether they are enabled, rather than specifying the elements of a service delivery system. Examples of the types of services where type 2 service transformation seems useful are healthcare and education. Type 1 service transformation can still be used in these service contexts, for instance, when addressing limited aspects of the more complex services, such as the registration of patients in a hospital or children at a school.

The framing that is applied affects what is put in the foreground and background, and how service transformation is approached. Discussions about realising service transformation that are based on type 1 service transformation include determining how to implement the service concept and setting up the related service delivery system. This framing of service transformation works well if you have experience from earlier transformation efforts. Information about what works and what does not helps to define a fitting service delivery system and implementation plan. Type 1 service transformation thus has links to, for instance, implementation science. This field studies how evidence-based practices that are developed in, for instance, medicine or social services, can best be introduced in order to facilitate a smooth roll-out of new routines (Fixen et al., 2005) and their transition into sustainable, established practices (see e.g. Brewster et al., 2015). It also has links to diffusion of innovations (Rogers, 2003), which describes the process of implementing innovations and the factors which influence this process. Both implementation science and diffusion theory address the process of implementation through diffusion of the outcomes of innovation processes and factors that influence its success. Researchers and practitioners working with type 1 service transformation can build on the knowledge development in these fields to improve the odds of successful service transformation.

Finally, type 1 service transformation frames service development along similar lines to product development. Successful realisation of service transformation thus requires knowledge about the service equivalent to that

required in manufacturing and assembly. Design for manufacture and assembly (DFMA) builds on the idea that you can determine what the consequences of design decision are because you know how production and assembly work. However, more knowledge is needed about the material of service (Blomkvist et al., 2016) as well as service equivalent of manufacturing and assembly in order to successfully apply the principles of DFMA for realising type 1 service transformation. As long as that knowledge is missing, *Implementation during design* helps to address potential consequences of design decisions for service transformation, but there are no guidelines in the way there are in DFMA. This relates to the first part of the critique that Mulgan (2014) voiced—that designers need more knowledge about the economics of services. Specifically, they need to be able to determine the costs of putting a delivery system in place, which requires understanding of the process of realising service delivery systems. However, since there are different ways of seeing the material of service (Blomkvist et al., 2016), it is likely that there are multiple views on the service equivalent of manufacturing and assembly. As a result, it may be difficult to determine the cost of realising service transformation. Type 1 service transformation thus helps to explain why service designers have not been good at developing viable service concepts: while it is possible to estimate the cost of manufacture and assembly of products, the knowledge required for making such calculations in a service context is mostly lacking.

The second critique by Mulgan (2014) was that service designers pay too little attention to changes in organisational culture that are needed in relation with the service transformation. Type 2 service transformation provides suggestions regarding how to address such challenges. The notion of enabling the enactment of roles provides a way of addressing how these changes in organisational culture can be realised. Role Theory provides the vocabulary to address 1) the changes in expectations that are required for the change in the organisational culture, 2) how these new expectations should be communicated and 3) what the expectations mean for requirements relating to role adequacy. For instance, in order to realise service transformation sales force employees may be expected to develop long-term relations with customers rather than meet sales targets. Such expectations can be communicated through training of the sales force and as part of the organisational socialisation (i.e. communication of norms in the organisation) when new employees become part of the organisation. Having to develop

long-term relations also requires different skills and resources (i.e. a different role adequacy) from employees. For example, employees may be required to spend more time with customers and might therefore not be able to maintain the same number of client accounts as before. Moreover, the notion of enabling the enactment of roles that facilitate value co-creating relations provides a way to describe the realisation of service transformation in the synthesis perspective of service innovation. Previous works regarding service innovation from a synthesis perspective have addressed factors that affect the invention of innovative ways of value co-creation (e.g. Patrício, Gustafsson, & Fisk, 2018; Koskela-Huotari & Vargo, 2016). How realisation of envisioned value co-creating relationships takes place is, to the best of my knowledge, not addressed yet. In literature regarding service logic the focus lies on how value co-creation takes place in existing service practices (Vargo & Lusch 2008; Vargo, Wieland, & Akaka, 2015; Grönroos, 2008; Grönroos & Voima, 2013). However, the path towards this situation, the realisation of service transformation, is not extensively discussed. Grönroos (2011) mentioned design, development and manufacturing of resources for value co-creation but does not discuss these further.

Furthermore, more research is needed to lift changes in value co-creation due to service innovation from a dyadic to a systemic level (Jaakkola & Alexander, 2014). Innovation in a service context is often addressed using a product logic, addressing the diffusion of the outcomes of innovation processes (Ostrom, Parasuraman, Bowen, Patricio, & Voss, 2015; Vargo et al., 2015). This view is firm-centric and dyadic, rather than addressing service innovation as a transformation of the creation of value-in-use by customers and other service actors in a network (Michel, Brown, & Gallan, 2008; Carlborg et al., 2014; Helkkula et al., 2018). A synthesis view on innovation supports looking at innovation from a value-in-use perspective, but this synthesis view is not commonplace in innovation literature (Witell, Snyder, Gustafsson, Fombelle, & Kristensson, 2016). In the development of type 2 service transformation I have taken a synthesis perspective on service innovation, addressing how the way in which value co-creating relations are shaped affects the co-creation of value-in-use in the network of service actors in the troubleshooting service.

Service evolution in type 2 service transformation implies working continuously with the shaping of value co-creating relations and enabling roles that facilitate these relationships. This approach to the realisation of service transformation resembles the notion of “Responding to change over

following a plan” in agile software development (Beck et al., 2001) and is related to the concept of *agile incrementalism* (Kowalkowski, Kindström, Alejandro, Brege, & Biggemann, 2012). The latter concept was introduced as one approach to service infusion—the process whereby manufacturing firms make a transition to developing services in addition to products, as a way to increase revenue (ibid.). From the analysis of a case study of service infusion, the authors found that service infusion in practice does not always follow a predefined strategy; that it can take place in an unplanned, incremental way as well (ibid.).

Finally, this thesis takes up the relation of design and trained designers to service transformation in type 1 and type 2 service transformation. In previous works, discussions about the role that design and trained designers can have in service transformation have taken the current activities of designers as starting point (e.g. Yu & Sangiorgi 2018a, 2018b; Raun, 2017). In contrast, in this thesis I have defined two perspectives on service transformation first, and then built on theory in design research to articulate how design and trained designers can relate and contribute to either perspective on service transformation.

For type 1 service transformation, design takes place as part of the design phase of the New Service Development. Design contributes to service transformation in this phase by taking a people-centred and holistic perspective developing service concepts that are grounded in the concerns that different stakeholders have. This is related to design as a human-centred approach (Steen, 2011). By seeing service from an outside-in, user-oriented perspective, design helps to find aspects of a service that can be improved, turning bad service experiences into good ones. Such a framing of design is similar to design as a problem-solving activity (Johansson-Sköldberg et al., 2013). Attitudes that are commonly attributed to designers (e.g. Michlewski, 2016), such as empathising with users, creating new meaning and engaging all the senses help to develop service experiences that are desirable for service users. The ability of trained designers to deal with complexity and consider both the service as a whole and the design of individual touchpoints contributes to the development of a coherent and consistent service concept. Communication through visualisations and other external representations such as prototypes helps to create a shared understanding of the service concept and how different parts of the service provider organisation are related to the service (Bitner et al., 2008). Service Design consultants

contribute to service transformation in different ways depending on the relationship they have with their client: whether they deliver a service concept, partner in service development or facilitate their client organisation in designing service concepts (Yu & Sangiorgi, 2018a). This view of how design and trained designers contribute to service transformation seems to build on assumptions about design that do not view design as situated (Vink, 2019).

In type 2 service transformation, design is an intentional effort to learn about value co-creating relations in a service. This inquiry uses representation techniques to learn about the value co-creating relationships that exist in the service. The emphasis lies on the verb *designing* rather than the noun *designers* (Sangiorgi, Prendiville, & Jung, 2017; Junginger & Bailey, 2017). Design is not only done by professional designers, rather it can also be done by stakeholders involved in the process of shaping value co-creating relations. Design work can be done by people who do not call themselves designers (Gorb & Dumas, 1987). While not everyone can design professionally, everyone has a certain degree of design skill (Manzini, 2015). Learning takes place through collaborative design activities (Hillgren, Seravalli, & Emilson, 2011; Eriksen, 2014). During these collaborative activities, participants can develop representations of the envisioned service that become boundary objects (Star & Griesemer, 1989) and that function as a reference that is shared among the participants (Eriksen, 2014; Overkamp & Ruijs, 2017). For service transformation, such representations of the envisioned service contribute to the development of shared understanding of the service transformation among those who develop and use these representations for realising service transformation (see Bitner, Ostrom and Morgan, 2008; Overkamp & Ruijs, 2017). If the goals for service transformation are clear, the actors involved in realising the transformation can determine how to get there.

Another reason why specifying service functions is not productive in type 2 service transformation, is because this type of service transformation takes place through incremental approximation. It is impossible to fully predict and plan how type 2 service transformation will take place, which means that it is necessary to leave room to make changes in the future. This idea of leaving room to make changes to a design after its initial implementation is also present in the notion of allowing tailoring of software systems while they are in operation (Henderson & Kyng, 1991), designing for design after design (Redström, 2008) and continuous reconfiguring of social structures (Akama,

2015). Furthermore, Manzini (2015) framed design as an open-ended process that is never done: “As we have seen, design processes are very often open-ended: they never finish because there is no longer a clear separation between the design and management stages of a project (the result is always a ‘beta version,’ to which the currently active participants may bring their corrective and ameliorating contributions).” (p. 52). Although not all of these constructs are developed specifically for service transformation, their suggestions are equally applicable to that context. They provide ways of addressing the notion of continuous transformation, which is needed because the effects of designs are unpredictable and because the situation changes over time. This goes for all kinds of design, including design for service.

Trained designers can contribute to type 2 service transformation by facilitating the inquiry of service actors into the value co-creating relations and how these relationships can be shaped. More specifically, designers can provide tools for learning and develop the spaces that service actors need in order to be able to use design as inquiry on a daily basis, rather than solely during design projects (Björgvinsson, Ehn, & Hillgren, 2012). Design in type 2 service transformation becomes similar to participatory design as an act of infrastructuring (Ehn, 2008). Initially, participatory design took place on the level of individual projects, involving users in collaborative design within the scope of those projects (Holmlid, 2009b). Later, participatory design became an approach for developing a space for *thinging*, an infrastructure that creates public agnostic spaces as long-term relations (beyond individual projects) (Björgvinsson, Ehn, & Hillgren, 2010). In such a space, the matters which are addressed might stretch beyond the scope of the initial project and might include actors who were not considered from the beginning (Dantec & DiSalvo, 2013). Trained designers can contribute in type 2 service transformation by helping service actors “become change-agents in the continuous making of their own futures” (Akama, 2014, p. 174). These contributions of design and trained designers in type 2 service transformation are related to a situated understanding of designing that fosters reflexivity in service actors (Vink, 2019).

6.2 Contributions, limitations and implications of the research

The work presented in this thesis is positioned at the crossroads of service design and service innovation and contains contributions to both service design research and service innovation research. In this section I address these contributions, their limitations and implications for practice.

6.2.1 Contributions to service design research and service innovation

The main result of the research presented in this thesis is the articulation of the two perspectives on service transformation: type 1 and type 2 service transformation. These two perspectives are a contribution to service innovation and service design research because they provide a framework for future research that is aimed at developing knowledge about service transformation. This contribution consists of four elements.

Firstly, a contribution is made to service design literature by presenting an articulation of service as artefact and service as value-in-use as two ontologies of service that are used in service marketing literature. While both have been used as perspectives in service design research, this work clearly positions the two views as *ontologies of service*, that each come with respective ways of addressing service transformation.

The second element of the contribution is the combination of literature from service innovation research and empirical work from the service development project for guided troubleshooting to establish two perspectives on realising service transformation. This contribution to service design literature helps to extend discussions on how service transformation might take place in practice. Currently, discussions on service transformation in service design research address type 1 service transformation (Almqvist, 2018, 2019; Lee, 2016; Raun, 2017; Weisser, Jonas, & Mager, 2018; Yu & Sangiorgi, 2018b) but not type 2 service transformation.

Thirdly, the concept of *enabling value co-creating relations* that is part of type 2 service transformation is a theoretical contribution to service innovation—in particular the synthesis perspective on service innovation. *Enabling value co-creating relations* describes how changes in value-in-use are realised through enabling the enactment of certain service actor roles, thereby shaping value co-creating relationships. Currently, concepts in service logic and service-dominant logic describe value co-creation in existing situations of service. Literature in the synthesis perspective on service innovation uses a service logic (as opposed to a goods logic) to discuss how service innovations are conceived. However, neither service logic nor service innovation from a synthesis perspective have articulated the process by which new ways of value co-creation are realised. It has been suggested that service innovation from a synthesis perspective is realised by changing the institutions that are underlying resource integration in a service practice (Koskela-Huotari et al., 2016; Vargo et al., 2015), but the process by which

such changes are realised is not well understood yet. Overkamp and Holmlid (2017c) have framed realisation of service transformation from a service-dominant logic perspective as shaping resources in service systems, but the process by which the resources are shaped remains abstract. The concept of enabling value co-creating relations provides a more concrete suggestion for how service transformation is realised: by allowing service actors to enact roles that facilitate value co-creating relations.

Finally, the thesis contributes to both design research and service innovation research by articulating the relation and contribution of design and trained designers to type 1 and type 2 service transformation. The role of designers has been discussed in terms of how designers can contribute to service transformation based on what designers do and can do today as part of the service development process (Yu, 2016). The work that I have presented in this thesis contributes by starting from the opposite end, and defining how design(ers) can contribute, given the way in which service transformation is framed.

In addition, the research presented in this thesis makes an empirical contribution to service innovation and service design by studying an industrial business-to-business service. Other works in service innovation literature have focussed on business-to-customer services, in particular financial services (Storey, Cankurtaran, Papastathopoulou, & Hultink, 2016; Meiren et al., 2015). The context of industrial service design is relatively unexplored both in general (Miettinen, 2017) and regarding service transformation in particular. Previous works in design research regarding service transformation have looked at realising service transformation in other service practices than industrial business-to-business services, such as healthcare (Raun, 2017; Almqvist, 2017).

6.2.2 Limitations of the knowledge contributions

The contributions of the research presented in this thesis should be evaluated in the light of the programmatic design research approach that I have adopted. As mentioned in Section 3.1.4, programmatic design research aims to provide knowledge that is co-created with the practice that is being studied (Seravalli, 2014). Pragmatist inquiries such as programmatic design research do not aim to provide objective, final truths. The knowledge that is developed is context-specific. In the context of the guided troubleshooting service, the

outcomes of the research (i.e. type 1 and type 2 service transformation) proved useful. This knowledge may, however, only provide a local solution.

Type 1 and type 2 service transformation fit both the discourses in service research and the outcomes of the design engagements in the service development project for guided troubleshooting. Existing literature addresses type 1 service transformation. However, in the specific service development process for the guided troubleshooting service this framing of service transformation was not fully compatible with the outcomes of the design engagements. The outcomes of the design engagements that were in conflict with type 1 service transformation formed the starting point for my inquiry to develop a theoretical reframing (cf Wetter-Edman, Vink, & Blomkvist, 2018). Type 2 service transformation was developed because it helped explain those parts of the data from the design engagements that could not be described using the frame of type 1 service transformation. Type 2 service transformation was useful to explain what was going on in those outcomes from the design engagements. The context-specific development of the two perspectives means, however, that type 1 and type 2 service transformation might not be the only two ways of framing service transformation. Other projects, for instance those that occur in contexts other than industrial business-to-business services, may provide additional ways to understand of service transformation.

In addition, different researchers may provide alternate explanations for how realisation of service transformation takes place. In my role as design researcher, I have been part of the method and results, which has affected the research outcomes. As part of the programmatic design research approach as I have designed, planned and performed the design engagements. Other design researchers with different backgrounds might have set up design engagements in a different way, thereby placing different amounts of emphasis on the various aspects of service transformation. For instance, when I started working as a design researcher on this project, I had only general, outsider's knowledge of the service of troubleshooting trucks and buses and the work of logistics companies. In order perform my role as designer and researcher, I felt that I needed to understand the service and general transportation context better. I first had to spend time learning about the project and its context. Therefore, in the beginning the design engagements were a way for me to better understand service transformation as well as a way to gain a better understanding of the specific service of troubleshooting trucks and buses. At the start of the project, I had to rely on

the knowledge of others and could not challenge suggestions made by members of the project team. When I had developed a better understanding of the service, I was more able to assess other people's suggestions. I could identify potential issues related to service transformations in suggestions made by the members of the project team regarding the guided troubleshooting service. Hence, the way in which I addressed the project team's suggestions regarding the realisation of service transformations changed over time, contributing to differences between the outcomes of earlier and later engagements.

Furthermore, my background as a designer has influenced my approach. Firstly, my training at Delft University of Technology to become an industrial design engineer has influenced my view on design and convinced me that it is best to design in a collaborative way. During my Master's programme, I have developed an approach to design that aimed to involve people in the design process, supporting them in sharing their knowledge and facilitating them their contributions to a design project. This educational baggage and background have developed a conviction in me that it is beneficial to design *with* other people rather than *for* them. In the project aimed at developing the guided troubleshooting, that convinced me to design with the project team and service actors, instead of designing service concepts by myself, for the project team and Truck&Bus. At the same time, I did not have years of experience facilitating collaborative service development processes. Secondly, I was a designer who had been trained as product design, working in a service development project. While I had worked on a few Service Design projects before I engaged in the service development project for guided troubleshooting, I had limited experience with working as a service designer. Together, these factors have influenced the design and outcomes of the engagements.

Besides my educational background, my role as a design researcher in the project and my thinking regarding service design and service transformation have also been influenced by my preconceptions and prior knowledge, including but not limited to:

- My upbringing in a western-European worldview with the accompanying culture and norms (both in general and related to design, designers and service in particular);
- Being a PhD candidate in Design as part of a research group that focusses on interaction and service design;

- Working as a design researcher with people who are part of another culture and language rather than my native language and culture;
- Conversations with colleagues and other researchers during seminars, conferences and other meetings;
- My personality and character traits, with their accompanying strengths and weaknesses.

These factors have influenced my pre-understanding of service, design and service transformation, which I took with me in the remote service development project and the design engagements I planned and performed. This has subsequently generated a certain back-talk from the engagements. In the process of developing this understanding, I have interpreted the outcomes of these engagements through a hermeneutic process (Alvesson & Sköldbberg, 2017): I have listened to the data and tried out different theories for framing the data, in order to find the theories that helped to interpret and articulate how service transformation was addressed in the engagements. Feedback that I received during, for instance, conferences, presentations and meetings with my supervisors have helped me to see gaps in this understanding. Still, design researchers coming from different backgrounds would have arguably had another pre-understanding of service transformation and would have taken another position in the project and approached their work in a different way, regarding both the setup of the engagements and the analysis of their outcomes. As a result, the design engagements and their outcomes would have been different.

Another example of how wearing both the hats of designer and researcher affected the results was that the roles of designer and researcher sometimes have contradictory or even non-compatible motives and objectives. You have different rationales as a designer than as a researcher. For instance, as a researcher you may want to make audio recordings of all the conversations in order to be able to return to a conversation several times or allow people who were not present to listen to the conversation. But as a designer, recording all the conversations may not be desirable, because recording the conversation most likely changes the nature of the conversation. I noticed that asking to record the interviews with actors in the service practice made the conversation come across as formal, for both the service actors and the members of the project team that accompanied me. Asking to record informal conversations regarding the project or work meetings with the project team would arguably have had a similar effect.

Therefore, I decided instead to record conversations by taking notes in my diary during and after the meetings. This, in turn, had consequences for how I could treat the data that I have collected.

The topics addressed above point to the contextualised nature of the research presented in this thesis and of the knowledge contributions that this research has produced. Firstly, I have participated as a design researcher in the method and analysis that led to the outcomes of the research (i.e. type 1 and type 2 service transformation). Secondly, type 1 and type 2 service transformation have been explored and developed through design engagements within a specific service development process. These characteristics of the research make its knowledge production context-dependent, which affects criteria for assessing the quality of the research (see also 3.1.4).

Regarding the first point about my involvement as a design researcher, the reliability of this type of research efforts is supported by being open about the research process and the theories that are used. I have done so by providing detailed descriptions of the engagements (aims and content). Furthermore, I have been clear about the theoretical position that informed my pre-understanding of service transformation (type 1 service transformation), in Chapter 2. Moreover, I was clear about my theoretical stances in the reframing of service transformation (type 2 service transformation), in Chapter 5. I have validated type 1 and type 2 service transformation as provisional hypotheses for framing service transformation by comparing different cases (i.e. different engagements) to see whether these framings were present across the engagements. I have also been involved in the project beyond the discrete engagements, which helped me to validate the results.

The second point—that I have explored and developed type 1 and type 2 service transformation as part of one service development process—stipulates that the contributions cannot be evaluated in terms of their generalisability. Outcomes of this programmatic design research should therefore be judged in terms of transferability; the extent to which results can be transferred to other contexts. I have not researched type 1 and type 2 service transformation in other projects or contexts in order to determine the extent to which they are transferable. I have only tentatively tested the transferability of the two perspectives of service transformation by projecting them onto different categories of services, but have not done an in-depth analysis of their transferability. The concept of roles and Role Theory

vocabulary, on the other hand, can be used to make sense of changes in value co-creating relations as a result of service transformation that are anticipated by service actors in contexts other than the one described in this thesis (Overkamp et al., 2018).

Furthermore, the results of programmatic design research should be evaluated in terms of novelty and clarity (Seravalli, 2014). Novelty is the degree to which the claims that the research makes are a contribution to the genealogy to which it connects (*ibid.*). Clarity is evaluated in terms of how clearly the insights from situation are articulated by the researcher (*ibid.*).

Reading the novelty of the outcomes, the two perspectives on service transformation are not entirely new to service innovation. While the idea of shaping value co-creating relationships has not been addressed specifically, resource-based and practice-based innovation (as well as a combination of the two) have been discussed before (Skålén et al., 2015). Moreover, the notion of implementing a service delivery system as a perspective on service transformation has been used in New Service Development. The novelty of the perspectives presented in this thesis is that they are articulated as two different perspectives, two different lenses for looking at service transformation. The two views on how design and trained designers can contribute to type 1 and type 2 service transformation are not entirely new either. Service Design and design for service have been previously addressed as different ways in which design and designers can contribute to service innovation. Service Design, as a people-centred, holistic and visual approach has been addressed before and so has design for service, where design is considered to be an inquiry. The novelty lies in the way the two views on what design does are used. The work in this thesis does not take these two views as a starting point. Instead, the type 1 and type 2 service transformation that developed from the programmatic design research are taken as the starting point. The ways in which design and trained designers contribute to these respective perspectives is addressed subsequently. The novelty of the contribution thus lies in that it addresses how design and trained designers can contribute to realising service transformation given the way that service transformation is framed. In other words: the novelty lies in that I have addressed ways that design and trained designers can contribute to service transformation in situations where realising service transformation is framed as assembling a service delivery system (type 1 service transformation), as well as how design(ers) can contribute in situations where realising service

transformation is framed as enabling service actors to enact roles that facilitate certain value co-creating relationships (type 2 service transformation).

To achieve clarity in the contribution I have used concepts from service innovation research as well as service design research to articulate type 1 and type 2 service transformation. More specifically, to articulate type 1 service transformation I used concepts from literature that has an assimilation perspective of service innovation and the notion of service as artefact in which this perspective is positioned. I have built on literature in the field of design research to articulate how design and trained designers can contribute to service transformation in this perspective by addressing implementation during their involvement in the design phase. To articulate type 2 service transformation, I have built on literature that adopts a synthesis perspective of service innovation and the service logic in which this perspective is positioned. I have built on service design literature to address how designing as learning, when performed by service actors, can contribute to type 2 service transformation and how designers can contribute to service transformation by facilitating such learning. Furthermore, I have used type 1 and type 2 service transformation to provide clarity regarding what was going on in the design engagements that were part of the programmatic design research inquiry. I have used the definition of type 1 service transformation to describe the outcomes I expected from the engagements and to clarify how some of the outcomes were not in line with these expectations. In the development of type 2 service transformation, I have combined constructs from this framing of service transformation with outcomes from the engagements in order to clarify how type 2 service transformation was present in the outcomes of the design engagements.

Finally, design research efforts such as the one presented in this thesis need to be evaluated in terms of the extent to which the knowledge gained can be used by practitioners (Manzini, 2015). The usefulness of the contributions for practitioners is discussed in more detail below.

6.2.3 Implications of the results for practice

Design research should be evaluated in terms of how it provides useful knowledge not just for design researchers but also for practitioners (Manzini, 2015). The research presented in this thesis has articulated two perspectives on service transformation, including two related generative constructs for

addressing service transformation and two ways in which design and trained designers can contribute. As discussed above, service transformation can be addressed both as type 1 and type 2 service transformation, but certain types of services lend themselves better to one view over the other. For practitioners working with service transformation, it is therefore useful to consider which perspective best fits for service transformation efforts they are working on in a specific service development process. The framing in either type 1 or type 2 service transformation affects how service transformation efforts are set up, what the aims of service transformation are, which actors are involved and how the outcomes of the transformation efforts are evaluated. Type 1 service transformation fits for the development of a service that aims to deliver a consistent, repeatable experience and where there is earlier experience with service transformation in the same situation. If delivering one experience is not the intention and/or if there is little prior experience with realising service transformation in the context in question, type 2 service transformation is more fitting.

If service development work is framed in type 1 service transformation, it is important to clearly specify the intended service concept or experience. Unless this experience is clearly defined, it is hard to determine what service process and service delivery system are required. If a service concept is not fully defined, it is harder to define touchpoints and specify the prerequisites for the service delivery system. In turn, this makes it difficult to write an implementation plan. In the development of the guided troubleshooting service, the lack of a clearly defined service concept and process meant that the number of possible consequences was too great to address. If the intended service experience is known, it is possible to develop prototypes of the service process that delivers this experience before scaling it up to be able to deliver the service to a larger audience. Such prototypes can help to explore the consequences of design decisions in the service concept for realising service transformation before these transformation efforts are performed in the service practice.

If trained designers are involved, knowing that the service development is framed in type 1 service transformation will help them to define a productive role for themselves as part of the service development and in realising service transformation. They can contribute by facilitating handover of the service concept to those who will work on realising the service transformation. Trained designers can also apply implementation strategies

during their involvement in the design phase. If service development is framed in type 2 service transformation, it is important to direct service transformation efforts at learning about value co-creating relations among service actors and how these relations are affected by service transformation efforts. Service practitioners can use prototyping activities to learn about value co-creating relations among service actors. Type 2 service transformation it is not about developing a prototype of the service process in order to find out how to best deliver the intended service experience. If trained designers are involved, a productive way for them to contribute to type 2 service transformation is to facilitate prototyping activities by adjusting the setup of these activities to the learning purposes: What insights for shaping value co-creating relations should the prototyping activities provide? What other aspects of the envisioned service do we still need to learn about in order to develop a better understanding of the value co-creating relations? And how can we explore these aspects through additional prototyping activities? Trained designers can facilitate inquiry by service actors and build the infrastructure needed in order for inquiry to continue when the designers are no longer involved (Hillgren et al., 2011). Designers should be aware of the fact that they are not a neutral party as facilitators of inquiry; they are often hired by someone and also have their own agenda, which affects how they are perceived by the people they work with.

Role Theory helps address changes in the roles of service actors as well as considering how new roles can be enabled, for instance by developing training programmes to build the role adequacy of service actors for the envisioned role, or by developing reward structures that enable the enactment of intended roles.

Being aware of what a fitting role is for design and trained designers helps service practitioners to identify how design and trained designers can support the realisation of service transformation. In addition, it helps trained designers define and communicate a role for themselves that is productive in relation to the type of service transformation that the project in which they are involved intends to realise.

6.3 Chapter summary

In this chapter I have summarised the results from the research. The work presented in this thesis has articulated two perspectives for service transformation with two associated ways for design and trained designers to

relate and contribute to realising service transformation. For each perspective, I have provided a generative construct for exploring the realisation of service transformation. The first perspective, type 1 service transformation, is positioned in the assimilation perspective of service innovation and is related to process and outcome archetypes of service innovation. It is based on New Service Development literature and it frames service transformation as the assembly of a service delivery system, similar to manufacturing and assembling a product. The related generative construct for studying the realisation of service transformation is the concept of design for manufacture and assembly (DFMA). Addressing service implementation as a concept during the design phase of a service development project makes it possible to reveal consequences of decisions in service concept designs and refine the service delivery system. The contribution of design in this perspective is the adoption of a holistic, people-centred approach to the development of service concepts. The contribution of trained designers to realising service transformation in this perspective is to facilitate the handover of such service concepts, and to use implementation strategies while they are involved in the project.

The second perspective, type 2 service transformation, builds on a service logic, which views service as the co-creation of value-in-use. Type 2 service transformation is positioned in the synthesis perspective of service innovation and relates to the systemic and experiential archetypes of service innovation. It frames service transformation as shaping value co-creating relations. The related generative construct for studying the realisation of service transformation is the concept of roles and Role Theory vocabulary. The combination of an interactionist, structural and network approach to roles makes it possible to address how the enactment of roles that facilitate intended value co-creating relations can be enabled, thus shaping value co-creating relations. Design as an approach to learning helps service actors develop an understanding of value co-creating relations in the existing service as well as how to allow the enactment of roles that enable envisioned value co-creating relations. The contribution of trained designers is to facilitate service actors' ability to perform this inquiry by providing them with tools for developing said understanding as well as developing the infrastructure for inquiry.

Type 1 and type 2 service transformation thus frame the realisation of service transformation in different ways. As a result, they prioritise different aspects of service transformation and require different types of knowledge

and skills. Furthermore, each type of service transformation has its own way in which design and trained designers can relate and contribute to realising service transformation. These two perspectives on service transformation each fit different situations. Which perspective is best depends on the type of service transformation that is to be realised.

The main contributions of this thesis lie in the development of type 1 and type 2 service transformation, which has taken place by abductively weaving theory and empirical material together. The first contribution of these two perspectives to service design is that they articulate service as artefact and service as value-in-use as two service ontologies, two ways of seeing service. The second contribution is that type 2 service transformation makes it possible to extend current research about service transformation in service design, which has taken type 1 service transformation as its perspective. The third contribution is to the field of service innovation. The notion of *enabling value co-creating relationships* by allowing service actors to enact roles that facilitate intended value co-creating relations provides a concrete suggestion for how service innovation from a synthetic perspective is realised. Earlier works have discussed the factors that influence innovation, but have not articulated how service transformation is realised. The fourth contribution of the descriptions of type 1 and type 2 service transformation lies in that these descriptions include ways in which design and trained designers can relate and contribute to realising type 1 and type 2 service transformation. Previous works have addressed the contributions of designers by starting in what designers already do, rather than from how realising service transformation can be framed. Finally, the work provides an empirical contribution by showing how the realisation of service transformation was addressed in an industrial business-to-business service development process. Industrial service design has not been addressed much yet, neither in general nor specifically in terms of the realisation of the transformation of this type of services.

The pragmatist philosophy and programmatic design research approach that I have adopted in the research presented in this thesis has generated context-dependent knowledge. The results are affected both by the context for the empirical work and by the fact that I, as a design researcher, have been part of the method, in that I planned and performed the design engagements. I am also part of the results through my interpretation of the outcomes of the

design engagements in the hermeneutic circle that moves back and forth between pre-understanding and understanding. I have made the research reliable by being open about the research process and the theoretical stances that I used to analyse the outcomes of the design engagements. I have used thick descriptions, constant comparison of hypotheses against data from different engagements and my long-term involvement in the service development project as strategies for validating the research results.

These results are contextualised and should thus not be discussed in terms of generalisability, but in terms of transferability: the extent to which the results seem applicable to other contexts beyond the one addressed in this thesis. The results can be used as provisional hypotheses by other researchers who study the realisation of service transformation. However, it cannot be assumed that type 1 or type 2 service transformation can be used as perspective in those other contexts in which service transformation is studied.

The quality of the results of this programmatic design research need to be assessed in terms of their novelty, clarity and usefulness. The work that I have presented in this thesis is novel because it articulates two perspectives on service transformation that have not been articulated in design research before. The thesis aims to provide clarity through articulating my learnings from the design inquiry (i.e. the two perspectives on service transformation) using literature from service design research and service innovation research as well as empirical material from the design engagements. The usefulness of this knowledge for researchers is that type 1 and type 2 service transformation provide them with provisional hypotheses for studying the realisation of service transformation.

The usefulness of the results of the research for practice lies in the fact that the perspectives provide practitioners who work on service development with the vocabulary to assess and articulate the kind of service transformation efforts they are working on, to determine a fitting approach for realising service transformation. If the type of service is more standardised and is well understood from earlier experiences with service transformation work in the same type of service, type 1 service transformation is more fitting. If the service in question contains less standardisation, type 2 service transformation will be a more productive lens for working on the realisation of service transformation.

Chapter 7 Conclusions and outlooks

7.1 Looking back

The research presented in this thesis started from a combination of my own interest as a designer in keeping the future realisation of my designs in mind and the desire to better understand how service transformation is realised. As a product designer, I kept future production in mind while designing, but I did not know about the equivalent of production in a service context—service transformation. In addition, around the time I started my PhD, Geoff Mulgan (2014) had voiced a critique of service designers that centred on their lack of skills in service implementation. This made me want to learn about the topic. In this thesis, I have addressed three research questions relating to realising service transformation.

How can the realisation of service transformation be framed?

What generative constructs facilitate studying the realisation of service transformation given the way that service transformation is framed?

How can design and trained designers relate and contribute to the realisation of service transformation given the way that service transformation is framed?

I have used a programmatic design approach to explore service transformation during a project aimed at improving the service of troubleshooting trucks and buses. The project was aimed at the development of technology for remote and workshop guided troubleshooting, but it could

be framed as part of a service development process. This made it a fitting context in which to study how service transformation was addressed in the project. I have examined this through design engagements that I planned and executed during my involvement in the project, over the course of three years.

The answers to the three research questions have been formulated as two perspectives on service transformation: type 1 and type 2 service transformation. Type 1 service transformation formed the starting point for the programmatic research and the design engagements. Type 2 service transformation was developed to address results from the design engagements that were incompatible with type 1 service transformation.

Type 1 service transformation is built on the literature that addresses this topic in New Service Development (NSD) and service marketing. In this literature, design and implementation of service concepts are commonly framed as two phases in a service development process. In each of these phases, different professionals work on the respective design and implementation of a service concept. Service transformation is realised by assembling a service delivery system that supports the service process. Service value is delivered through this service process, which is seen as a series of dyadic service interactions (i.e. touchpoints or service encounters) between service provider and service customer. The service concept is broken down into touchpoints, for which specifications are defined and fulfilled in order to realise the intended service process.

In type 1 service transformation, service design is a phase in service development during which a service concept is designed and tested. The outcome of this phase is a prototype of the envisioned service concept and service process that is handed over to those who will realise the service delivery system. Trained designers contribute to the design of service concepts by taking a people-centred and holistic approach to the design of service concepts. During their involvement in the design phase, trained designers can apply implementation strategies and facilitate the handover of the service concept in order to increase the odds of successful realisation of service transformation (i.e. implementation of the service concept).

The framing of service transformation as a phase that comes after the design phase reveals similarities with between this process and certain characteristics of product development. In product development, concept design takes place in one phase of the project, while production and assembly

take place in later phases. Decisions made during the concept design phase affect production and assembly. Therefore, design for manufacture and assembly (DFMA) was found to be a generative construct for studying type 1 service transformation.

In DFMA, production and assembly are addressed during the design phase. This notion has been central to the development of the program *implementation during design*, which was developed as a way to explore type 1 service transformation. In type 1 service transformation, implementation as a concept can be addressed during design in order to facilitate the realisation of service transformation. More specifically, consequences for implementation of a specific service concept can be considered in terms of prerequisites for the service delivery system and effects on the existing service. Such an assessment then forms the basis for a redesign of the service concept to address any negative consequences that were found. In addition, addressing implementation as a concept during service design helps to further define the elements of the service delivery system and develop an implementation plan.

Type 2 service transformation is positioned in the service ontology of service as value-in-use which is put forward by a service-dominant logic. Service value is considered to be co-created in collaborations among service actors in a network constellation. Service actors enact value co-creating relations with other service actors by exchanging and integrating resources such as skills and knowledge. The service ontology of service as value-in-use also emphasises the fact that service is situated: the way in which a relation between service actors co-creates value-in-use depends on the context in which the relation is enacted.

Service transformation efforts aim to shape the value co-creating relationships between service actors. This relates to work within the synthesis perspective of service innovation literature, where innovations in service are framed as making changes to the resources that are exchanged and/or the service practice in which resources are exchanged and integrated. Service transformation is an ongoing process that shapes the value co-creating relationships of various actors in the service practice.

Realising type 2 service transformation takes place by enabling service actors to enact roles that facilitate intended value co-creating relations. Such enablers include contracts, legislation and technology. The concept of roles and Role Theory vocabulary were useful in analysing how service actors

addressed service transformation in the engagements in terms of how 1) realisation of service transformation would affect value co-creating relationships and 2) the enactment of roles that would facilitate value co-creating relations could be enabled. The concept of roles and Role Theory vocabulary were found to be a generative construct for working with type 2 service transformation and formed a central part of the program that was developed to study type 2 service transformation: *enabling enactment*. In this program, Role Theory vocabulary for the analysis of service actor roles is combined with methods using the concept of roles for generative purposes. Methods that use roles in design research facilitate the representation of envisioning service actor roles. Adaptations of Role Theory vocabulary for a service context from service marketing are useful for the systematic analysis of envisioned roles. Together, they provide a structured way to learn about value co-creating relations and factors that enable the enactment of service actor roles that facilitate envisioned value co-creating relations.

The formulation of these two perspectives on service transformation provides four contributions. Firstly, a contribution to design research is made through the articulation of the service ontologies of service as an artefact and service as value-in-use. Secondly, type 2 service transformation provides a contribution to service design research, where it makes it possible to expand current discussions that view realising service transformation from the perspective of type 1 service transformation. Thirdly, the concept of *enabling value co-creating relationships* contributes to service innovation by providing a way to frame the process of realising service transformation when service innovation is viewed from a synthesis perspective. Fourthly, type 1 and type 2 service transformation provide a contribution to service design research by framing how design and trained designers can relate and contribute to service transformation, based on these two perspectives. Earlier works have addressed the contribution of trained designers to service transformation by looking at how activities that designers currently undertake can contribute to realising service transformation. In this thesis, the perspectives on service transformation are taken as a starting point for defining how design and trained designers can relate and contribute to service transformation. In addition, the thesis makes an empirical contribution to service innovation and industrial service design literature by providing data on how service transformation is addressed in this context. Previously, service innovation literature has focussed on innovation in business-to-customer services, such

as financial services; industrial service design is a relatively unexplored field, both in general and regarding the realisation of service transformation in particular.

The contributions are made based on research that used a programmatic design research approach, which aims to develop contextualised knowledge. The results are therefore not final truths. New empirical work may lead to changes in the way service transformation is framed and what this means for the ways in which design and trained designers can relate and contribute to service transformation. In addition, in programmatic design research, the researcher is part of the method and the results. The outcomes of the research are thus affected by my background as a designer and researcher, my preconceptions about service and design, and the way I planned and performed the design engagements. In addition, the results are influenced by my interpretation of the outcomes of the design engagements using a hermeneutic perspective. Other design researchers can use other design engagements and/or theoretical stances to interpret outcomes of design engagements, providing alternate theories about realising service transformation. In addition, the contextualisation of the design engagements in the project for the development of guided troubleshooting also limits the contributions of the work presented in this thesis.

Finally, the outcomes of the research have several implications for service design practice. Most notably, the articulation of type 1 and type 2 service transformation helps service practitioners determine how the realisation of service transformation should be addressed in specific projects: as assembling a service delivery system that contains the prerequisites for the delivery of a certain service (i.e. type 1 service transformation), or as enabling the enactment of service actor roles that facilitate the desired value co-creating relationships between service actors (i.e. type 2 service transformation). This, in turn, affects decisions about which generative construct for service transformation to use in order to work towards realising service transformation. Furthermore, it affects the ways in which design and trained designers can best support these efforts to realise service transformation.

7.2 Looking ahead

The research presented in this thesis has provided new questions regarding the realisation of service transformation. In this section I address five of these

avenues that could be researched further. Firstly, future research could explore service transformation further through the two programs that were developed in this thesis. Research in the program *implementation during design* could look into developing methodological support for addressing consequences of the service concept and refining specifications for touchpoints, similar to the tools and methods that support the application of design for manufacture and assembly (Boothroyd et al., 2011). Furthermore, addressing *implementation during design* requires an understanding of how design decisions affect service transformation. To that end, knowledge about the material of service design and the equivalent of manufacture and assembly in product development needs to be developed further. Moreover, I have not been able to evaluate the effect of the implementation strategies that I have applied, because the project did not include implementation of the guided troubleshooting service concept. Future work could explore the extent to which these efforts have had an effect in further work towards realising the service transformation to guided troubleshooting. When it comes to the program *enabling enactment*, future research could address how to combine 1) tools and methods that design literature has developed for exploring possible future services and 2) the adaptation of Role Theory vocabulary for systematically analysing (existing) roles in services. Such research could elaborate on the suggestion that ongoing and static prototyping techniques can highlight different aspects of envisioned service actor roles (Overkamp & Holmlid, 2018). Analysing envisioned roles and different alternatives for differentiation into roles helps evaluate whether roles are tenable or a potential cause for role pressure. Finally, future research could study how trained designers might facilitate negotiations of envisioned roles. For instance, it would be interesting to explore whether designers should guard the interests of future roles, which do not exist yet and therefore do not have people that can represent the role.

Secondly, it seems that type 1 and type 2 service transformation are part of a continuum of perspectives on service transformation rather than a dichotomy. Type 1 service transformation is more local in nature and focusses on service transformation as something that involves service customers and service providers. Type 2 service transformation addresses the realisation of service transformation on a more global level of a service practice. Such a continuum of service transformation shares similarities with the concept of shearing layers in architecture (Brand, 1994). This suggests that there are layers in the built environment that differ in longevity: Site, Structure, Skin,

Services, Space plan and Stuff (*ibid.*). The site—the geographical location—is the ‘slowest’ layer and may not change at all. The stuff—the furniture and appliances—are regularly replaced as a result of changes in fashion or wear. Future research can explore whether a similar continuum exists for service transformation, where type 1 service transformation is closer to the ‘stuff’ end of the spectrum and type 2 service transformation is positioned more towards the ‘site’ end of the spectrum.

Thirdly, it would be interesting to explore connections between the concepts of roles of service actors and institutional logic with regard to systemic service innovation, which takes place in service ecosystems (Vargo et al., 2015). Both expectations for roles and institutions relate to norms, values and beliefs of service actors and both guide the actions of service actors (Koskela-Huotari et al., 2016; Biddle, 1979). Furthermore, redefining roles of service actors is one way in which institutional work enables new ways of value co-creation (Koskela-Huotari et al., 2016). Future work could look at how institutional work by service actors relates to changes in expectations for service actor roles: what the effects are of making, breaking and maintaining institutions on the expectations for the actors in a service ecosystem. Exploring such overlaps between institutional logic and roles can be interesting on all three levels of service ecosystems (i.e. micro, meso and macro). For instance, on the level of organisations as service ecosystems, previous work has looked at how organisational change comes about as a result of disrupting institutions in the organisation through service design projects (Kurtmollaiev, Fjuk, Pedersen, Clatworthy, & Kvale, 2018). Disruption of the institutional logics of an organisation comes with changes in the expectations for its employees. For instance, the successful transition to a service logic requires, among other things, that employees build learning relations with customers and that cross-departmental connections are developed in the organisation (Neu & Brown, 2005). The concept of roles and Role Theory vocabulary can complement the concept of institutional work in addressing such changes in expectations. Furthermore, the notion of enabling certain service actor roles can be used to explore how certain existing institutions can be maintained or broken. For instance, supporting and incentivising roles of service actors that maintain or break existing institutions could be a way to affect institutional work. Moreover, services typically contain variations (Rodrigues & Holmlid, 2017) and not all these variations lead to disruptions of institutions. An avenue for future research could be to explore the process by which new ways of value co-creation

become institutionalised and the factors that potentially affect which variations in service eventually become institutionalised ways of value co-creation. The Perceived Action Potential (PAP) of service actors affects how these actors react to new situations in a service (Rodrigues, Blomkvist & Holmlid, 2018). Future research could look at whether Role Theory vocabulary, such as the concept of role expectations, is useful as a complement for addressing service actors' PAP and, in turn, the way in which they respond to new service situations and how this influence the institutional work performed by service actors.

Fourthly, future research could explore the transferability of type 1 and type 2 service transformation beyond the project studied here. Such studies could take the two perspectives as tentative hypotheses for framing and studying service transformation in other service development projects. It would be particularly interesting to explore the two perspectives with services which are expected to be exemplars of one of the types of service transformation: standardised services on the one hand and networked services on the other hand.

Finally, more knowledge is needed regarding the implications of the work presented in this thesis in order to teach future generations of service designers. How can design education prepare designers for their work on type 1 and type 2 service transformation efforts? What theories, strategies, attitudes, skills, and tools do these designers need to master in order to be able to contribute to realising both types of service transformation?

I look forward to exploring these questions further, in order to develop our understanding of service transformation!

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