Motivating Consumers to Repair Through Platform Design

A Strategy to Consumer Electronics Diagnostics

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Master Thesis
Strategic Product Design, TU Delft

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A Strategy to Consumer Electronics Diagnostics

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Abstract

In a predominantly linear economy, premature replacement of consumer electronics accelerates CO_2 emissions, resource scarcity, e-waste, and pollution. Focusing on vacuum cleaners as high-volume small appliances, this project uses consumer behaviour factors as a leverage point to design digital interventions that motivate consumers to repair.

This project, commissioned by Techniek Nederland, operates at the intersection of industry networks and academic research, serving as a bridge between several nationwide initiatives.

The project is guided by the main research question (RQ):

How can a repair platform address consumer needs, integrate stakeholder roles, and improve diagnostics in electronics repair to motivate repair practices?

Five sub-questions further explore category-specific repair challenges, critical consumer behavioural factors, diagnostics journeys, stakeholder dynamics, and intervention prioritisation.

To answer these questions, a mixed-method design approach was employed, combining literature reviews, expert interviews, product analysis, consumer research, and benchmarking of existing platforms. Insights from these activities were translated into a design vision, objectives and criteria. These informed further ideation workshops, concept development, and platform interventions, which were iteratively refined against the evaluation criteria.

The main outcomes of the project are twofold:

- A research-grounded set of design criteria for professional repair platforms, serving as a reference to inform digital interventions in the repair domain.
- A final platform concept spanning two horizons: a near-term Repair Prompt Studio enabling consumers to build diagnostic prompts and use for external AI tools, and a longer-term RepAIr Platform centralising repair data, adapting diagnostic pathways, and integrating solutions.

The design was evaluated through a user testing and consolidated into a strategic roadmap, outlining actionable steps toward the project's overarching vision of creating a cultural shift towards repair willingness.

This thesis connects theoretical insights from consumer behaviour research with tangible digital interventions, providing industry stakeholders with actionable tools to enhance current repair practices.

Keywords

Consumer Behaviour | Consumer Electronics | Repair | Diagnostics Journey | Platform Design

Acknowledgements

This thesis marks the conclusion of my student journey in the Netherlands, spanning both my bachelor's and master's degrees. Over these five years, I have had the privilege to meet inspiring people, work with industry partners, and gather insights that shaped the consolidated outcomes within these pages.

I am especially grateful to my supervisory team. To Ruth, who saw the potential in me for this project first, and whose inspiring attitude and thoughtful guidance shaped my work throughout. To Ruud, for his thought-provoking perspectives and pushing me to be more structured, timely, and deliberate in shaping a clear and convincing narrative. And to Debbie, for welcoming me into her network, connecting me with people in the repair field, and always responding with genuine interest and care.

While this project was led independently, the most valuable breakthroughs came through conversations and collaboration with people rather than screens and algorithms. I am grateful to everyone who participated in interviews and workshops (whether out of curiosity or persuasion) and to those who shared their thoughts even in informal conversations.

To my family, thank you for supporting me from afar in my search for a better life and purpose beyond home, for the calls, and for listening even when the subject matter felt distant. To my friends in the Netherlands and abroad, thank you for staying connected, keeping me motivated, and providing both distraction and perspective when needed. This thesis may carry my name, but it has been shaped by all of you.

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1.
Introduction

Summary

This chapter lays the foundation by focusing on vacuum cleaners as the product category used to guide the research directions of this project.

It begins with an overview of high-level statistics specific to the Netherlands. Following this, a review of vacuum's failure analysis literature is conducted, community repair data is analysed, and consumer behavioural mental categorisation of vacuum cleaners is defined. These steps lead to a synthesis of findings, grouped by key consumer needs within the scope of this project.

The chapter concludes with a summary of takeaways that further refine the project's scope and highlight opportunities for design.

Content

1.1 Problem Statement
1.2 Design Brief
1.3 Research Questions
1.4 Design Process

1.1 Problem Statement

In today's predominantly linear economy, the rapid replacement of consumer electronics significantly contributes to CO_2 emissions, resource scarcity, e-waste, and pollution. Therefore, extending the lifespan of these products is considered one of the core strategies of a circular economy (Cooper, 2020).

At an annual growth rate of 2% in the EU, waste from electrical and electronic equipment (WEEE) has become one of the fastest-growing waste streams, reaching an estimated 12 million tons in 2020 (Interreg Europe, 2022). Although e-waste represents only 2% of the global solid waste, it is responsible for a staggering 70% of the hazardous waste ending up in landfills (Fig. 1.1), due to the presence of up to 60 different elements from the periodic table embedded in complex electronics (World Economic Forum, 2019).

Within this stream, small equipment, such as vacuum cleaners, constitutes the largest global share, accounting for 38% of total e-waste (World Economic Forum, 2019).



Fig. 1.1 The butterfly diagram (Ellen MacArthur Foundation, February 2019)

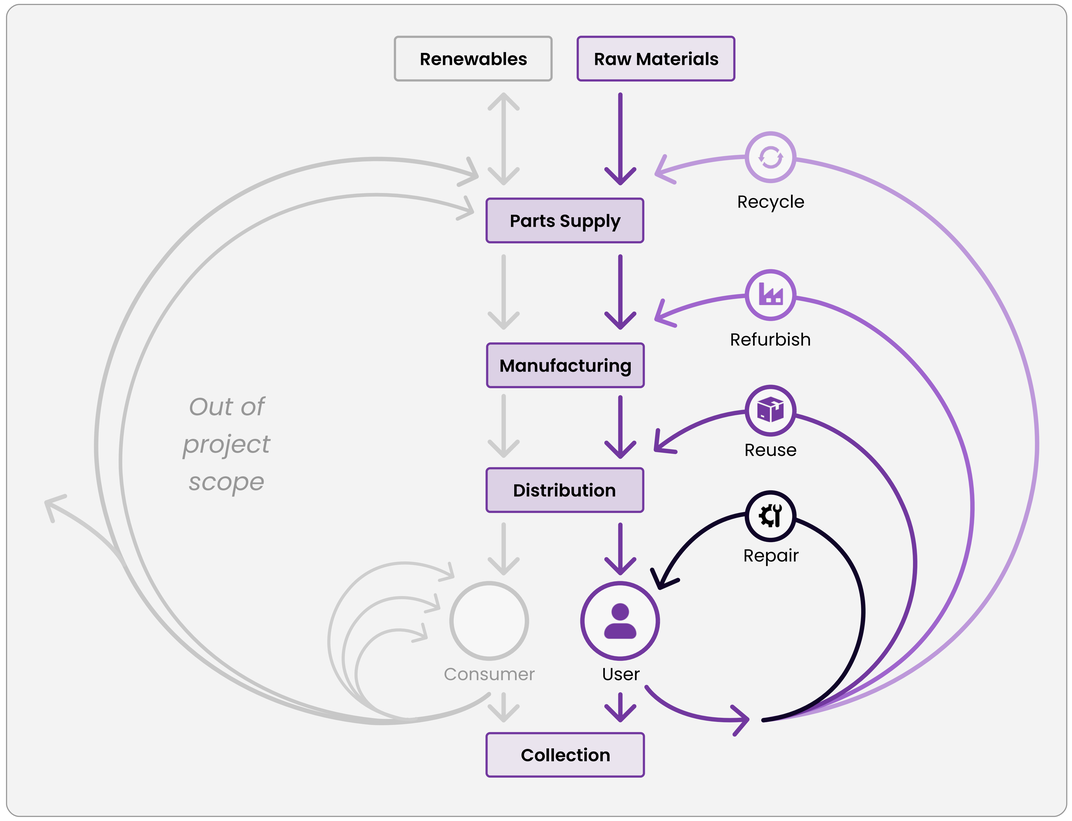


Fig. 1.2 The butterfly diagram (Ellen MacArthur Foundation, February 2019)

While recycling often results in the loss of valuable materials, repair can offer greater environmental benefits, as visualised in the butterfly diagram (Fig. 1.2, Ellen MacArthur Foundation, February 2019). For example, extending the life of a vacuum cleaner for 2 years is estimated to reduce material resource use by up to 25%, assuming no major efficiency losses or material burdens from repair (Rames et al., 2019).

In response, the European Union has introduced tightening regulations, new legislation and regulations addressing three different phases in the life cycle of EEE.

These range from design (e.g. Ecodesign for Sustainable Products Regulation (ESPR) (Regulation (EU) 2024/1781, 2024), use (e.g. Right to Repair Directive (R2RD) (Directive (EU) 2024/1799, 2024)) and end-of-life (e.g. EPR for WEEE and the Circular Economy Action Plan (CEAP) (Document 52020DC0098, 2020). This is complemented by national initiatives including Sweden's repair tax deductions, Austria's Reparaturbonus campaign (BMK, 2025), and France's Bonus Réparation scheme (Ministère de l'Économie et des Finances, 2023). Furthermore, transparency efforts have been reinforced through scoring systems such as the French and Belgian repairability indices (European Environment Agency, 2024), the EU Commission's JRC system, and the development of Digital Product Passports (DPP) (Adisorn et al., 2021).

Despite increasing regulatory support and consumer rights movements, actual engagement with repair services, especially professional repair, is steadily declining. In industrialized economies such as the Netherlands, consumers increasingly replace devices long before they become "beyond repair" (Van den Berge et al., 2020), thus repair decisions largely depend on individual choice, and "physically repairable" does not ensure a consumer will act (Jaeger-Erben et al., 2021).

In fact, repair demand and the number of professional repair shops in Europe, have diminished over recent decades, while product sales reached record highs (Fachbach, 2022). In the Netherlands, the market size of the Consumer Electronics Repair industry has been declining at a CAGR (Compound Annual Growth Rate) of 3.1 % between 2019 and 2024 and is expected to continue declining in the next 5 years (IBISWorld, Inc., 2024) (Fig. 1.3).

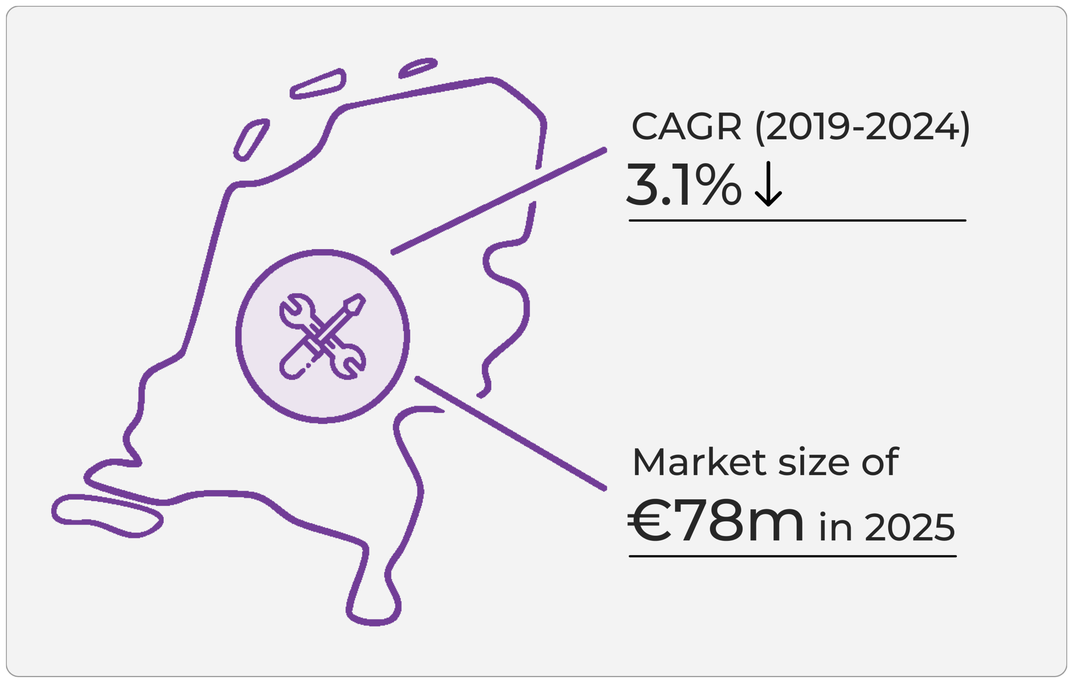


Fig. 1.3 Consumer Electronics Repair Market Statistics in the Netherlands (IBISWorld, Inc., 2024)

Additionally, a UK consumer study found that hiring a professional repair service is often perceived as inconvenient, frustrating, expensive, and untrustworthy (Lefebvre, 2019). These negative perceptions, combined with other internal and external factors, motivators, and triggers, create a complex web of influences on repair behaviour (Svensson-Höglund et al., 2022), which further drive the need for interventions on consumer-facing level.

The Netherlands is the first country in Europe to introduce an official register as response to the new European regulations. Yet, the so called Nationaal Reparateur Register merely provides repair service location of registered repairers by Techniek Nederland (Fig. 1.4), adding little value beyond basic map applications.

Moreover, this platform fails to address the diverse and interconnected consumer factors influencing repair behaviour, reducing its potential for positive impact.

Nationaal Reparateursregister | Techniek Nederland

Fig. 1.4 Nationaal Reparateursregister by Techniek Nederland

1.2 Design Brief

This project develops design interventions for a professional repair service platform, targeting key consumer barriers in electronics diagnostics. Focusing on vacuum cleaners as a research category, it investigates how digital solutions can respond to diverse consumer behavioural factors while mediating stakeholder interests. The project maps ecosystem dynamics, identifies critical intervention points in the diagnostics journey, and translates insights into research-informed platform criteria. Findings inform the development of concept prototypes mapped across a roadmap, aiming to highlight actionable interventions to motivate consumers and drive a cultural shift in repair practices.

1.3 Research Questions

Based on the problem statement and design brief, the following main and sub research questions, have been derived (Fig. 1.5).

RQ.1 What are the category-specific challenges in vacuum cleaners' repair?

RQ.2 What are the critical consumer behavioural factors to address?

Main RQ:

How can a repair platform for **consumer electronics** support the **diagnostics journey,** address **consumer needs,** and consider **stakeholders** to deliver **interventions** that effectively motivate repair?

RQ.3 What is the current consumer diagnostics journey, and which critical stages should a platform address?

RQ.4 How can a repair platform navigate stakeholder roles, dependencies, and tensions?

RQ.5 What platform interventions should be prioritised and why?

Fig. 1.5 Research Questions Schema

1.4 Major project stakeholders

Techniek Nederland

This project has been commissioned by Techniek Nederland, a trade association of installers and consultants in the technology sectors, standing for “a stronger, healthier, safer, more sustainable and happier Netherlands.” As such, Techniek Nederland works in a partnership with around twenty other organisations under the LLE (Lang Leve Electronica) Coalition, including retailers, repairers, manufacturers, government organisations, consumer organisations, NGOs and knowledge institutions, aiming to significantly reduce the environmental impact of electrical and electronic equipment (EEE).

Additionally, this project is closely linked to a recently launched 2025 initiative, named Klantreis Elektronica Reparatie, working towards enhancing the consumer electronics repair journey for in and out-of-warranty products above 100 Euros. Finally, Techniek Nederland is an initiator together with the Ministry of Infrastructure and Water Management in collaboration with Centraal Register Techniek, of a National Repair Register. This register reflects a 2023 proposal of EU Commission that every member state in the European Union to have an online register (platform) by 2027 with which consumers can quickly and easily find qualified repairers (Directive (EU) 2024/1799, 2024). For the Netherlands, this is the Nationaal Reparateursregister, which is where this thesis learnings aim to contribute to.

TU Delft

“Tackling Fixophobia” research project led by the Faculty of Industrial Design Engineering at TU Delft is an NWO KIC-funded initiative launched in September 2024 to drive multi-actor system change through repair system innovations. The phenomenon, referred to as “Fixophobia”, referring to the combination of economic, psychological, and structural barriers discouraging repair, results in premature obsolescence and increasing e-waste. In this sense, this thesis project has the ambition to further excel on learnings closely linked to “Tackling Fixophobia” aiming to boost consumer trust, acceptance, and behaviour towards repair through innovative strategies.

This project acts as a bridge between the two nationwide activities, connecting industry networks and academia research together (Fig. 1.6).

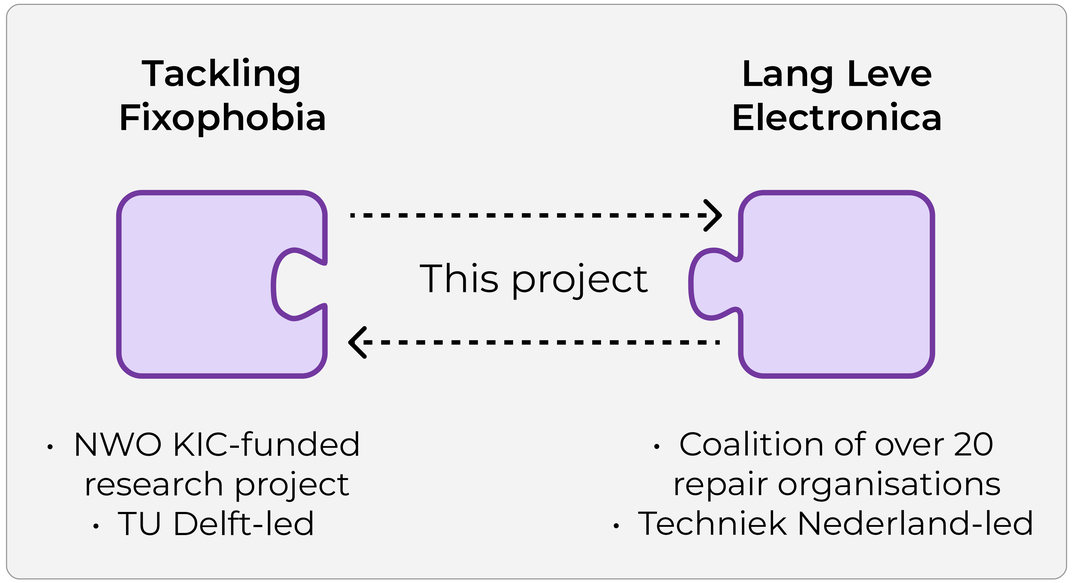


Fig. 1.6 Project Positioning

1.5. Design Process

The activities conducted throughout the project have been aligned with the corresponding research questions they aim to address. Fig. 1.7 presents how the RQs have been reordered and maintained throughout the report structure, with each section clearly stating the research question in focus.

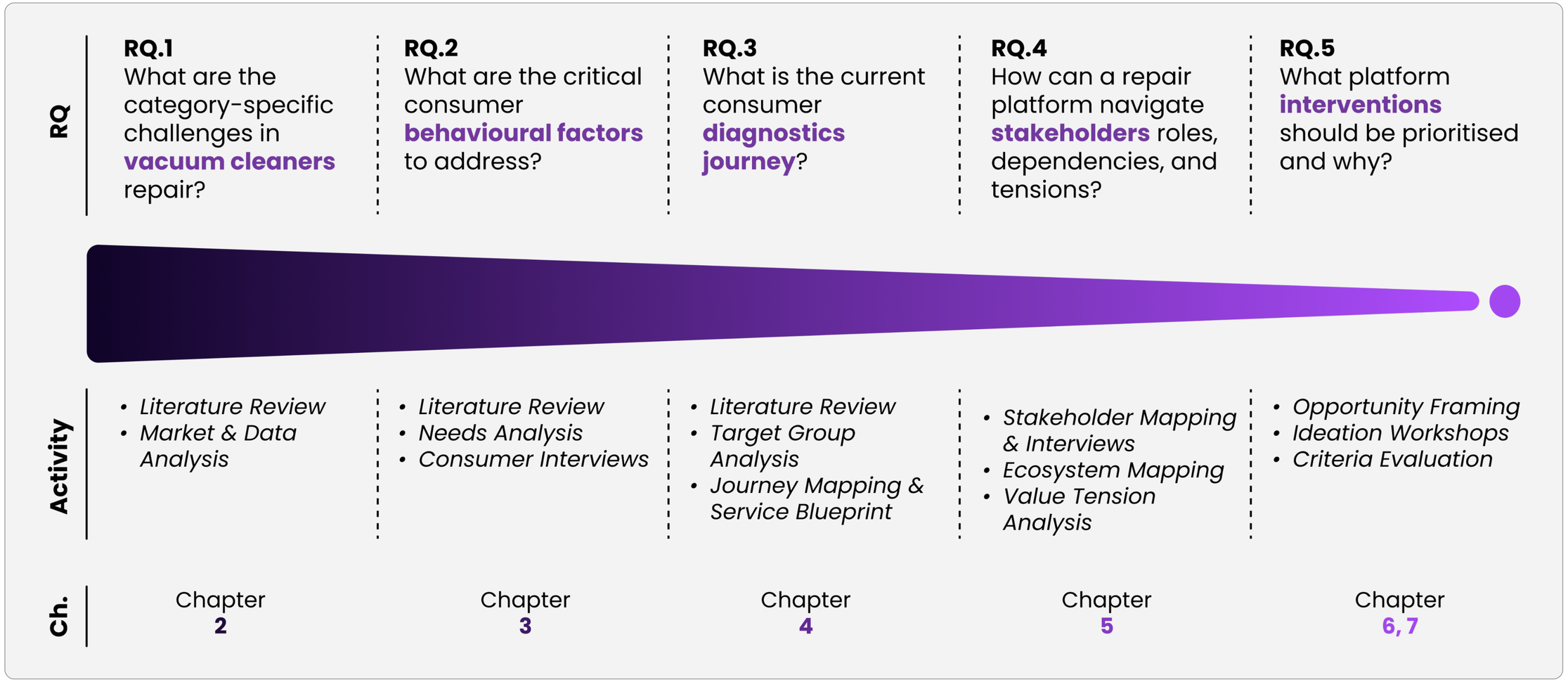


Fig. 1.7 Design Process

2.

Product Analysis of Vacuum Cleaners

Summary

This chapter lays the foundation by focusing on vacuum cleaners as the product category used to guide the research directions of this project, addressing RQ1.

It begins with an overview of high-level statistics specific to the Netherlands. Following this, a review of vacuum's failure analysis literature is conducted, community repair data is analysed, and consumer behavioural mental categorisation of vacuum cleaners is defined. These steps lead to a synthesis of findings, grouped by key consumer needs toward vacuum cleaners.

> ***RQ.1:*** *What are the category-specific challenges in vacuum cleaners' repair?*

Content

2.1 Introduction to Vacuum Cleaners
2.2 Repair Challenges of Vacuum Cleaners
2.3 Implications to Platform Design

2.1. Introduction to Vacuum Cleaners

Vacuum cleaners are selected as a case study to ground this platform in a specific product context and test its relevance for professional repair services. As widely owned household electronic appliances, they exhibit frequent usage, a moderate to long lifespan, and common repair challenges, making them an ideal product category to assess platform interventions.

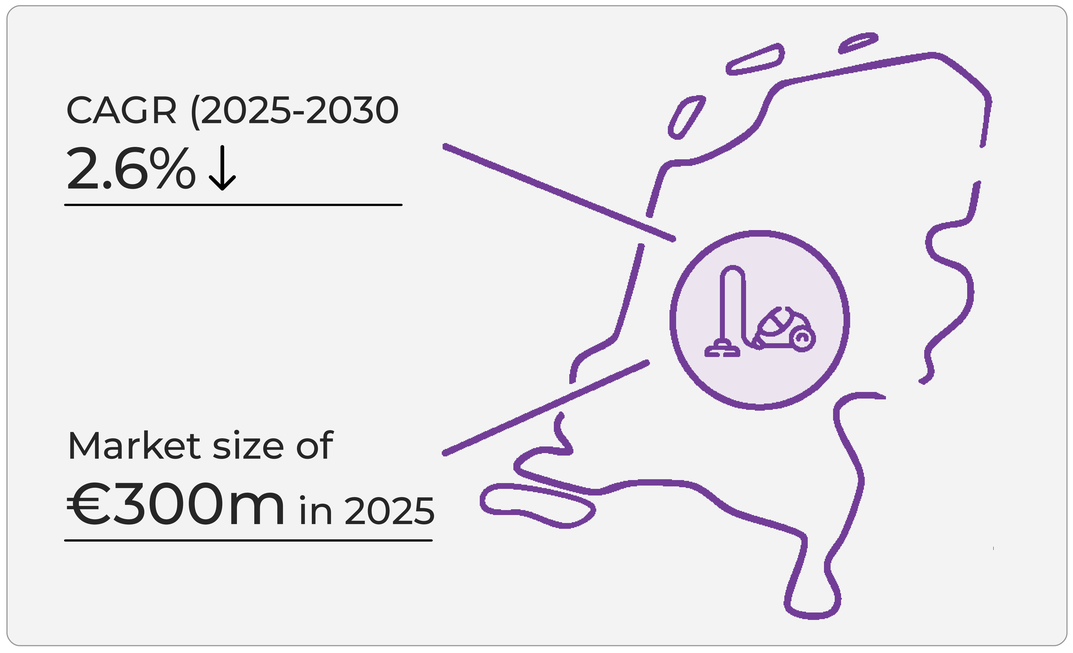


Fig. 2.1 Vacuum Cleaners Market Statistics in the Netherlands (Statista, 2025).

Hertzum (2024) describes household appliances as mirrors of everyday sustainability practices. Vacuum cleaners are no exception, they are ubiquitous, used regularly, and hold strong potential for extended use when properly maintained or repaired. In the Dutch market, vacuum cleaners are among the most purchased appliances (Fig. 2.1), with over €300 million market value in 2025 and a projected annual growth rate of 2.6% (CAGR 2025-2030) (Statista, 2025), confirming their economic and environmental significance.

The aim of this project is not to build a vacuum cleaner-specific platform, but to explore platform applicability for one representative product type that exemplifies routine, mid-cost, repairable consumer electronics falling under small appliances category.

2.1.1 Product Warranty

The terrain of legal guarantees and extended warranties is often complex to navigate and misunderstood by consumers (Svensson-Hoglund et al., 2021). A full flowchart of warranty scenarios in electronics repair in the Netherlands is available in Appendix A. Van den Berge et al. (2023) highlight that product age, repair costs, and trust in manufacturer intentions become more significant in the repair-versus-replacement decision beyond the warranty period.

In the Netherlands, warranty duration is a subjective even outside legal warranty, as it is linked to expected product lifespan by consumer with a so-called statutory guarantee (conformity) (RVO, 2025), however, this subjective interpretation often leads to disputes, as manufacturers and retailers may have differing views on what constitutes a "reasonable" lifespan.

The project chooses to focus on out-of-warranty scenarios, where the decision to repair or replace is highly driven by consumer choice rather than a legal case.

| Out-of-warranty
| Statuary / Legal
| Commercial / Retailer
| Extended

Project Scope

2.2. Repair Challenges of Vacuum Cleaners

2.2.1 Failure-Cause Analysis

Household vacuum cleaners are generally classified into multiple categories, upright, cylinder, cordless, robotic, and handheld, each with distinct designs and common failure patterns. According to Rames et al. (2019), common issues in upright vacuums, such as suction deterioration, blocked filters, and belt breakage, dominate reported failures (n=350). Belt replacements are a frequent maintenance item specific to these models. Cylinder vacuums share many high-frequency problems but also report higher frequency of faults, including broken accessories and brush malfunctions, alongside blocked filters (n=287).

The challenge lies in the overlapping nature of these failures. For instance, overheating can result from a broken motor or blocked filters (Fig. 2.2). Many issues are interconnected, with suction deterioration emerging as a central symptom tied to multiple root causes.

> The interconnected nature of failures requires a platform to prevent misidentification of issue or exaggeration of problem causes.
>
> **Takeaway**

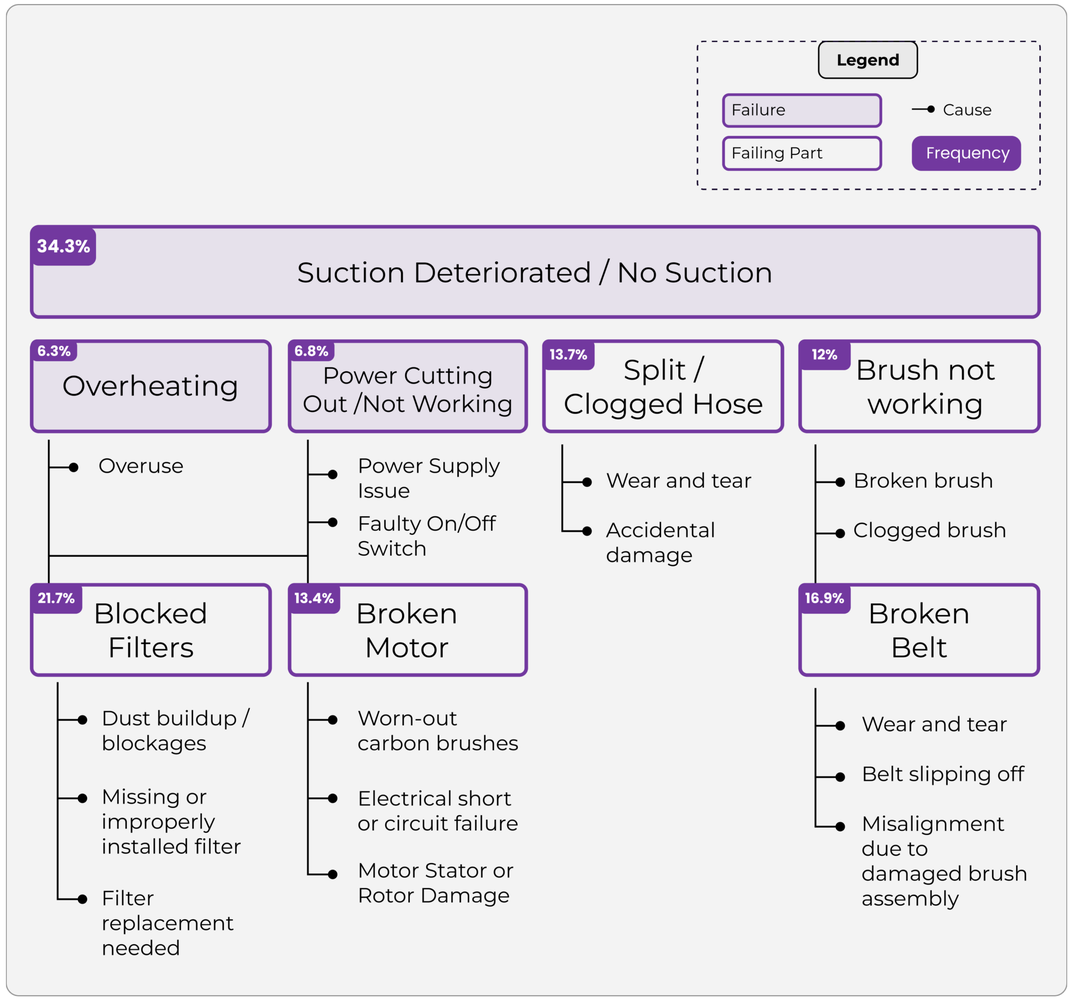


Fig. 2.2 Frequency-Based Failure Analysis of Upright Vacuum Cleaners (Data from Rames et al., 2019)

2.2.2 Spare Parts

The cost of spare parts adds to this complexity since a simply straightforward symptom could stem from multiple potential failure parts, each varying significantly in replacement costs. For instance, a power-cutting issue might necessitate a new motor, averaging €55. However, a thorough diagnosis could reveal simpler fixes, such as replacing carbon brushes, which cost an average of just €12.

Similarly, a vacuum not recharging might initially suggest a battery issue but could also result from a broken cable. Batteries range in price from €17 to €120, whereas a new cable typically costs around €31, making the latter repair significantly cheaper and, therefore, more likely to be considered (Fig. 2.3). Van der Velden (2021) discovered that in 20% of cases, the repair is not made because a spare part is considered too expensive.

Authorised repairers, obligated by manufacturers to use branded parts, often impose financial barriers to repair due to higher costs. In contrast, aftermarket parts can significantly reduce repair expenses. This disparity makes some professional repairs economically unviable, as motor and battery replacements can account for 92% and 72% of the purchase price of an upright vacuum cleaner, respectively (Bracquene et al., 2019).

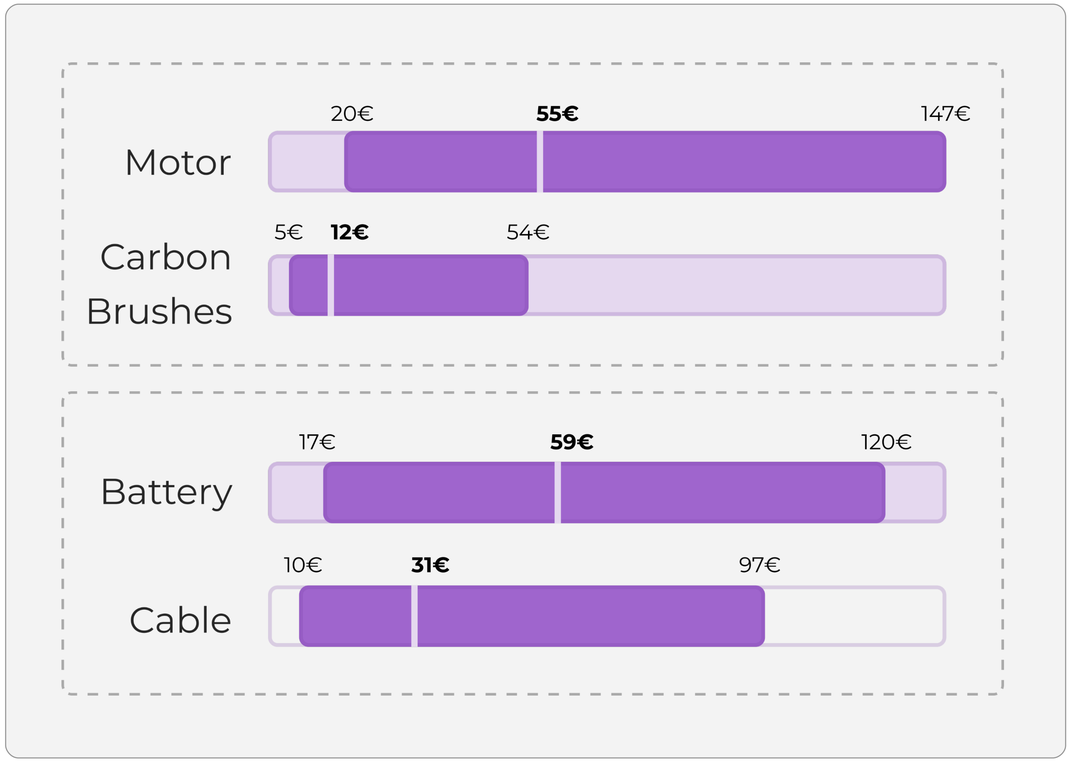


Fig. 2.3 Frequency-Based Failure Analysis of Upright Vacuum Cleaners (Data from Rames et al., 2019)

A platform should therefore prevent premature failure conclusions, and highlight how different parts or repair types impact the viability of repair.

Takeaway

2.2.3 Data from Community Initiatives

In 16% of Repair Café cases, the failure cause remained undefined, and the most common repairs were relatively simple, ranging from filter changes, blockages, and power cord repairs (Repair Café, 2023). Those small performance issues in vacuum cleaners are often being linked to maintenance neglect. In a UK study, only 5% of respondents shared to clean their filters regularly, and 13% didn't know whether their vacuum even had such (Salvia et al., 2015). However, product care and maintenance falls outside the scope of this project.

Out of 5430 vacuums which were recorded for repair through Repair Monitor in the Netherlands, 1998 (36.8%) were not repaired or only partially repaired (Fig. 2.4). This suggests that a significant portion of vacuums do not complete the repair process, indicating potential inefficiencies or barriers in the repair ecosystem. Only 771 (38.6%) of the 1998 cases had a recorded reason for not being repaired. This reveals a large gap in documenting why repairs fail or remain incomplete, which could hinder the ability to identify trends or address systemic issues effectively. Among the 771 documented cases, 278 (36%) had reasons that indicate potential professional intervention. These reasons include factors such as time-consuming repairs, lack of tools or spare parts, no access to repair instructions, or challenges too complex for community-based solutions. For 61% of the 778 cases (471 cases), the reasons for non-repair were related to fundamental barriers such as unrepairable conditions, prohibitively expensive parts, or components that are no longer available on the market. These systemic challenges in repair feasibility may not be fully addressable by professional repair services alone, and some require broader legislation adaptations which are out of this project scope. 80% of the vacuums which were submitted for repair, were from the last 15 years, with majority, of 32% being 5-10 years old, presenting a strong demand for out of warranty repairs, yet still in a useful product age.

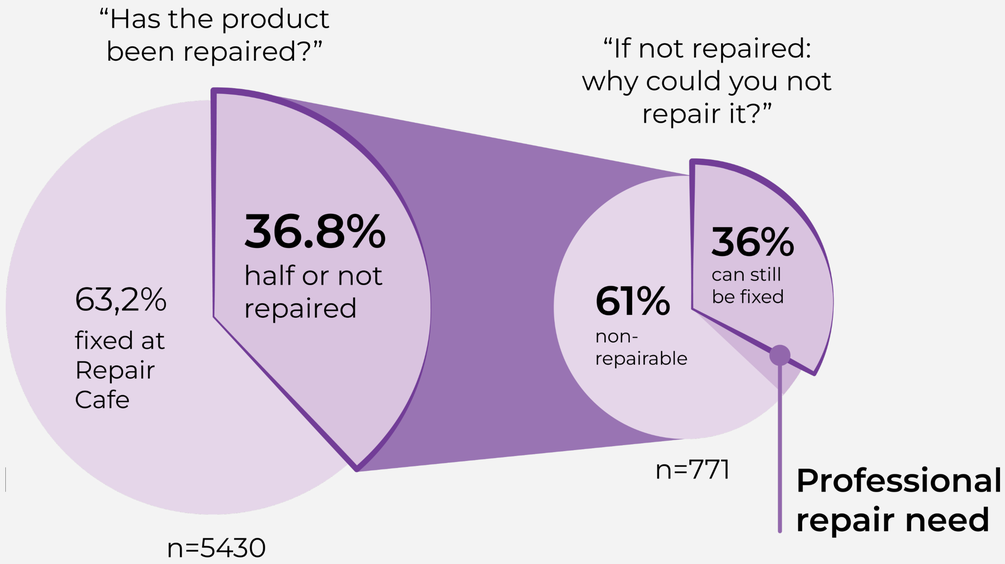


Fig. 2.4 Vacuum Repair Statistics from Repair Cafes in the Netherlands (Repair Café, 2025)

An opportunity for platform lies in developing a classification model to guide users toward the most appropriate repair pathway (self, professional, community), based on the nature and feasibility of the issue.

Takeaway

In a micro-tasking initiative, DustUp, The Restart Project (an Open Repair Alliance partner) analysed over 3,000 vacuum cleaner repair attempts, categorising issues by fault type (Open Repair Alliance, 2024). Their findings identified cords, batteries, and motors as the top three most frequently reported problems.

Cords exhibited an 81% repair success rate in community contexts, but batteries and motors demonstrated significantly lower fixed rates (27% and 37%, respectively) despite still having a moderate repairability potential (38% and 21%). However, batteries and motors are also often reasons for a vacuum cleaner being considered beyond repair, with end-of-life rates of 33% and 40%, respectively (Fig. 2.5). Battery-powered models have become increasingly common, which introduces early obsolescence due to battery degradation and a tendency to replace the product rather than the battery (Magnier & Mugge, 2022).

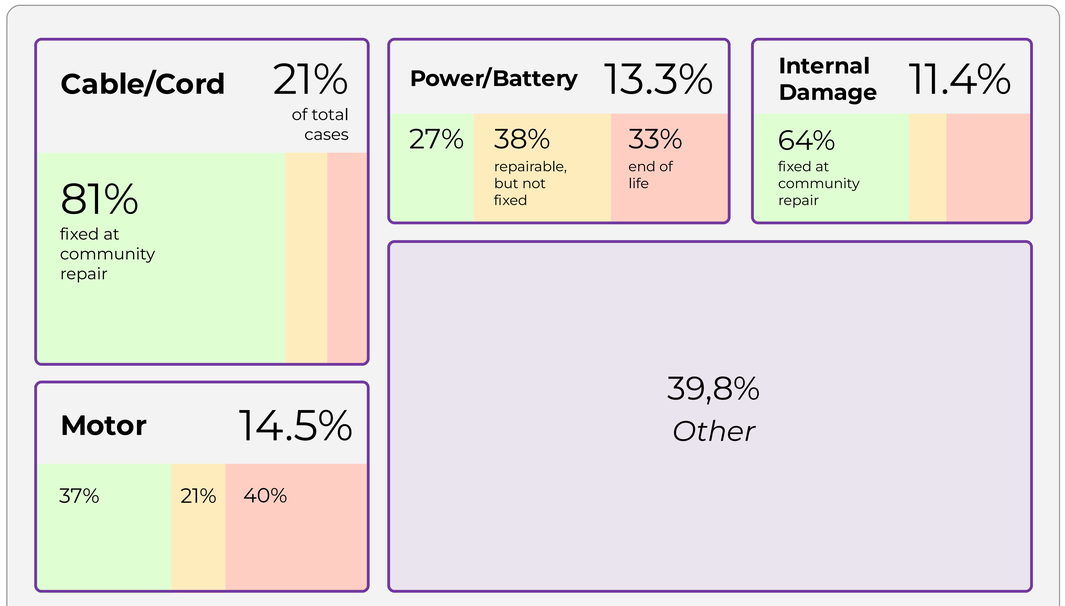


Fig. 2.5 Community Repair Attempts by Frequency and Outcome (Open Repair Alliance, 2024)

While motors and batteries offer significant potential for intervention through professional repair platforms, their thin margin between repairable and end-of-life status underscores the importance of precise, context-dependent diagnostics.

Takeaway

Together community repair data bases as Open Repair Alliance (Open Repair Alliance, 2024), Repair Monitor (Repair Café, 2025), and Restarters (Resarters, 2025) hold a total of over 15,000 logged cases of vacuum cleaners' repairs to date.

Drawing learnings from community repairs' huge datasets presents an opportunity for solutions to use existing data sources for informing repair pathways.

Takeaway

The platform focuses on battery and motor repairs as professional repair scenarios to explore potential intervention opportunities. Considering that some vacuum cleaners, such as cordless models, feature both, while others, like corded, rely solely on a motor.

Motor | Battery

Project Scope

2.2.4 Vacuums Mental Categorisation

According to Cox et al. (2013) categorisation of electronics, vacuum cleaners fall under "workhorse" products, valued for their service utility and typically used until performance degrades (Fig. 2.6). Yet even within these categories, consumer perspectives can shift based on individual priorities. For example, a household that relies heavily on a vacuum cleaner for daily cleaning might treat it as a "workhorse," while another might view the same product as an "investment" due to its importance in maintaining a specific lifestyle or its role as a durable household asset. Moreover, despite being hidden from view at home and not embedded in social norms like smartphones, vacuum cleaners are still subject to novelty-driven replacement. In Salvia et al.'s (2015) UK-based study, 16% of respondents replaced their working vacuum cleaner simply because they wanted a new one. Emotional attachment or brand endorsement further blur these boundaries.

	Workhorse	**Up-to-date**	**Investment**
Traits	Durable, service-oriented, and typically long-lifespan.	Updated for aesthetics or the latest technology trends.	Perceived as 'special' or of high quality, with emotional durability.
E.g.			

Fig. 2.6 Electronics Categorisation (Adapted from Cox et. al, 2013)

Vacuum cleaners fall into varied consumer mental categories, requiring a platform to adopt a context- and person-specific approach to address differing priorities and motivations.

Takeaway

2.2.5. Consumers Needs towards Vacuums

Table 2.1 summarises repair issues for vacuum cleaners, linking them to consumer needs in professional repair. A detailed derivation and discussion of these consumer needs is provided in the following Chapter 3.

Table 2.1 Vacuum Cleaner Specific Issues by Consumer Needs

Needs	Vacuums' Repair Issues
Cost & Viability	• Less commonly repaired electronic at repair shops, than smartphones or laptops. • Repair costs often approach or exceed the price of new budget models. • Labour-intensive repairs such as motor replacements might not justify the cost and effort.
Time & Duration	• Highly varied repair times from 5-7 days (Vorwerk, BEAM Stofzuigers) to 2-3 weeks (Dyson, Coolblue)
Mental Valuation & Feasibility	• Vacuum cleaners' design often contributes to a perception of low repairability (Van Den Berge et al., 2021) • Older model score higher repairability due to increased information provision and accessibility of priority parts (Bracquene et al., 2019). • Unawareness of common vacuum cleaner issues, for example in a UK study, only 5% of consumers regularly cleaned filters, while 13% didn't know their vacuum had one (Salvia et al., 2015). • EU directive for at least 10 years for the availability of spare parts, particularly excludes the vacuum cleaner motor (Right to Repair, 2024). • Price of the motor and battery represent 92% and 72% respectively of the total purchase price (Bracquene et al., 2019) of an upright VC.

2.3. Implications to Platform Design

This chapter synthesises key takeaways from the vacuum cleaner case study to identify critical criteria that inform platform design. Together, the insights point to three core platform design criteria (Fig. 2.7)



Figure 2.7 Criteria from Chapter 2

The following reflection revisits the sub-research question at the centre of this chapter, considering it in light of the findings.

> ***RQ.1:*** *What are the category-specific challenges in vacuum cleaners' repair?*

The exploration in this chapter highlighted how vacuum cleaner repair is constrained by a convergence of technical, economic, and behavioural factors. High-cost critical components, particularly motors and batteries, dominate failure patterns while showing low community repair success rates (37% and 27% respectively). In professional contexts, their repair viability is further reduced by OEM part pricing, labour costs, and limited parts availability, with motors notably excluded from the EU spare parts directive (Halte à l'Obsolescence Programmée (HOP) & iFixit, 2024).

Failures are often interconnected, making accurate diagnosis difficult and contributing to high non-completion rates (36.8% in Repair Monitor data), much of which remains undocumented. While certain components, such as cords, show high repairability (81%), the parts most aligned with professional intervention are also those with the greatest barriers.

Consumers often undervalue maintenance (only 5% clean filters regularly) and may misinterpret symptoms, leading to premature replacement decisions. Their mental categorisation varies: for some, they are utilitarian necessities; for others, replaceable consumer goods subject to novelty-driven upgrades. This diversity in consumer valuation means that identical failure scenarios may trigger different decisions depending on perceived product importance, convenience, or emotional attachment.

In sum, any intervention for category-specific challenges of vacuum cleaners must therefore address both structural repair ecosystem gaps (parts supply, economic viability) and behavioural drivers (consumer knowledge, value perception, and repair willingness) to meaningfully improve repair outcomes in this category (Fig. 2.8).

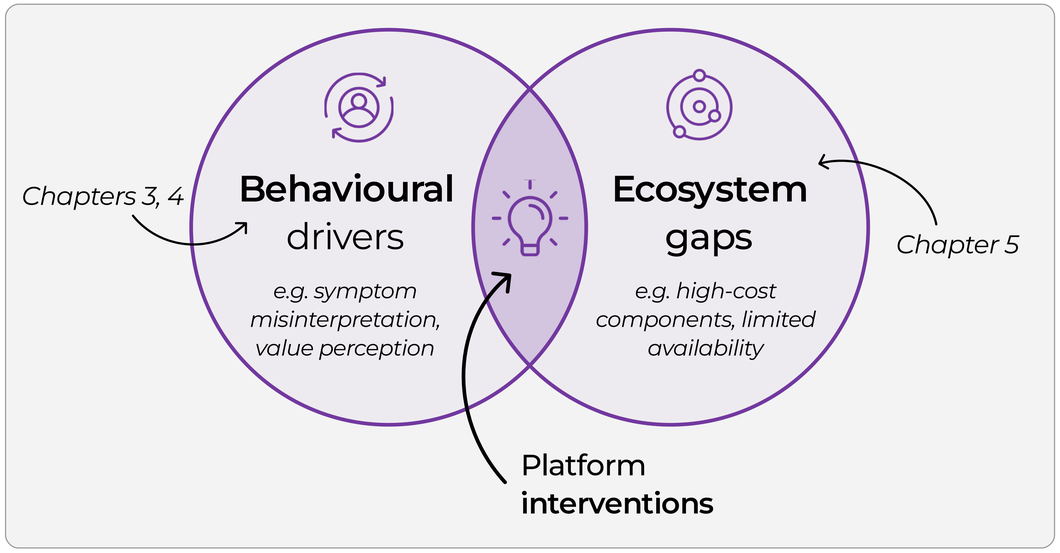


Figure 2.8 Synthesis of the Path Towards Platform Intervention

3.

Behavioural Factors and Consumer Needs in Repair

Summary

This chapter complements consumer research with insights from stakeholder perspectives, aiming to answer RQ.2. It begins by developing a stakeholder map to contextualise the repair environment in the Netherlands, particularly in relation to the project's platform. Based on this framework, stakeholder participants were recruited and interviewed using a semi-structured approach. The findings from these interviews were synthesised into an ecosystem map, highlighting value tensions in repair. As part of project's scope, the chapter further deep dives into the professional repair sector, identifying repairer needs from literature.

RQ.2: *What are the critical consumer behavioural factors to address?*

Content

3.1 From Predispositions to Barriers in Repair
3.2 Consumer Needs
3.3 Implications to Platform Design

3.1. From Predispositions to Barriers in Repair

Efforts to extend the lifespan of electronic devices are often driven by technocratic approaches, which focus on technical solutions and expert-driven strategies rather than user-centred or social perspectives (Jaeger-Erben et al., 2020). Strategies like Design for Disassembly (DfD), or tools such as repair manuals, FAQ pages, tutorial videos, and community platforms like iFixit, assume that consumers will take initiative to disassemble, diagnose, and repair their products. While technically sound, such solutions overlook the significant role of social and psychological dynamics that shape real-world repair behaviour (Makov & Fitzpatrick, 2021).

Consumers differ not only in their technical competencies, but also in their attitudes, motivations, and perceived barriers. Without recognising this diversity, repair offerings remain fragmented and ineffective in activating large-scale behavioural change (Bayraktaroğlu et al., 2024). In this project, consumer repair behaviour is understood as the outcome of a layered and interdependent process shaped by both internal and external socio-cultural factors, which were assessed through criteria and clustered into few key consumer needs (Fig. 3.1).

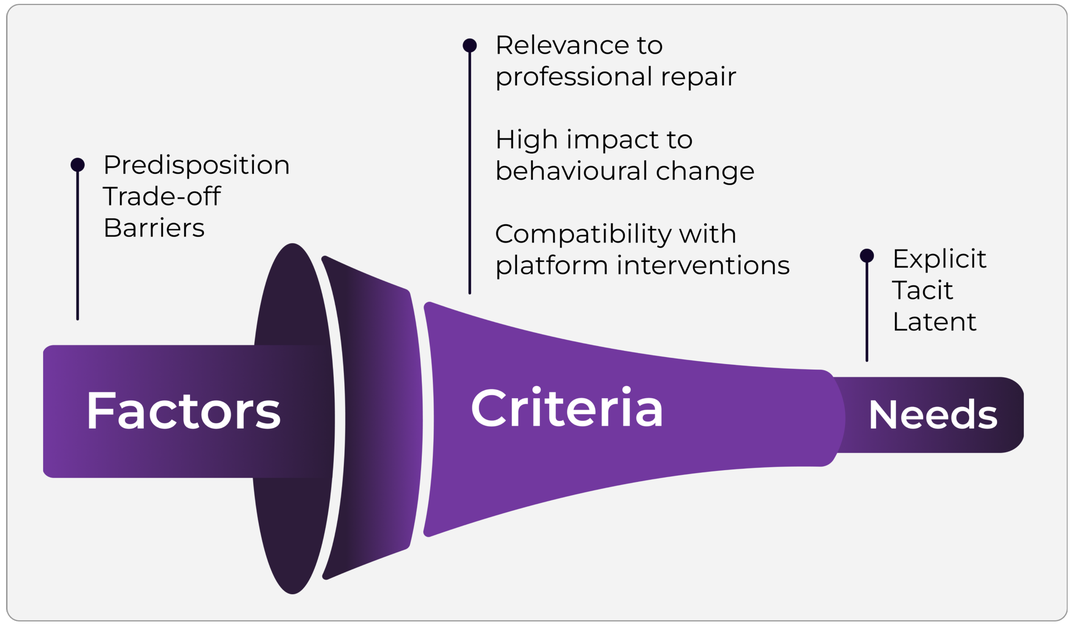


Fig. 3.1 Process of needs derivation in chapter

3.1.1 Predisposition factors

Predisposition is understood as the outcome of a layered and interdependent process shaped by both internal and external socio-cultural factors (Laitala et al., 2021).

In this project, the exploration of socio-cultural factors at the predisposition stage is guided by an adapted model from Svensson-Hoglund et al. (2022) and the well-established Theory of Planned Behaviour by Ajzen (1993).

This combined framework does not seek to contradict or replace either model. Instead, it leverages the Theory of Planned Behaviour (TPB) to zoom in on individual-level processes, while Svensson-Hoglund's model provides a holistic perspective that includes external influences split by their tangibility, and illustrating the complex peripheral interplay shaping an individual's intention to repair (Fig. 3.2).

The predisposition stage of the repair process is arguably the most challenging to influence, as it stems from a lifetime of accumulated experiences that shape the consumer's mental model and fundamentally determine their willingness to engage with repair at every stage of the forthcoming repair journey.

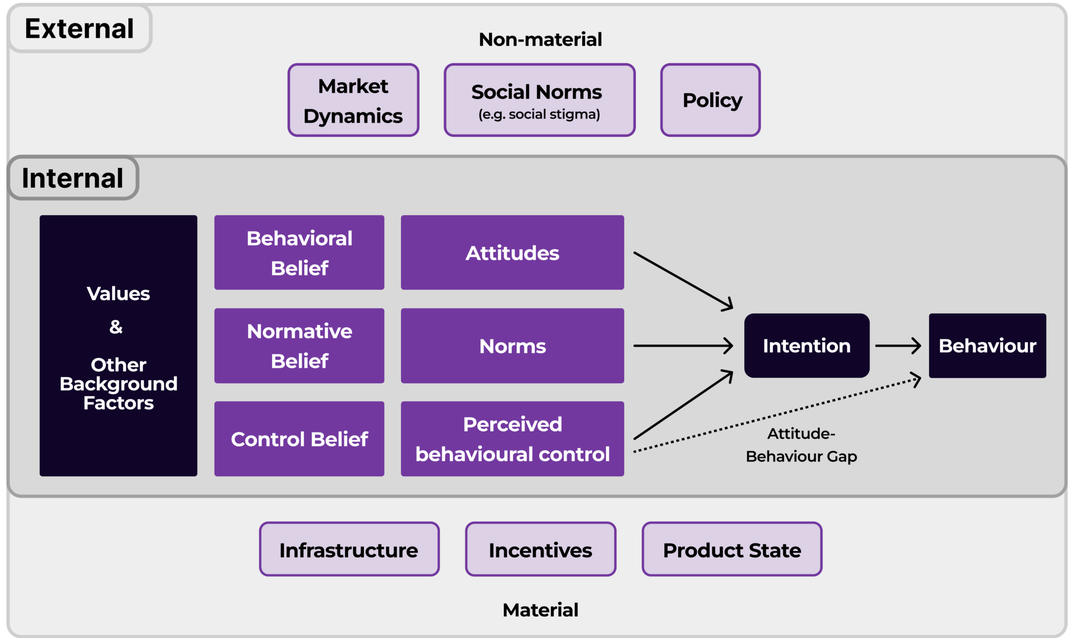


Fig. 3.2 An Adapted Model of Internal and External Factor (adapted from Svensson-Hoglund et al., 2022, and Ajzen, 1991)

Internal Factors

Values form the foundation of the internal decision-making process influence all other following constructs in the Theory of Planned Behaviour (TPB) (Fig. 3.2). According to Sheth et al. (1991), product values are categorised in Table 3.1, whereby other literature also often adds an economic value on top of those (McCollough, 2010).

However, during ownership, these values often fade or shift. For example, when a product malfunctions, its functional value may diminish. Yet, emotional attachment or social value might still influence the willingness to repair (Magnier & Mugge, 2022). To sustain or revive product value, literature proposes multiple design strategies, which have been linked to the values they address in Table 3.1.

Table 3.1 Product Values, Design Strategies and Applicability to Project

Values	Example to Vacuums	Design Strategies	Project Applicability
Functional	Cleans the house effectively.	Upgradability, Modularity, Predictive Maintenance	Align with the platform's objectives to facilitate informed and transparent feasibility and cost valuation.
Epistemic	Novelty or curiosity.	Gamification, Upgradability, Storytelling, Experiential Learning	
Economic	Repair vs. replace worthiness.	Design for standardization and compatibility	
Conditional	Situational needs.	Design for durability and adaptability, Customisation	Supports the platform's multi-tiered approach.
Social	Seen using it by others.	Product care and aesthetics, Social comparison	Excluded due to their latent and subjective nature, which falls outside the platform's primary focus.
Emotional	A sentimental gift by a close one.	Emotional durability, Slow design, Storytelling, Customisation	

Other values tied to the user's identity and environmental concern include frugality (i.e. minimising expenses and avoiding waste) and stewardship (i.e. responsible management of resources). However, sustainable practices as stated by Rabiu & Jaeger-Erben (2022) result when "the relevant situational context and the required practice elements in terms of objects, skills, and meanings co-occur and do not contradict the existing socially accepted ways of doing and saying."

Project Scope

Since high environmental values already suggest a stronger willingness to repair, the platform assumes users to have low environmental concern, and focuses on other factors, highlighting room for exploring more intervention opportunities.

Low environmental concern

↳ Higher interventions need ↑

Alongside values, other background factors, as capabilities, previous experiences and repair habits, are also foundational in the Theory of Planned Behaviour (TPB). Dávila et al. (2021) argue that internal factors like these often play a stronger role in repair decisions than external contextual factors. Well-established repair habits can reduce the need for repair by encouraging better product maintenance, supported by design strategies outlined in the literature to foster product care (Ackermann et al., 2021).

The platform should adapt to users' varying capabilities and experiences by offering tailored pathways aligned with their level of knowledge. Yet, maintenance strategies are not in scope for a diagnostics platform.

Takeaway

Perceived behavioural control (PBC), social norms, and attitudes are other core constructs shaping repair intentions. Attitudes stem from beliefs about repair outcomes (e.g., saving money or reducing waste), social norms reflect beliefs about what is acceptable to others, and PBC arises from beliefs about the ease or feasibility of repair.

This complex interplay of internal factors becomes evident in the widely recognised intention-behaviour gap, where positive repair intentions fail to translate into action. For example, in a UK government-funded study, while only 14% of participants would not consider repair if suction was lost and 11% if the vacuum did not switch on, just 18% had ever repaired their current vacuum cleaner (Harmer et al., 2019) (Fig. 3.3). According to another Eurobarometer survey, 77% of EU consumers share to prefer repairing over replacing products (APPLiA Nederland, 2023), yet repair is still not a common societal practice. This discrepancy highlights the challenge of translating pro-repair intentions into actual actions (Hertzum, 2024).

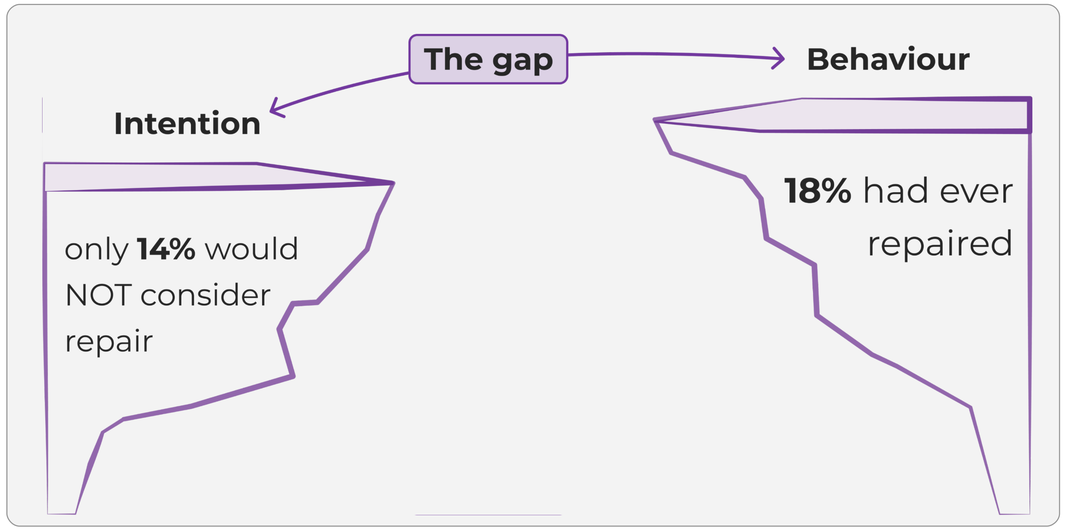


Fig. 3.3 Intention-Behaviour Gap (data from Hertzum, 2024)

Closing the intention–behaviour gap is key to achieving the platform's societal objective to enable a cultural shift toward repair. Yet, this demands triggers that reshape perceptions and support decision-making at key repair points.

Takeaway

External Factors

External factors, as noted in Fig. 3.4, are further split into material and non-material factors.

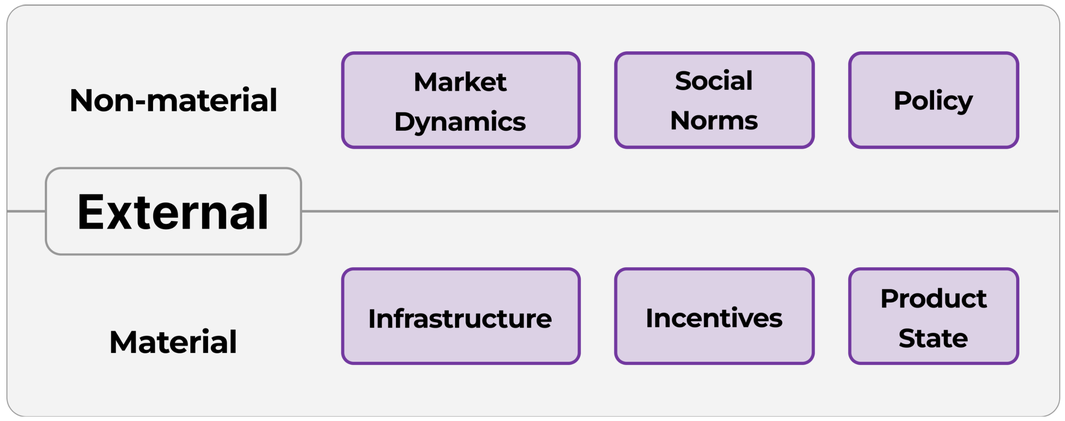


Fig. 3.4 External Factors

Non-material factors include social norms, reflecting societal attitudes and expectations over repair. Social contexts have been reported to prioritise novelty over longevity, with limited encouragement to repair due to factors such as social pressure and a lack of support (Jaeger-Erben, 2021; Lefebvre et al., 2019). This pressure leads individuals to discard broken devices in favour of acquiring the latest models, often associating repair with poverty (Terzioğlu, 2020; Wieser & Tröger, 2018; McLaren & McLauchlan, 2015). Furthermore, market dynamics (e.g. marketing of new products) and policy factors (e.g. directive reinforcement), further shape repair behaviours and consumer choices.

Social norms on both internal and external level have been further derived as key consumer need cluster in this project:

> Social Perceptions & Trends

Takeaway

Material conditions, including how users perceive product 'brokenness', the existing repair infrastructure and incentives, significantly influence repair decisions. While the interpretation of 'brokenness' varies by user (Jaeger-Erben, 2021) and perceived value diminishes over time, even when functionality remains intact (Magnier & Mugge, 2022). Other studies, such as Luyk-de Visser (2008), further explore this through the concept of User Perceived Failure Severity (UPFS), which reflects the severity of failure as judged by the user and the subsequent decision to repair or discard the product.

Project Scope

Understanding the consumer’s mental valuation on severity and loss of value is key to designing interventions. Market and policy dynamics are, however, beyond the scope of this project.

3.1.2 Trade-off at Product Breakage

When a product breaks, consumers are faced with a decision-making moment, involving a trade-off between repair and replacement, with various factors influencing the final choice (Van den Berge et al., 2021). The relative value of the existing product is weighed against the perceived value of a new one, influenced largely by factors from the predisposition section (Fig. 3.5). If the consumer perceives the mental book value of owned product (an internalised sense of the product’s remaining worth based on use, age, or condition) as still high enough, they are more likely to lean toward repair.

This moment is referred to in this project as a " repair incline" since it involves multiple decision-making milestones before a consumer commits to repair. If, however, the consumer perceives the expected value of a new product as greater, they opt for replacement, effectively exiting the repair pathway.

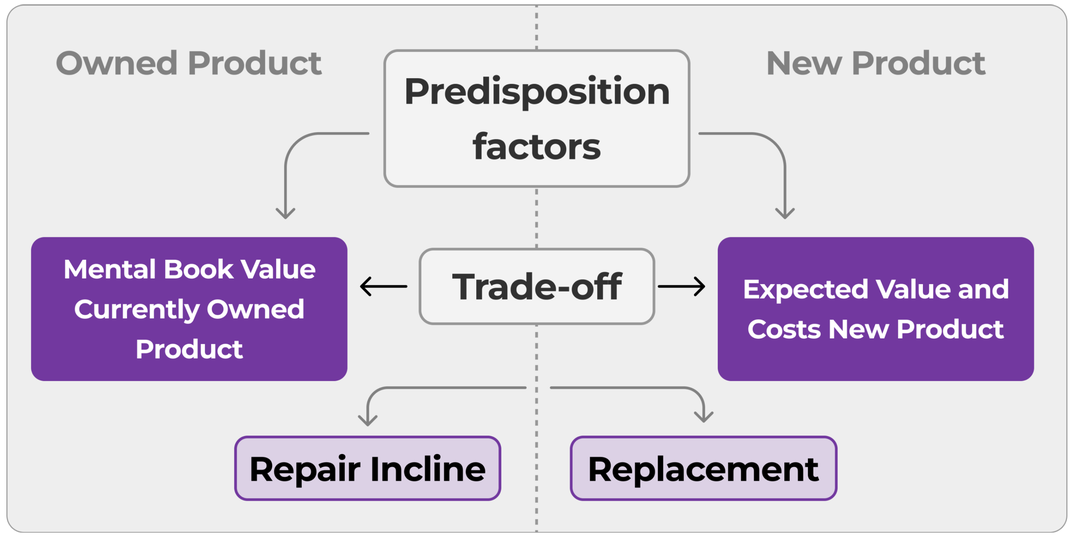


Fig. 3.5 Trade-off between new and owned product (Adapted from Van Den Berge, 2024)

Magnier & Mugge (2022) define three main categories driving product replacement, being product-related (i.e. functional-failure, novelty seeking, “brokenness” interpretation), consumer-related (i.e. internal predisposition factors), business-related (i.e. low replacement prices and purchase opportunities).

As a consumer-oriented project, the focus lies on product- and consumer-related replacement reasons. Business-related reasons lie beyond the platform’s direct sphere of influence, as they are largely shaped by manufacturers and policy decisions.

Takeaway

Obsolescence is another key factor in the replacement decision. Various types of obsolescence influence how consumers perceive their products and whether they choose repair or replacement (Fig. 3.6). Den Hollander et al. (2017) argued that all types of obsolescence are eventually subjective, because reasons for obsolescence only exist in the consumer’s mind. A table consolidating all five obsolescence types against replacement categories is in Appendix B.

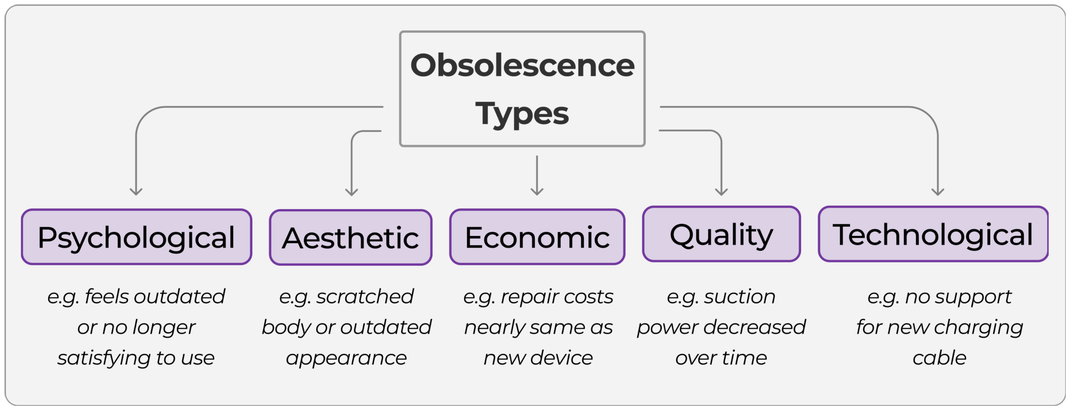


Fig. 3.6 Obsolescence Types and Examples

Project Scope

This project focuses on addressing explicit rather than implicit consumer knowledge, prioritising actionable interventions that directly guide consumers in their decision-making. Therefore, obsolescence is considered as an underlying influence but not explored in depth.

Focus on explicit needs

3.1.3 Barriers Towards Repair

This chapter focuses on barriers to repair, building on earlier discussions of ability as part of internal predisposition factors. In this context, Fogg's Behaviour Model (2009) provides a valuable framework to understand how behaviour emerges from the interplay between Motivation, Ability, and Prompts (Triggers) (Fig. 3.7), whereby the platform aims to serve as a trigger-rich environment.

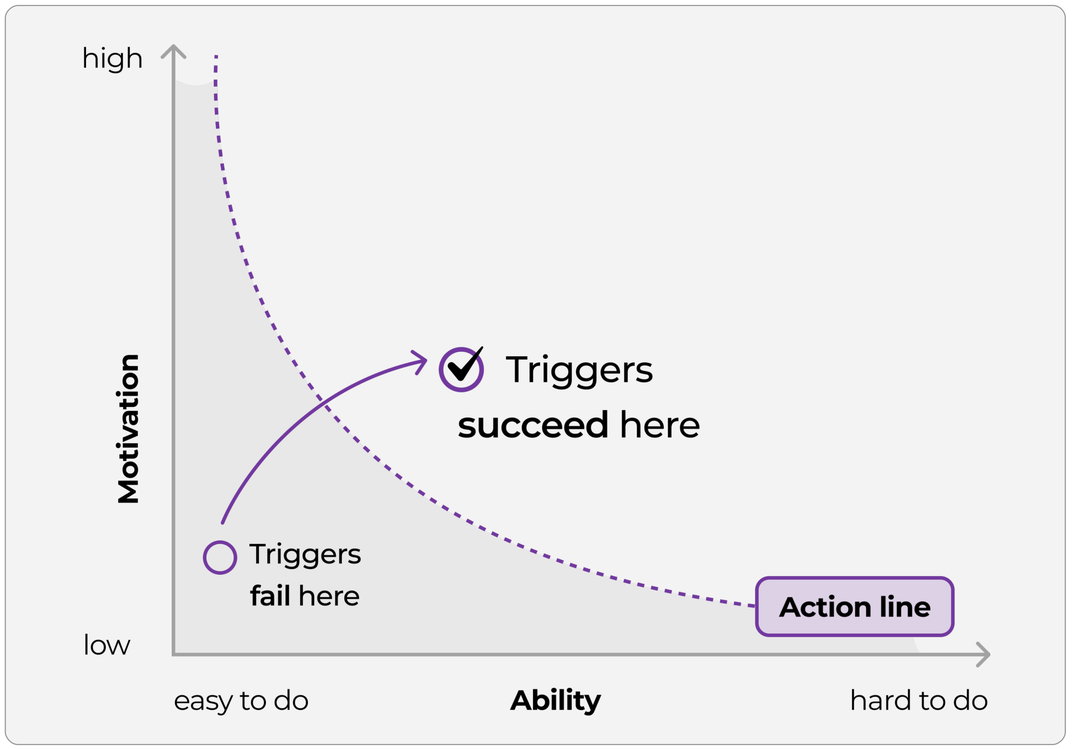


Fig. 3.7 Fogg's Behaviour Model (2009)

Motivations and barriers are often viewed as two sides of the same coin, with one potentially replacing or counterbalancing the other. Prior research has explored barriers and ability-related factors using various frameworks and emphases. Ackermann et al. (2018) identified nine motivations and four ability dimensions.

Roskladka et al. (2023) categorised 26 barriers into willingness, technical, and convenience barriers (Fig. 3.8). Terzioğlu, N. (2020) clustered 19 barriers across value, technical, and emotional aspects, while Tecchio et al. (2019) examined repair barriers from the industry's perspective, classified as "Consumer choice," "Technically infeasible," and "Non-viable." Despite differing terminologies and clustering, much of this prior research converges on similar underlying barriers.

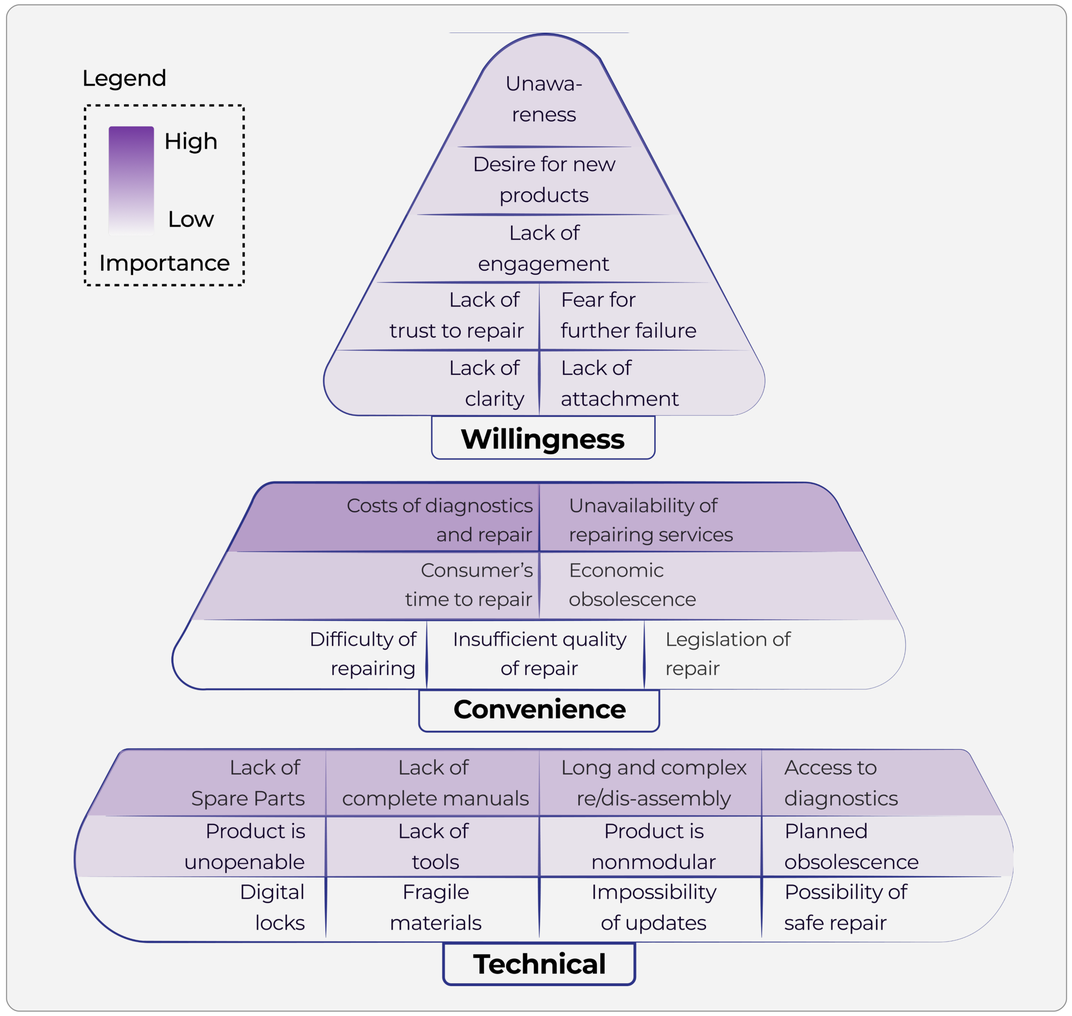


Fig. 3.8 Barriers to repair (adapted from Roskladka et al., 2023)

For this project, the most recent and actionable framework by Roskladka et al. (2023) has been selected as the primary reference point (Fig. 3.8). This study not only identifies and clusters key barriers but also evaluates them based on influence and addressability, making it a valuable tool for prioritising interventions.

Table 3.2 Barrier-to-Need Mapping

Barrier (Roskladka et al.)	Needs Cluster
Lack of trust to professional repair Insufficient quality of repair	**Quality & Trust**
Lack of clarity on how repair works Unavailability of repairing services Lack of Spare Parts Lack of complete manuals Access to diagnostics Lack of tools	**Information Clarity & Accessibility**
Costs of diagnostics and repair Economic obsolescence	**Cost & Viability**
Consumer's time to repair	**Time & Duration**
Fear for further failure Difficulty of repairing Long and complex re/dis-assembly	**Mental Valuation & Feasibility**
Unawareness of repair impact and lack of habits	**Environmental Awareness**

The barriers identified by Roskladka et al. (2023) are assessed and excluded if necessary based on the following criteria:

- Low scored importance or limited addressability within the scope of the platform;
- Greater relevance to DIY repair rather than professional services;
- Incompatibility with a digital service platform format.

All barriers identified as within the scope of this review have been systematically mapped to organised clusters of consumer needs (Table 3.2). These clusters, along with their justification rooted in relevant behavioural literature, are detailed in Appendix C and discussed in following chapter.

It is important to acknowledge the limitations of these barriers since Roskladka et al.'s study focuses on professional repair of washing machines, while this platform is developed with vacuum cleaners in mind. While many barriers were still transferable, certain device-specific nuances have been derived back in Chapter 2.

Seven consolidated consumer need clusters are derived from the behavioural review and will guide the next stages of this project.

Takeaway

3.2. Consumer Needs

Following the literature review on consumer behavioural factors, a bottom-up approach was used to identify consumer needs, meaning the needs were derived starting from the perspective of end-users, real-world contexts and empirical literature. The resulting set includes those needs that are both addressable through a digital platform and specifically relevant to professional repair services (Fig. 3.9). Needs related to technical product design (e.g., modularity, proprietary tools) or those shaped by broader market dynamics or policy have been excluded from the project scope. A full table with source justification per need is available in Appendix C.

Needs Evaluation and Categorisation

The needs identified in previous studies reflect cultural nuances from different European and international literature. To explore how these findings apply to professional repair in the Netherlands, a semi-structured interview format was adopted, featuring open-ended questions to allow for deeper probing and a more flexible exploration of consumer perspectives. The interview guide is available in Appendix D.

Research Activity Objectives

- Evaluate if predefined needs (e.g., cost, time) align with real user priorities in the context of professional repair in the Netherlands.
- Identify and categorise explicit, tacit and latent needs.
- Inform the creation of the customer journey map.

Appendix E provides a table that organises qualitative data and findings and links those to interviewees' quotes as justification.

1 Time & Duration

Need clear expectations regarding the time that the repair can start and the duration it takes.

2 Information Clarity & Accessibility

Need easy access to information on repair services, processes, and available options to reduce uncertainty.

3 Mental Valuation & Feasibility

Need clarity on whether a repair is feasible, as many believe their product is beyond repair when it might be still fixed.

4 Cost & Viability

Need clear costs for repairs, including potential savings and cost changes in the process, to make informed decisions.

5 Quality & Trust

Need trustworthy and transparent repair services to feel confident in the quality of the work and avoid concerns about being misled.

6 Social Perceptions & Trends

Need to align repair choices with social expectations, norms and trends.

7 Environmental Awareness

Need better understanding about the environmental impact of their decisions.

Fig. 3.8 Consumer Needs in Professional Repair

Table. 3.3 Consumer Participants (CP) for Evaluation Interviews

Consumer Participant (CP)	Previous repair experiences
CP1	DIY repair of *vacuum cleaner* Professional repair of *smartphone*
CP2	DIY repair of *vacuum cleaner* Professional repair of *laptop*

Consumers express clear expectations for repair costs and timelines, distinguishing between simple repairs that should be fast and complex ones that may take longer.

> *"Of course, depends on how bad the repair is... if this is a high damage, it takes three days ... but for a vacuum cleaner wheel, I expect a few hours." – CP2*

There is also strong demand for unbiased, transparent information to prevent feelings of manipulation or mistrust toward repair services.

> *"I always have the feeling that production companies don't want to give you all the information... they leave some out so you have to call someone, and they can earn money." – CP1*

Consumers often rely on mental models to pre-judge whether to repair or replace, forming assumptions about repair "worthiness" before obtaining a price estimate.

> *"I thought I can buy a new phone, but that will cost me way more than just repairing the screen... and I had the phone for one year, so I didn't want to throw it away." – CP1*

Misinterpretations about the feasibility of self-repair or the need for professional intervention reveal a significant gap in self-assessment capabilities.

> *"If I know that I can do it... I have a bit of technical knowledge but not too much and I have a bit of tools but not too many" – CP2*

Social influences, such as word-of-mouth and peer opinions, significantly shape repair decisions, yet they are often unspoken or indirectly acknowledged in consumers' reasoning.

> *"I have friends who are way more technical than I am... so I also ask them is it better to repair it myself or shall I go to someone else or is it just a lost cause... it's a bit of word of mouth... and also just looking on reviews" – CP1*

After the evaluation, a categorisation of explicit, tacit, and latent needs has been developed, going from surface to deeper layer ones respectively (Sanders & Stappers, 2012) (Fig. 3.10).

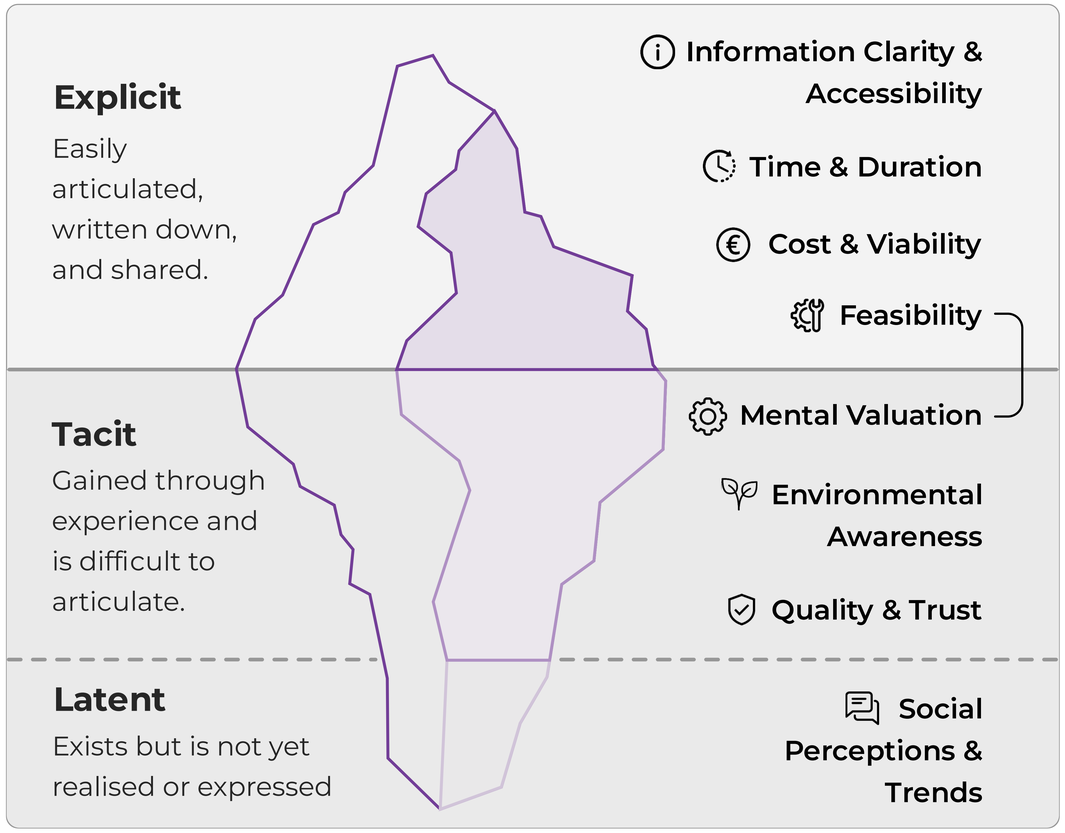


Table. 3.10 Categorisation of consumer needs in repair

3.3. Implications to Platform Design

It is important to note that needs level categories are inherently fluid, for instance, while some consumers may explicitly articulate whether they trust a repairer, trust is often shaped by subjective predispositions. Similarly, environmental awareness, particularly the intuitive understanding of our impact on the environment, is often considered a form of tacit knowledge, while some aspects of environmental knowledge can be explicit (e.g. knowing facts about climate change).

Project Scope

To ensure feasible and high-impact outcome, this project scopes the platform's core intervention around explicit needs since those can be measured and evaluated through interaction and can translate into tangible platform design interventions.

- Information Clarity & Accessibility
- Mental Valuation & Feasibility
- Time & Duration
- Cost & Viability

The selected consumer needs form the foundation for the platform's core objectives (Fig. 3.11), with a distinction made between platform-specific objective and the broader societal change it aims to support, whereby addressability of more implicit needs is possible. Transparency stands at the centre of the platform's ambition, not only in the informational sense, but as a structural mechanism and key lever to contribute to a larger cultural shift towards repair.

To make this overarching objective actionable, transparency is divided into two platform-level sub-objectives. The first is Cost & Time, which responds to consumers' need for clarity on cost, viability, and time to repair. The second is Early Failure Diagnosis, addressing the need for understanding whether a product is worth repairing. By targeting explicit needs, the platform aims to indirectly affect more latent drivers of behaviour, gradually shifting social perceptions, foster greater trust in professional repair services, and strengthen environmental awareness.

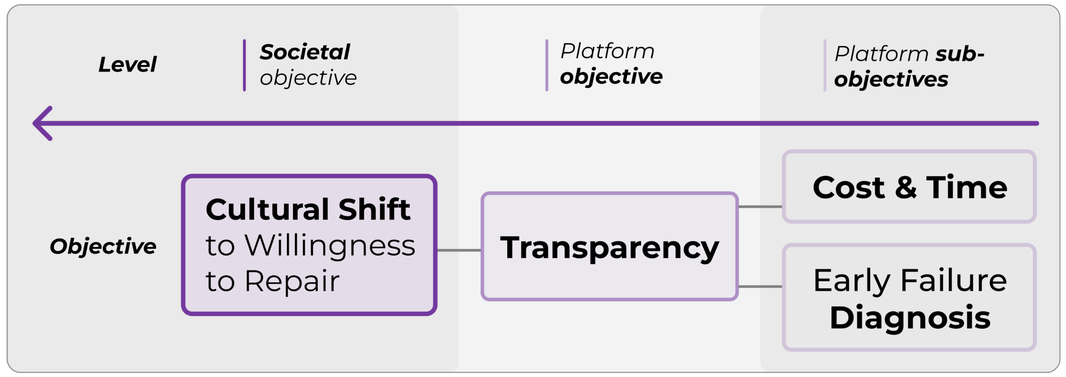


Figure. 3.11 Platform Objectives from Chapter 3

The final transparency objective has been formulated as follows:

Transparency
Objective

The platform establishes transparency across early failure diagnosis, time estimation, and cost clarity through a data-driven, clear, and hyper-contextual pathway.

To deliver on these objective, design criteria were further derived for the platform to adopt (Fig. 3.12).

Legend Criteria | Implication from chapter

Hyper-Contextual Process

Recognising the diverse motivations, abilities, and repair experiences among users, the platform must adopt a hyper-contextual approach that dynamically adapts based on individual user profiles and situational factors. Grounded in Fogg's Behaviour Model, this differentiated support system delivers timely triggers and tailored pathways that correspond to varying levels of motivation and technical skill. By addressing user-specific contexts, the platform ensures that repair decisions are supported according to the user's unique behavioural and cognitive needs.

Clear Output Newly Derived

The platform's communication must prioritise clarity and accessibility to overcome common consumer uncertainties about repair processes, costs, and feasibility. Clear output involves structured, transparent presentation that builds trust and reduces ambiguity..

Figure 3.12 Criteria from Chapter 3

Building on the chapter's exploration and findings, this reflection revisits the sub-research question at its core.

> ***RQ.2:*** *What are the critical consumer behavioural factors to address?*

The exploration of critical consumer behavioural factors in this chapter began with a review of literature on the broader drivers and barriers shaping repair behaviour in a complex, interrelated journey of influencing factor. This was analysed structurally using the Theory of Planned Behaviour and Svensson-Hoglund's model of internal and external influences, providing a combined lens on individual predispositions and socio-contextual conditions. In parallel, trade-off factors at the point of product breakage were assessed to capture decision dynamics between repair and replacement, while Fogg's Behaviour Model was applied separately to consider the role of triggers, and the platform as such.

Repair barriers were systematically reviewed through Roskladka et al.'s actionable framework, filtered for relevance to a digital platform for professional vacuum cleaner repair. The resulting synthesis organised consumer needs into explicit, tacit, and latent categories, with explicit needs forming the primary focus due to their measurability and direct translation into design interventions.

By mapping these behavioural factors to design implications, the chapter addressed RQ.2 by identifying which decision-making patterns are most critical to influence. The answer is not a single barrier or value, but the interplay between transparent information, contextual triggers, and perceived feasibility, elements that can bridge the intention–behaviour gap and create a wider cultural shift to repair willingness.

4.

Target User, Diagnostics Journey and Service Blueprint

Summary

This chapter focuses on constructing a diagnostic journey of the current repair process in the Netherlands in relation to RQ.3. To begin, criteria for identifying target platform users are established, and representative personas are compared and selected to illustrate the journey.

The chapter then integrates insights from a literature review, a journey mapping workshop, and consumer interviews to compose a comprehensive diagnosis journey map, incorporating a service blueprint to capture also repairer perspectives within.

Finally, key stages in the journey are identified as opportunities for targeted platform interventions.

RQ.3: *What is the current consumer diagnostics journey, and which critical stages should a platform address?*

Content

4.1 Defining the Target Consumer
4.2 Consumer Engagement Funnel
4.3 Journey Map & Service Blueprint
4.4 Implications to Platform Design

4.1 Defining the Target Consumer

The following sections detail the demographic and psychographic segmentation in repair, a typology of repair consumers, comparisons between different professional repair personas, and the criteria for identifying the primary target users. A clear understanding of the user categories in repair and their specific needs forms the foundation for developing the diagnostic journey map.

4.1.1 Demographic & Psychographic Segmentation

Key demographic trends reveal that age is positively correlated with repair behaviour, with older individuals more likely to hire professional repair services. Women are generally more inclined to seek professional repair, while urban residents face fewer logistical barriers to accessing services (Fachbach et al., 2022). According to a European Commission funded study, there are also generational differences in attitudes toward repair, with younger individuals expressing more interest in repair but lacking the necessary skills (European Commission, 2018), while older generations may avoid repair tasks due to historical associations with economic hardship (Svensson-Hoglund et al., 2023). According to Hertzum (2024), there are also cross-country differences in the importance they attach to sustainability.

While demographic and psychographic patterns offer useful insights, they can risk oversimplification and biases. This project avoids generalised segmentation, instead focusing on individual motivations and capabilities to adapt to diverse user needs rather than predefining them by static categories.

Takeaway

4.1.2 Typology of Repair Consumers

The concept of non-demographic segmentation advocates for the classification of consumers based on criteria beyond traditional demographics such as age, residence, or income (Yankelovich & Meer, 2006). This approach aligns with the objectives of this study to dynamically cater to a diverse set of platform visitors. Specifically, two dimensions were identified as pivotal to differentiate between repair segments. Willingness to repair, highlighted often as the most challenging barrier to address (Roskladka, 2023), is one critical determinant for the platform's impact. Level of involvement, drawing from research on facilitated DIY repair, this dimension classifies consumers based on their participation in the repair process, traditionally categorised as passive and active (Bayraktaroğlu & İdemen, 2024).

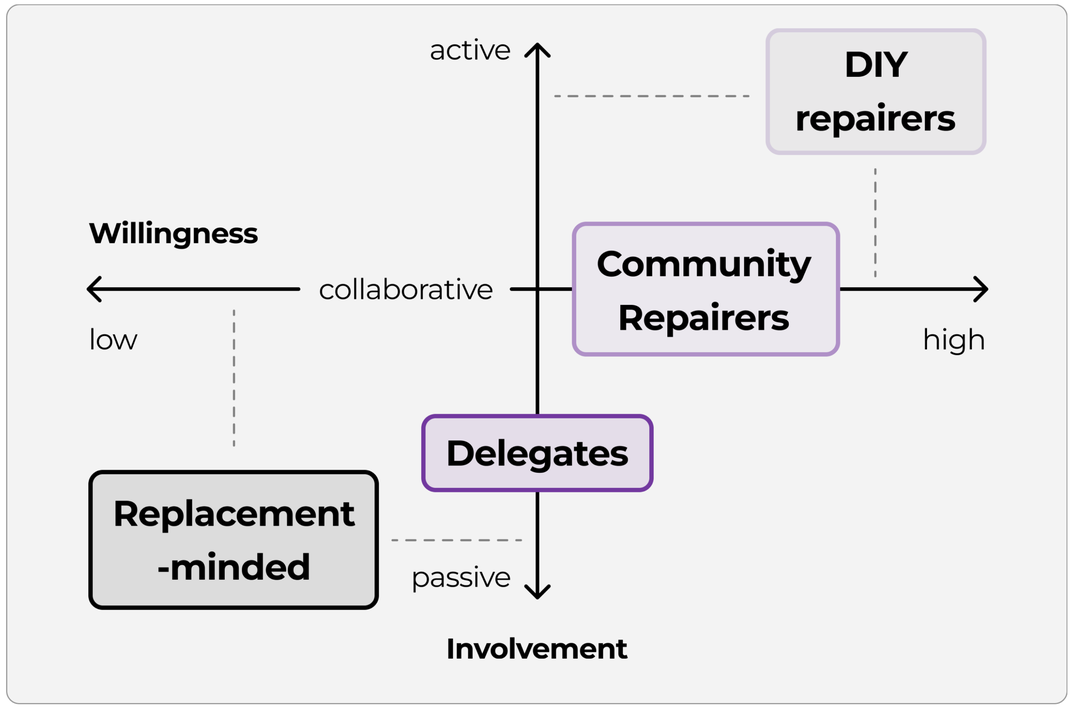


Fig. 4.1 Segmentation Matrix

The project's framework is expanded to include a middle ground of collaborative involvement. These dimensions are visualized as a matrix (Fig. 4.1), with the X-axis representing willingness to repair (from low to high) and the Y-axis representing level of involvement (passive, collaborative and active). This categorisation results in the identification of four repair segments (Table 4.1).

Table 4.1 Segmentation of Repair Consumers

Typology	Description
Delegates	As passive value receivers with medium repair willigness, they are often limited to self-servicing tasks (e.g. contacting a repair company, delivering faulty products) (Bayraktaroğlu & İdemen, 2024).
DIY Repairers	Active and willing to repair their own devices but may still seek professional services for complex repairs.
Community Repairers	Prefer collaborative repair approaches, such as community repair events or group efforts, but may still seek professional services if redirected by others.
Replacement-minded	Passive consumers who are unlikely to engage with repair services.

Project Scope

While other user types may benefit, the primary design interventions are scoped around the needs and behaviours of Delegates, offering support for decision-making in professional repair services.

> Delegates as core target group

Comparison within Delegate Typology

To further illustrate the segmentation, the methodology of persona creation was employed. However, a unified understanding of one single way to apply the method does not exist, nor does a definition of what a persona description should contain exactly (Dam & Siang, 2025). Therefore, based on the research, several "Delegate" personas including demographics, traits, needs and repair perspectives were created. An incorporated spider net aims to reflect the seven key needs visually highlighting how they differ in intensity per different personas. Fig. 4.2 illustrates that even within a single user cluster of Delagates, a one-size-fits-all solution is inadequate.

Research Activity Objectives

- To establish user criteria that define the scope of platform visitors
- To identify key differentiators and shared values within the Delegate cluster

Across all personas, transparency emerges as a unifying theme, whether it is as effective feasibility assessments for Cas, detailed communication for Pieter, or community-driven approval for Marieke. This reinforces the project's focus on transparency as key to fostering a cultural shift in this segmentation group of repair.

Catering to the diverse priorities of all personas requires a platform that is responsive to different user types, further grounding the "Multi-tier approach" criteria.

Takeaway

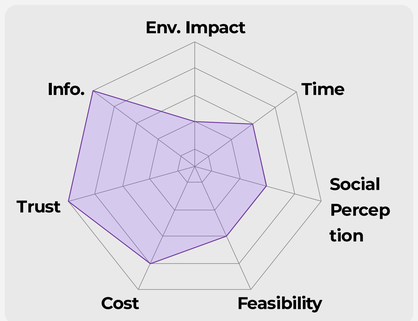
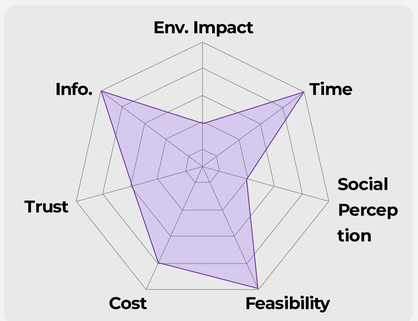
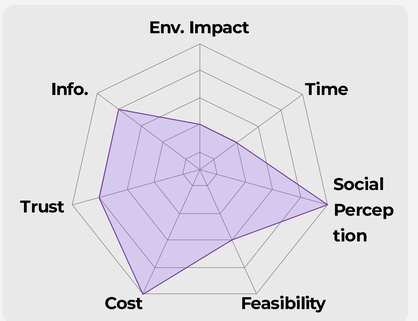
	 **Pieter** *The Trust-Driven Traditionalist*	 **Cas** *The Efficiency Pragmatist*	 **Marieke** *The Social Researcher*
Demographics	**Age**: 56 **Occupation**: Facility Manager **Household:** Married, one grown-up child	**Age**: 30 **Occupation**: Project Manager in a high-pressure industrial firm **Household:** Single	**Age**: 42 **Occupation**: Retail Worker **Household**: Partner and two kids
Core Traits	• Trust-Oriented: Prioritises transparency and accountability. • Evidence-Seeking: Needs fair price and thorough information grounded with sources.	• Independent & Pragmatic: Seeks the most rational judgment and solution. • Tech-Savvy & Analytical: Comfortable with advanced tools. • Time-Conscious: Avoids delays; prefers quick fixes.	• Community-Driven: Relies on social approval to guide repair choices. • Cautious Spender: Balances budget with fairness and quality.
Key Needs *(full needs description in Ch. 3)*	• Quality & Trust - Needs to know of the accountability and skills repairers have to perform his repair accurately and fairly. • Information Accessibility & Clarity - Needs a structured and user-friendly way of accessing repair information.	• Time & Duration - Needs a quick and accessible way of evaluating the repairability, and initiating service. • Mental Valuation & Feasibility - Needs a efficient yet accurate way of finding information on problem.	• Social Perception & Trends - Needs a reliable way of gathering opinions and feedback to guide repair choices. • Cost & Viability - Needs a clear and transparent way of comparing repair costs and assessing value for money.
			
Repair Perspective	"I want my repair to be as structured and well evidenced as possible."	"I want to quickly decide whether repair is the most rational decision."	"I am curious to hear what others experiences are before I decide to repair."

Fig. 4.2 "Delegate" Personas Comparison

4.1.3 Target User Criteria

To ensure a clear and targeted approach in addressing diverse consumer pain points, multiple criteria have been established to define the primary focus of platform visitors.

High Digital Literacy

Can easily use and benefit from a digital platform.

Professional Repair Preference

Prefer to choose a professional service repair pathway.

Repair Services Access

Baseline to minimise external geographical barriers.

Low-to-Mid Repair Willingness

Greatest potential for behavioural shift through interventions.

4.2. Consumer Engagement

The following sections detail the consumer growth strategy, demographic and psychographic segmentation, a typology of repair consumers, comparisons between different professional repair personas, and the criteria for identifying the primary target users. A clear understanding of the user categories in repair and their specific needs forms the foundation for developing the diagnostic journey map.

4.2.1. Consumer Growth Strategy

The acquisition–retention funnel is a useful framework for understanding how users engage with a service, from initial awareness to continued use (Fig. 4.3) (Rogers, 2017). While originally developed for growth marketing, its structure helps illustrate how a platform must attract, convert, and retain users to be effective. In the context of repair, this funnel can be applied to identify where and how consumers might be motivated to engage with a digital service at the moment of product breakage and follow through with a professional repair.

For this project, the acquisition phase concerns how users discover and enter the platform, particularly during the diagnostic stage when a product first fails. Given the limited public awareness of the existing repair Nationaal Reparateur Register, addressing this stage could help to improve visibility and access at this moment of consumer need.

The retention phase, on the other hand, becomes a design priority. Since repair is not a high-frequency activity, retention is less about daily engagement and more about perceived value and trust when the service is needed again. A high retention rate is therefore not a feature of habit but of platform value addition and capture.

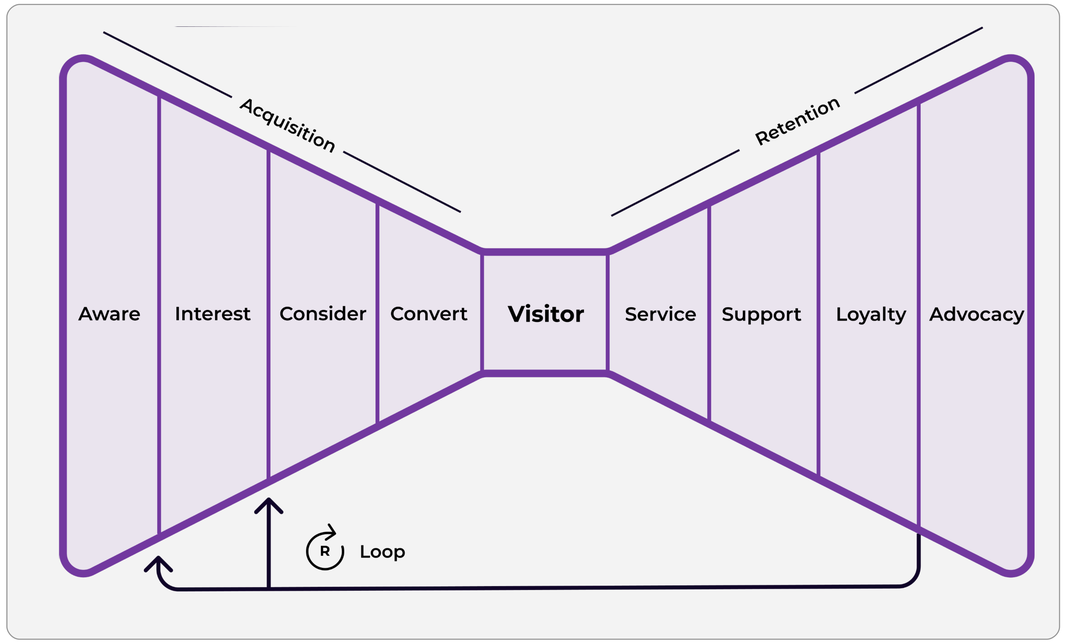


Fig. 4.3 Acquisition-Retention Funnel (Rogers, 2017)

Acquisition recommendations will target the moment of product breakage, ensuring visibility during this key repair decision window.

Acquisition is addressed as recommendations

The platform will focus on organic retention through a strong value proposition, rather than manipulation tactics or frequency-based engagement. Loyalty programs, push marketing, or re-engagement strategies are excluded from scope due to the low-frequency nature of repair journeys.

Criteria for value-based interventions

Project Scope

4.2.2. Behavioural Design Patterns in Platform Design

Given that retention in repair platforms relies on perceived value rather than frequent engagement, certain behavioural psychology principles can be leveraged to encourage sustained use. Unlike habit-forming apps (e.g., social media), repair platforms must minimise friction, reinforce trust, and maximise utility at the moment of need.

In User Experience Design, there are recurring solutions to solve common problems, also referred as design patterns. As an evaluation metric to the proposed platform intervention, this report zooms into an online repository of persuasive patterns to evaluate their presence in the platform interface choices and how those serve as triggers to change towards better repair behaviour by keeping user retained (Toxboe, 2023). The full list of those patterns is in Appendix U.

Research on behavioral design organises mechanisms for sustaining user engagement into complementary clusters (Fig. 4.4). The Cognition cluster emphasises reducing mental effort through patterns like recognition-over-recall, enabling users to identify prior interactions instead of retrieving them from memory, which lowers friction and supports confidence during infrequent use. The Feedback cluster highlights how priming and feedback loops reinforce mental availability, allowing users to retain the platform as a reliable problem-solving resource long after initial interactions. The Perception and Memory cluster demonstrates that structural and visual cues, such as chunking, sequential task framing, and picture superiority effects, improve comprehension, create lasting cognitive impressions, and foster a sense of completion. Together, these clusters suggest that retention is achieved by designing interactions that leave clear, memorable outcomes.

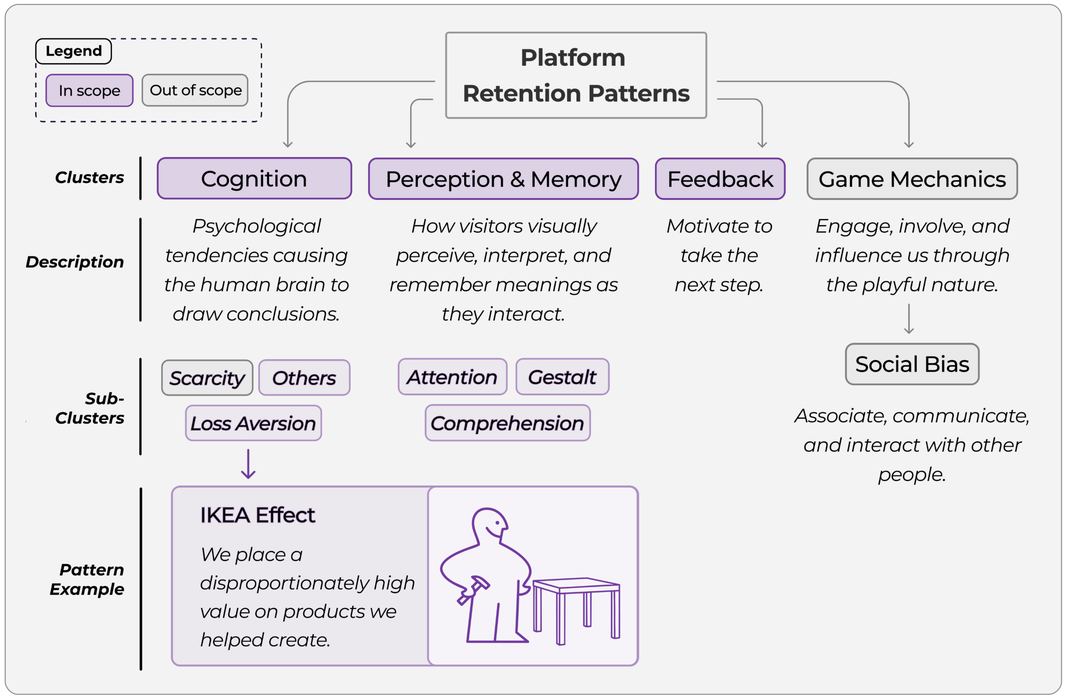


Fig. 4.4 Behavioural Patterns (adapted from Toxboe, 2023).

The patterns which the platform will use as reference for designing its interventions will be from Cognition, Perception & Memory, and Feedback clusters.

> Patterns as guidelines for platform retention

Frequency-driven tactics (e.g., gamification), manipulation or bias related (e.g. Decoy Effect, Scarcity, Optimism Bias) and Social Biases ones (e.g. testimonials, leaderboards) are excluded since they do not fit the scope of this project for value-based strategies.

Project Scope

4.3. Diagnostics Journey Definition

4.3.1. Literature Review of Repair Journeys

Different literature suggests varying stages and flows in the repair process, but there is no universally agreed-upon model or terminology to describe the repair journey. While some stages are commonly identified across studies, the lack of consensus underscores the complexity and diversity of repair experiences.

The framework in Fig. 4.5 has aimed to merge overarching literature findings into a unified repair process cycle (Russel et al., 2022; Lefebre, 2019; Svennson-Hoglund., 2022; Pozo Arcos, 2021), which will be used as basis to organize the journey in this project systematically.

A critical challenge lies, though, in addressing the diagnostic phase, where consumers mainly decide whether to repair or replace a product. The International Electrotechnical Commission (2015) defines fault diagnosis as "the action to identify and characterise the fault. Fault diagnosis may also localise the fault and/or indicate its cause."

This project positions diagnostics as neither solely done by professionals nor exclusively consumer-driven but as a complex series of cross-influencing social factors and infrastructural pathways that define each separate user's journey. Pozo Arcos et al. (2021) has also determined that beyond the time of 30 minutes, the fault self-diagnosis a consumer performs on their own is likely to be deemed unsuccessful since most people would not continue, which will serve as a criterion in platform concepts around self-diagnostics prior to professional one.

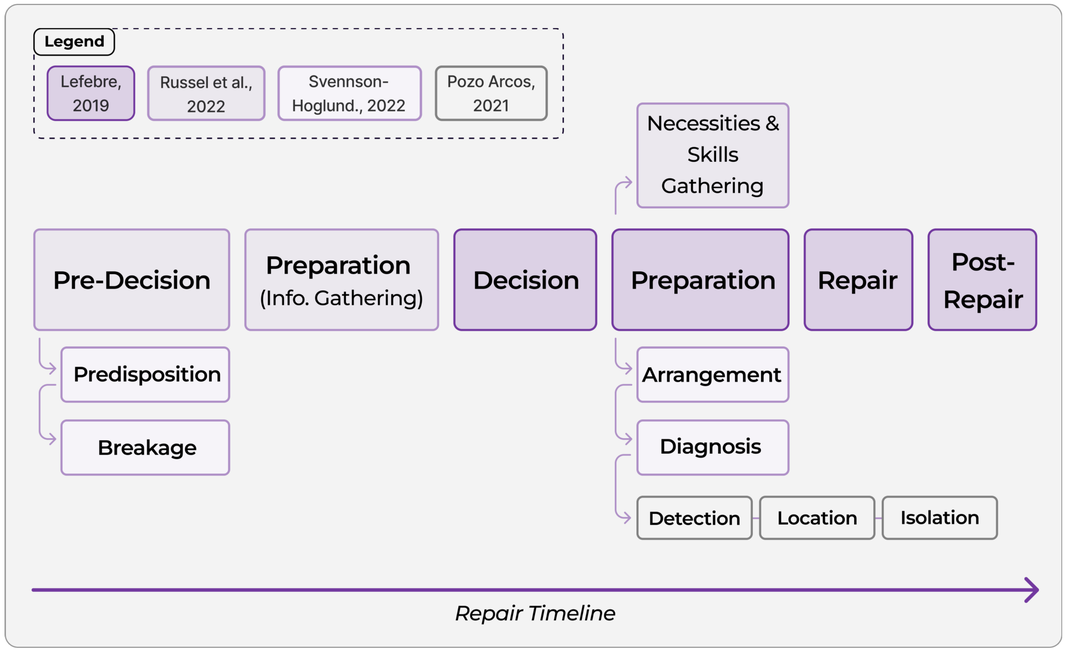


Fig. 4.5 Literature Review on Existing Repair Journeys

Project Scope

As a project focusing on diagnostics journey, the subsequent repair actions after a decision (Fig. 4.5), such as repair arrangement, the repair itself, or post-repair activities, fall outside the scope of this study. This project also does not distinguish between outcomes where a product is refurbished, resold, or disposed if the diagnostics have failed at some stage, instead, these outcomes mean an end to the repair pathway.

> Diagnostics journey defined from Pre-decision to (Professional) Diagnosis

4.3.2 Journey Map & Service Blueprint Creation

This project draws on initial insights from the Klantreis Elektronica Reparatie initiative by Techniek Nederland, which aims to standardise the consumer repair journey in the Netherlands. As part of the initiative, a stakeholder journey mapping workshop was organised with members of the Lang Leve Electronica (LLE) coalition (Fig 4.6). I participated in this session as a participant, engaging in collaborative mapping activities that helped shape the foundations of this project's journey map.



Fig. 4.6 Impression from Journey Mapping Stakeholders' Workshop

The session included nine participants, representing diverse perspectives from across the repair ecosystem, including members from a Repair Café, a professional repair platform, an e-waste platform, and a large electronics retailer. The workshop outcomes are further documented in Appendix F.

To uncover where users are most likely to drop out and where targeted interventions could have the most impact, a detailed customer journey map was created for the scope of this project (Fig. 4.8). Journey maps are visual and research-driven tools that help unpack user experience over time (Interaction Design Foundation, 2016a).

Research Activity Objectives

- Reveal system-level misalignments by aligning the frontstage user experience with backstage service operations.
- Construct a shared, research-informed journey that highlights key pain points and informs targeted platform interventions.
- Define the project scope by identifying which journey phases offer the most meaningful opportunities for impact.

The final journey map is a composite outcome of multiple inputs, including the LLE workshop, prior research activities, and an early journey based on literature (Appendix G). The journey is structured around four macro-stages, each broken into micro-stages to reflect granular actions. The map also integrates other key elements such as a persona and user scenario, emotional and cognitive reflections, touchpoints, and pain points mapped to overarching consumer needs.

To complement the consumer perspective and reveal operational misalignments, the journey was extended with a linked service blueprint (Interaction Design Foundation, 2016b). This blueprint begins at the moment a user engages with a professional repair service and maps frontstage actions, backstage operations, and supporting processes.

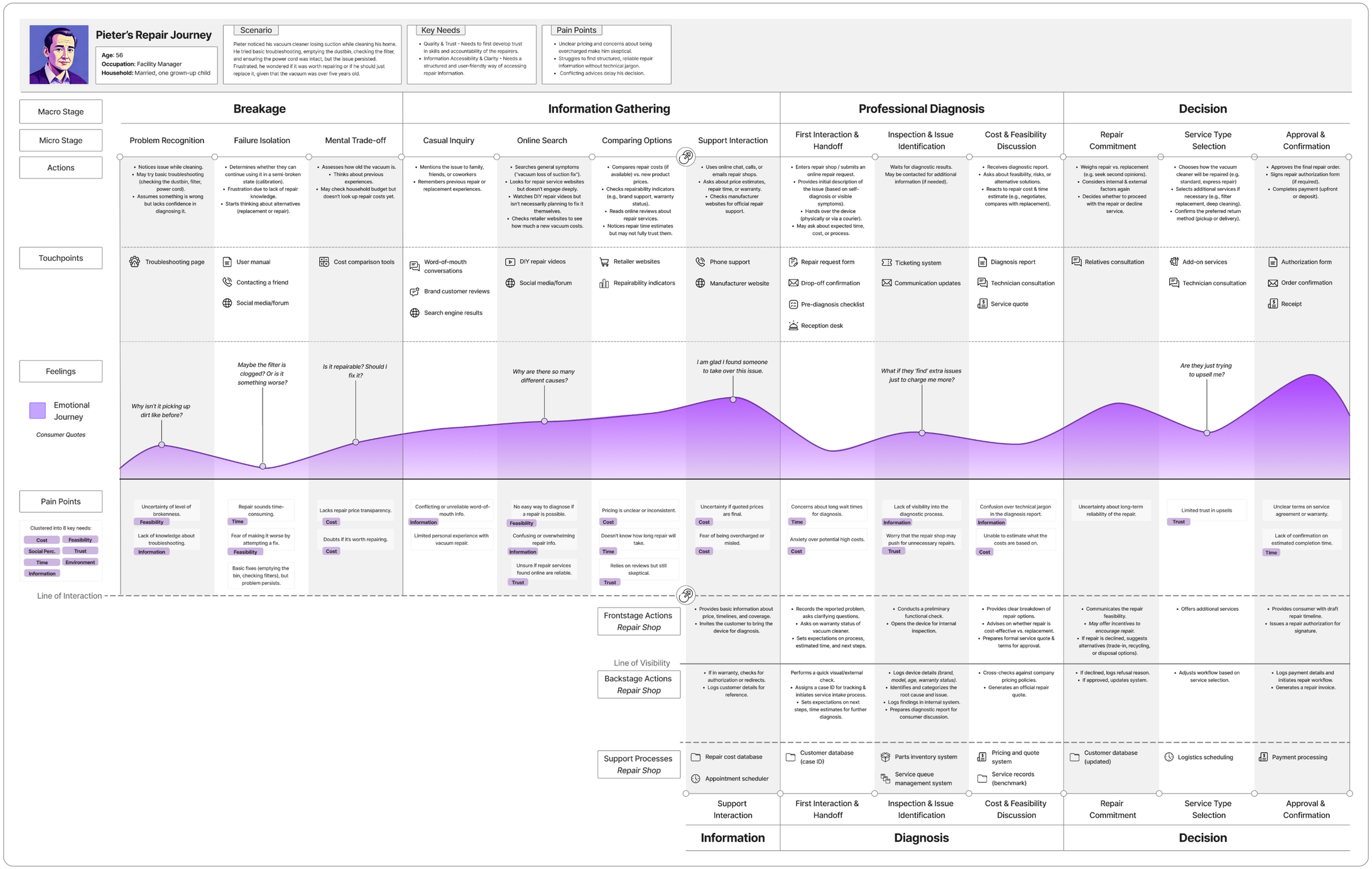


Fig 4.8 Customer Journey Map

Journey Map & Service Blueprint Takeaways

While the diagnostics process has been structured into four macro stages, the most significant drop-off occurs during the breakage and early information-gathering phase when users weigh the mental costs of repair against replacement.

As a primarily consumer-facing platform, the greatest opportunity for intervention in this project lies before professional diagnosis engagement. For this reason, the platform's key intervention point is in making the platform instantly discoverable at the moment of failure and ensuring it supports users through breakage and information gathering (Fig. 4.9).

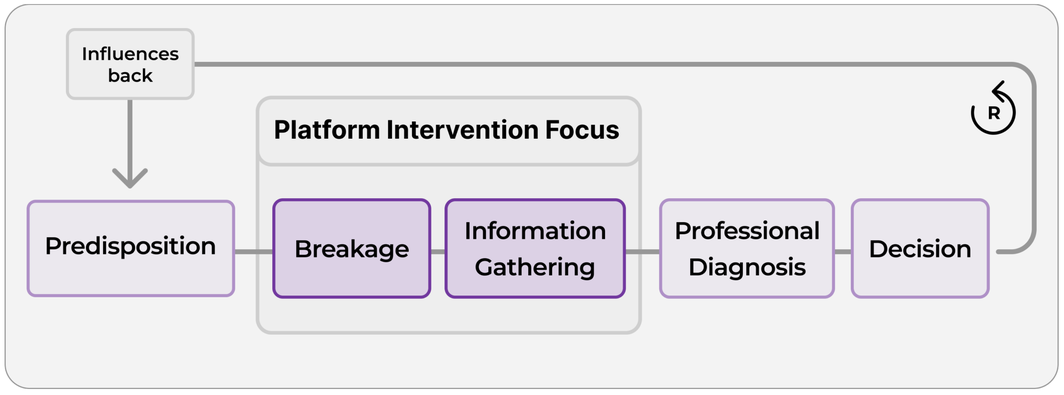


Table. 4.9 Project's Journey Stages Scope

> The platform focuses on guiding users through the mental and informational challenges after a device failure, up until they engage with a professional repair service.
>
> **Takeaway**

The journey map showed that no two repair paths are alike. Drop-off points, frustrations, and support needs vary greatly depending on the user, the type of failure, and other factors (Fig. 4.10).

Rather than offering a linear process, the platform must guide users through a flexible, adaptive flow, starting immediately from the moment of device failure. By responding to different levels of knowledge, confidence, and urgency, the platform can more effectively steer people toward appropriate support, whether that's professional repair (the focus of this project), self-repair, or community help.

> Tailoring dynamically the diagnostic flow to user type and failure context is essential for increasing repair willingness.
>
> **Takeaway**

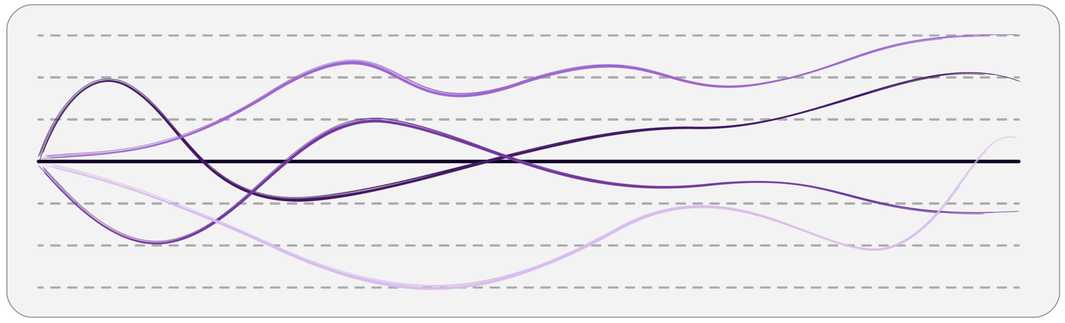


Table. 4.10 Different emotional repair journeys

Limitations

This journey map is scoped specifically around the path toward professional diagnosis, using a single persona and one service workflow. While this allows for focused insight, it risks simplifying the actual complexity in repair service flows. In reality, emotional drivers and pain points vary considerably depending on the user profile, type of device, failure symptoms, and whether repair is pursued through professional, community, or DIY pathways. The map should thus be seen as a foundation to understanding the broader landscape.

4.4. Implications to Platform Design

The insights from this chapter shaped a new overarching platform objective to drive user engagement throughout the repair diagnostic process. This objective is grounded in two sub-objectives of acquiring new visitors to the platform, but also retaining them throughout their diagnostics pathway (Fig. 4.10).

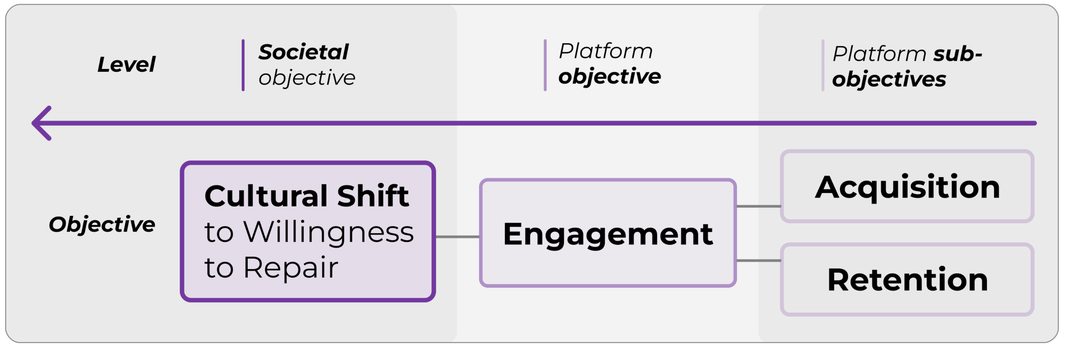


Figure. 4.10 Platform Objectives from Chapter 4

The final Enagagement objective has been formulated as follows:

Engagement Objective	The platform drives user acquisition and retention by relevant entry points and ongoing value delivery.

This chapter synthesises further the key takeaways from the target user definition and journey mapping to identify further criteria that inform platform design. Together, the insights supported existing or identified new criteria (Fig. 4.11).

Legend — Criteria | Implication from chapter

Multi-Tier Process

The exploration of diverse “Delegate” personas and their distinct characteristics demonstrates that repair journeys are highly individualised and non-linear. This diversity further calls for a platform capable of dynamically adapting to different user profiles. This approach aligns with the journey mapping outcomes highlighting varied drop-off and pain points and the need for adaptive intervention rather than a one-size-fits-all linear process.

Clear Output

Given the broad spectrum of digital literacy, repair knowledge, and cognitive styles revealed across the user segments, the platform must prioritise clarity and accessibility in its core communications. While it must adapt dynamically individual-to-individual, the core information and guidance provided must remain universally clear and accessible.

Value-based Engagement — Newly Derived

The chapter’s findings reinforce that repair is a low-frequency, high-stakes activity. Therefore, the platform’s engagement model should move away from habitual, frequency-driven tactics common in other digital services. Instead, it should focus on providing clear, trustworthy value exactly when users face repair decisions, fostering genuine retention based on perceived utility and support.

Non-biased Governance Newly Derived

Reflecting on the retention patterns, it is clear that fair governance is critical to sustaining trust in platform. Therefore, it must avoid manipulative patterns (e.g., decoy effect, scarcity), which can bias decision-making. The platform should provide fact-based, transparent diagnostics and advice, while refraining from profiling users based on demographics like age, gender, or income, risking privacy and bias issues.

Fig. 4.11 Criteria from Chapter 4

Following the chapter exploration and findings, the following reflection revisits the sub-research question that laid central to chapter.

> ***RQ.3:*** *What is the current consumer diagnostics journey, and which critical stages should a platform address?*

This chapter expanded the understanding of repair consumers by introducing a typology based on willingness to repair and level of involvement, resulting in distinct segments, personas, and spider maps illustrating the varying intensity of their needs. The focus is on the Delegate cluster, whose moderate repair willingness and involvement make them prime users for digital support in professional repair.

The journey mapping and service blueprinting activity highlighted that the diagnostics journey is complex and non-linear, with significant drop-off occurring early, between device failure and the decision to seek professional repair.

These early stages present the highest user drop-off risk and thus the greatest opportunity for platform intervention, requiring adaptive guidance tailored to different user knowledge, motivation, and urgency.

Addressing this stage requires the platform to be instantly discoverable at the moment of failure, resulting in the objective for better outreach. In addition to acquisition, the chapter highlights retention as a key platform goal. Given that repair is a low-frequency activity, retention here depends less on habitual use and more on sustained perceived value and trust in the platform.

5.

Ecosystem Dynamics, Stakeholders, and Platforms Analysis

Summary

This chapter complements consumer research with insights from stakeholder perspectives, focusing on RQ.4. It begins by developing a stakeholder map to contextualise the repair environment in the Netherlands, particularly in relation to the project's platform. Based on this framework, stakeholder participants were recruited and interviewed using a semi-structured approach.

The findings from these interviews were synthesised into an ecosystem map, highlighting value tensions in repair. As part of project's scope, the chapter further deep dives into analysing the professional repair sector and existing digital platforms.

RQ.4: *How can a repair platform navigate stakeholder roles, dependencies, and tensions?*

> ***Sub-RQ.4:*** *How should it position itself relative to existing repair solutions?*

Content

5.1 Stakeholders in Platform Design
5.2 Ecosystem Analysis & Value Tensions
5.3 Professional Repair Deep Dive
5.4 Digital Platforms Deep Dive
5.5 Implications to Platform Design

5.1 Stakeholders in Platform Design

5.1.1 Stakeholder Mapping

To support the development of the platform holistically, a stakeholder map analysis identified and positioned the key actors shaping repair landscape and the current platform. The structure of the activity has been adapted from Politecnico di Milano DESIS Lab (Politecnico di Milano, 2025), including the four levels of involvement, noted as co-manage, co-produce, consult, and inform (Fig. 5.1).

The map was informed by nation-wide repair initiatives (e.g. Reparatiefabriek, Klantreis Elektronica Reparatie), research projects (e.g. Tackling Fixophobia and ShaRepair), and repair coalitions (e.g. Lang Leve Elektronica), consolidating and reorganising stakeholders through the prism of the platform. The full stakeholder map with definition to each quadrant level of involvement is available in Appendix H.

Research Activity Objectives

- Serve as the foundation for the selection of interview participants, ensuring a balanced representation of views across all quadrants of the map.
- Lay the groundwork for creating the ecosystem repair map to understand the interrelations of stakeholders.

There are limitations presented by this tool from the fact that it should be considered a living document, open to revision as new stakeholders emerge or existing ones shift roles. Furthermore, while every effort was made to include all relevant stakeholders, some actors may have been overlooked. Additionally, clustering stakeholders for clarity may risk underrepresenting smaller yet significant contributors in the field.

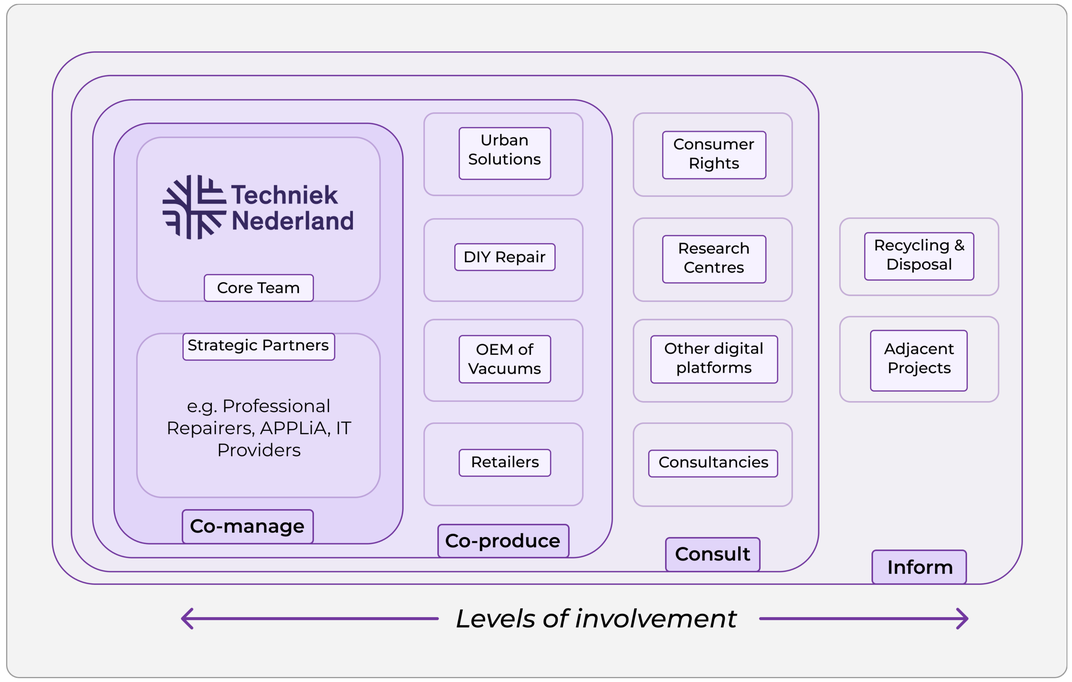


Figure 5.1 High-level Stakeholder Map

The stakeholder map reveals a fragmented repair ecosystem, where manufacturers, repairers, and community initiatives often operate in silos. This tension directly shapes the gap for a platform's role not only as a neutral mediator, but also as a strategic integrator of stakeholder resources and activities.

While the map highlights "co-manage" partners as critical to the platform's immediate realisation, it also recognises the evolving relevance of peripheral actors. As part of a phased approach, the map is intended as a living document, allowing for stakeholders to shift across tiers over time based on changing roles.

Takeaway

5.1.2 Expert Interviews

To gain a deeper understanding of stakeholder roles, interests, and systemic barriers, 12 semi-structured interviews were conducted with actors from the defined stakeholder landscape. Participants were primarily recruited through the networks of the associated research projects of Tackling Fixophobia and Klantreis Elektronica Reparatie.

Table 5.1 maps each interviewee's position within the predefined stakeholder map, alongside their relative interest in and influence over the platform's design, with detailed reasoning provided in Appendix I. This structure draws from Mendelow's Matrix (1991), a classic framework for stakeholder analysis based on influence and interest, which helps differentiate the relative importance of stakeholder views in strategic decision-making. The interview focused on stakeholder perspectives regarding the current repair ecosystem, its key barriers, and their expectations for the platform. To reflect the varied roles and expertise of participants, the interview guide was tailored according to each session and participant's expertise. All interviews were audio-recorded, transcribed, and supported by observational notes. Data was analysed using open coding within a grounded theory framework (Saldaña, 2013), allowing themes to emerge inductively from the discussions, and have been reflected in Appendix J.

Research Activity Objectives

- Lay down the qualitative foundation for ecosystem map, where interdependencies, value tensions, and systemic risks between stakeholders are analysed and justified in detail.
- Refine the constructed journey map and service blueprint, and triangulate back the identified consumer needs.
- Identify preliminary criteria and platform intervention ideas.

Table 5.1 Interviewees' role, influence, and interest to project

Stakeholder Participant (SP)	Professional Role	Mapped Role	Project Influence	Project Interest
SP1	*Co-Founder of Design Consultancy for Circular Consumer Electronics*	Consult	L	L
SP2	*Founder (DGA) of White Goods Repair Platform*	Co-Produce	M	M
SP3	*Chair at Local Repair Café*	Co-Produce	M	M
SP4	*Manager Reverse Organisation at Online Retailer*	Co-Produce	M	H
SP5	*Owner of a Self-Repair Platform*	Co-Produce	M	H
SP6	*Sustainability Senior Manager at Electronics Manufacturer*	Co-Produce	M	H
SP7	*Project manager and Community lead at a recycling start-up*	Co-Produce	L	L
SP8	*Consumer Electronics Industry Manager at Techniek Nederland*	Co-Manage	H	H
SP9	*Product Manager at Spareka*	Consult	L	M
SP10	*Customer Experience Manager at Electronics Manufacturer*	Co-Produce	M	H
SP11	*Project Developer at Research Institute*	Consult	L	M
SP12	*Member of iFixit's EU policy team*	Co-Produce	H	M

5.2 Ecosystem Analysis and Tensions

5.2.1 Ecosystem Mapping

The Ecosystem Map for this project builds on Talmar et al.'s (2018) framework and its Ecosystem Pie Model (EPM), which visually embeds the constructs and relationships that shape how actors interact to create and capture value at both the ecosystem and actor levels.

The ecosystem-level constructs (including user and actor segments and the shared ecosystem value proposition) and actor-level constructs (such as resources, key activities, value addition and capture, interdependencies, and risk) are presented as a high-level overview in Fig. 5.2. As emphasised by Russell et al. (2022), the repair ecosystem must be understood not merely as a linear value chain, but as a constellation of interdependent actors who influence and are influenced by one another before, during, and after (a repair event). Therefore, the framework further integrates additional interlinks caring insight, such as information flows, monetary exchanges, risks and value tensions, as visually represented in the legend of Figure 5.2.

The identified Ecosystem Value Proposition (EVP) which holds valid across all actors in repair is as follows:

EVP	Efficient, accessible, and sustainable repair solutions for consumers and providers alike, extending product lifespan, and reducing e-waste.

To structure the complex repair ecosystem, Fig. 5.2 outlines the map's constructs. Those include more peripheral to platform scope ones as DIY Repair (Physical, Digital), Manufacturer & Retailers, End-of-life management (Recycle, Refurbish & Resell), and Spare Parts (Branded, Aftermarket).

But also central to scope constructs as Consumers (Delegates, Community, DIY Repairers), Digital Traceability Platforms (Business-driven, consumer-driven) and Professional Service Repair (Authorised, Non-authorised).

The following chapters (5.3 and 5.4) will investigate these primary constructs, particularly professional repair and digital platforms in more depth. A complete view of the interconnected flows across the full ecosystem is available in Appendix K.

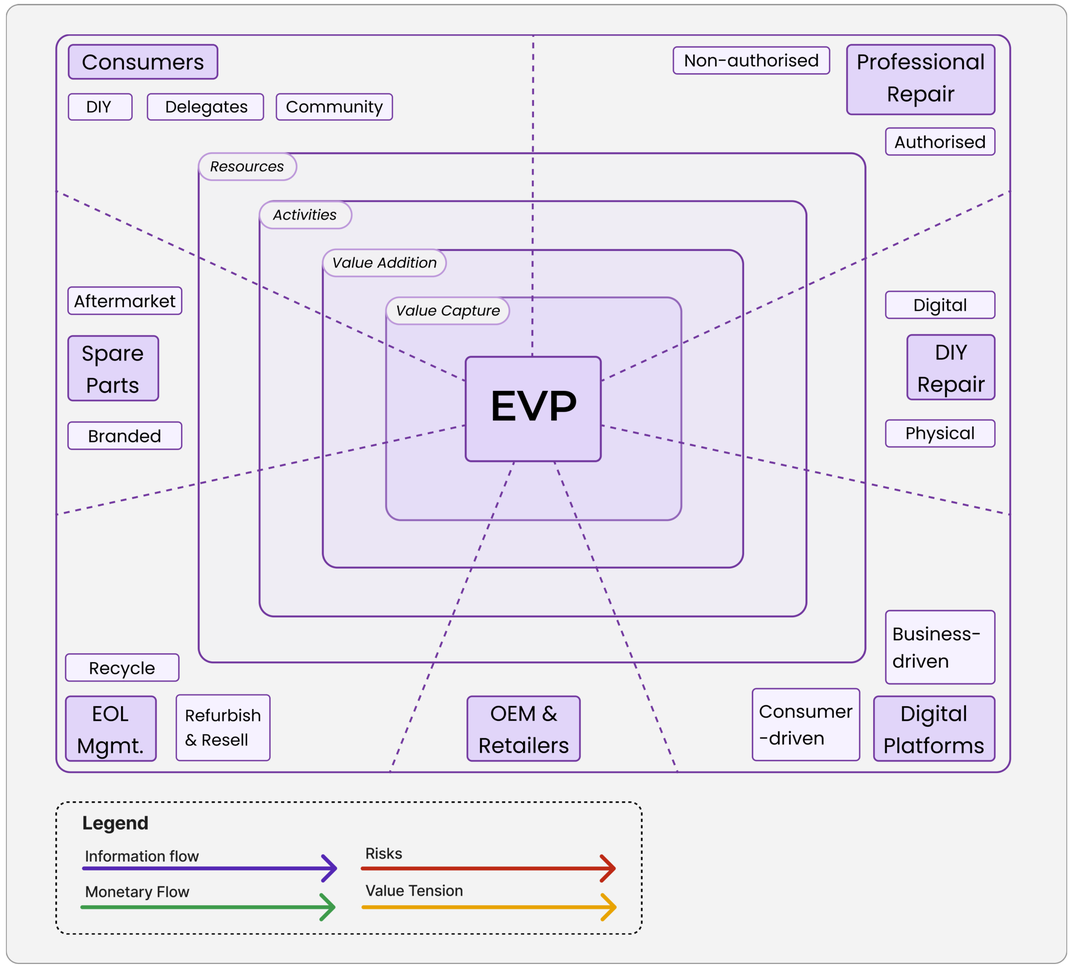


Fig. 5.2 Simplified Ecosystem Map (adapted from Talmar et al., 2018)

Research Activity Objectives

- Discover value tensions that hinder the achievement of the EVP, and present implications for platform criteria.
- Link the complex interdependencies in repair ecosystem in the Netherlands and identify opportunity spaces.
- Categorise the ecosystem constructs, deep dive into each actor-level resources, activities, value addition and capture.

5.2.2 Value Tension Analysis

This section presents a set of critical value tensions that emerged through a synthesis of ecosystem analysis and stakeholder interviews. Moreover, drawing on Adner's (2006) logic on initiative, interdependence, and integration risks, we see how seemingly aligned actors may in fact be operating under divergent logics, highlighting why some repair solutions remain fragmented or underutilised.

A full overview and justification of all tensions from stakeholder interviews is available in Appendix J. Among other conflicts that were discovered within the interviews and the ecosystem map approach were a few, which fall outside of the scope of this project. These are tensions related to manufacturer's responsibility (Manufacturer Narratives vs. Independent Repair), regulatory hurdles (Entry of new repairers vs. Regulatory Oversight), and market dynamics (Replacement Advertisement vs. Repair Willingness).

After applying these selection criteria, the tensions were narrowed down to five that are most relevant to the project.

Actors	Tension	Actors
Manufacturers	**OEM Liability** vs. **Repair Open-Source**	*Non-authorised, DIY and Community Repairers*

This tension between manufacturers' legal safeguards and professional repairers' need for technical transparency highlights a structural conflict of balancing safety, expertise, and quality control with equitable access to repair.

> *"Product liability is what the manufacturers are very afraid of... unqualified or unauthorised people doing things in their product with their brand logo on it." – SP4 (Stakeholder Participant 4)*

Independent Repair Shops, OEM Service Networks	**Repair Profit-Margin** vs. **Fair Costs**	*Consumers*

This conflict illustrates the challenges of balancing financial viability for repair providers against consumers' demand for affordable services. Out-of-warranty repairs often result in higher costs for parts and services, creating a consumer perception of overpricing compared to replacement. On the other hand, lower repair prices might disincentivise repair businesses from offering services.

> *"As soon as you are going out of warranty repairs, there's no structure so it's more expensive, the spare parts will be more expensive too." – SP10*

Legislators, Consumers	**Repair Compliance** vs. **Profitability**	*Professional Repairers*

The tension reflects the difficulty of meeting repair compliance mandates (e.g., Right to Repair laws) against repair businesses' operational costs. While compliance supports environmental objectives, repair providers often face unprofitable costs for investigation, transportation, and service handling.

> *"It (remote diagnosis) is always free for the client, but for us we only get money if it is repaired... Sometimes it costs us, sometimes we earn money" – SP9*

OEMs, Authorised Workshops	**Authorised Workshops** vs. **Non-authorised**	*Independent Repairers*

The tension exposes how OEM restrictions on parts/tools create systemic advantages for authorised repairers, while independent ones struggle with fragmented supply chains and technical barriers, ultimately limiting consumer choice. Furthermore, the out-of-warranty flow is not regulated by manufacturer resulting in some repairers to adapt their approach and overcharge consumers.

> *"They [unauthorized workshops] are restricted by the brands and the suppliers on what they can do... there are so many brands, and they all use different parts and components, and they all have different supply lines." – SP11*

Legislators, Trade associations,	**Platform Regulated Supply** vs. **Small Repair Shops**	*Independent Repairers*

Lastly, the tension between repair platforms and small repair workshops highlights the accessibility challenges faced by small businesses in participating in platforms as the Nationaal Reparateurregister. High entry costs and membership fees often exclude those businesses, despite their repair capabilities.

> *"If you want to be part of [Nationaal Reparateurregister] as a company, you have to pay quite substantially... and simple workshop that can be very professional... can simply not afford to be part of it." – SP5*

> *"The problem is not that there's all of these repair workshops... but people are unable to find them... if in your city there's a repair store that's visible, then after a while you'll know that it's there" - SP12*

The recurring stakeholder tensions reveal deeper structural imbalances in the repair ecosystem between access and control, affordability and viability, inclusion and exclusion. These tensions underscore the systemic value of fair mediation to navigate conflicting interests, cost transparency to protect consumers in out-of-warranty situations, and integrative coordination to align fragmented responsibilities, data, and repair pathways.

Takeaway

The platform prioritises on consumer-facing tensions, while still balancing stakeholder needs. It builds on the existing network of authorised workshops and does not seek to lower entry barriers or restructure supply models.

Consumer-first platform

Project Scope

5.3 Professional Service Repair Deep Dive

To clarify the strategic role of professional repairers within the platform, this section takes a closer look at their position in the repair ecosystem not just as service providers, but as essential partners in shaping how the platform delivers value.

Despite the rising complexity of electronic products and a growing urgency for circular business practices, the availability and accessibility of skilled repair services has diminished over the past years (Fachbach, 2022; Sabbaghi et al., 2017). Professional repair operations have relatively high success rates (75–85% for common household appliances like washing machines), yet still face decreasing market presence (Tecchio et al., 2019).

In contrast to DIY repair, which is often associated with positive emotions such as creativity and empowerment (Dávila, 2021), professional repair is perceived by consumers as inconvenient, expensive, and time-consuming (Lefebvre, 2019). A Dutch research study recommends that in order to significantly reduce costs in repair services, the industry requires scaling up, professionalising, and automating repairs (Stichting Genoeg om te leven et al., 2024).

Güsser-Fachbach et al. (2023a) describe the willingness to professionally repair a product as a function of price and convenience, while Fachbach et al. (2022) quantify the acceptable repair costs to range up to 31% of the product's purchase value. However, while Europe's average labour costs for repair was valued at 25,3 Euro per hour, that in Netherlands falls under the leading most expensive labour costs averaging around 35 Euro per hour (Rames et al., 2019).

5.3.1 Categorising Repair Types & Services

Understanding why and how consumers seek repairs is essential for defining the platform as centred to professional service repair. Russel et al. (2022) categorise repairs into three main reasons, which connect further to the types of repairs based on severity / investment identified through synthesis of online repair forums and industry literature (Fig. 5.3). On top of this, there are four main service flows in professional repair which are elaborated in Fig. 5.4.

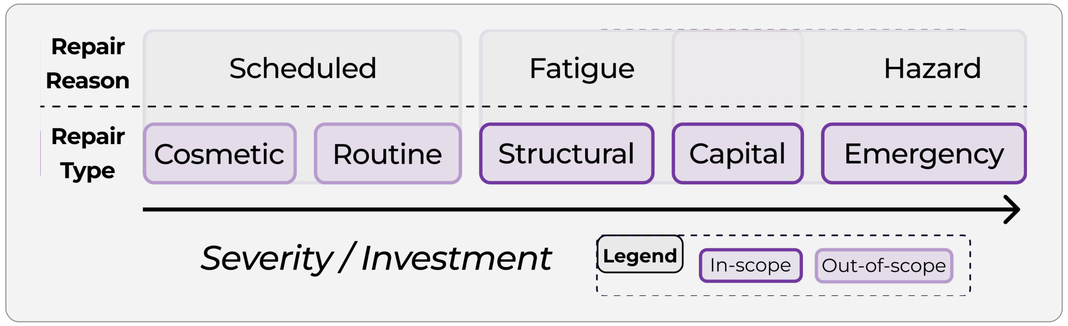


Fig. 5.3 Repair Types Categorisation

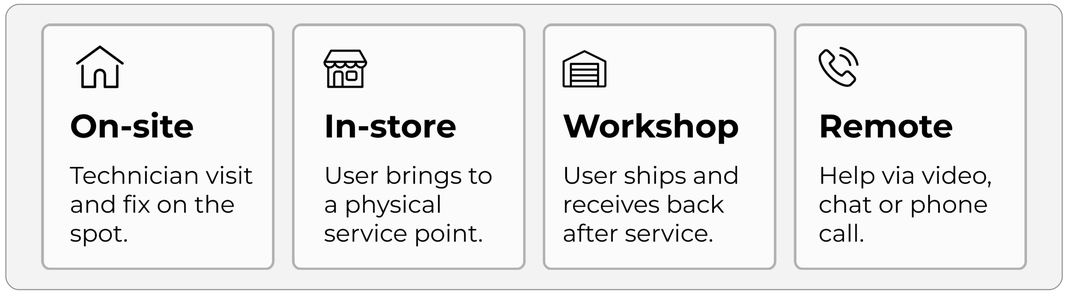


Fig. 5.4 Repair Flows Categorisation

The platform addresses structural, capital and emergency cases whereby professional repair is not just a fallback, but a necessary service layer. Video remote diagnostics is a flow which is currently untapped on the Dutch market, yet the platform looks into optimising for main repair flows with majority of cases currently being handled on-site, in-store and through workshops.

Takeaway

5.3.2 Professional Repairer's Needs

Following a review of systemic challenges and stakeholder insights, the following five repairer needs have been identified as both addressable through a digital service platform and directly relevant to professional repair services (Fig. 5.5). Needs that fall under OEM-controlled constraints (e.g., design for disassembly, software locks) or require broader regulatory intervention (e.g., Right to Repair legislation) have been excluded from the project scope. Instead, this evaluation focuses on barriers that a platform can realistically alleviate through strategic service interventions. The interview guide is available in Appendix L and needs' source justification in Appendix M.

Revenue & Profitability

Need demand and repair types that can cover their operating and labour costs.

Quality & Trust

Need to build consumer trust by demonstrating professionalism, reliability, and transparency.

Technical Knowledge

Need reliable access to product diagnostics, common fault patterns, firmware/software specifics.

Risk Management

Need clear understanding of risk and the ability to communicate these to clients.

Spare Parts Accessibility

Need access to a network of spare parts suppliers to ensure they can source the necessary components.

Fig. 5.5 Repairer Needs

Repairer's Needs Evaluation

A focused evaluation of the identified repairer needs within the Dutch context was necessary. To address this, a semi-structured interview approach was employed, targeting repair professionals (Table 5.2).

Table. 5.2 Repairer Participants (RP) for Evaluation Interviews

Repairer Participant (RP)	Previous repair experiences
RP1	Manager Business Development at an authorised service centre (ASC)
RP2	Owner of a phone repair business chain for both authorised and non-authorised repairs

Research Activity Objectives

- Inform back to the diagnosis service blueprint from the perspective of professional repairers.
- Evaluate if predefined repairer needs reflect actual ones in the Netherlands.
- Identify repairer-facing platform intervention opportunities.

Professional repair businesses are a critical node in the repair ecosystem but face challenges in sustaining operations. There is a need for diversification of repair services to other consumer goods, highlighting an interest to expand beyond traditional electronics.

> *"I think 80% of our volume is smartphones. But we see volume decreasing. That's why from a few years ago we have been looking at other products and... started with television, coffee machine, drone, EV charger repair, et cetera. So, it's broader." – RP1*

Consumer needs identified in this project have been triangulated with repairers' perspectives, highlighting location proximity, cost, time as main pain points. In addition, fairness, transparency, sharing clear process expectations, and manufacturer affiliations are key trust drivers.

> *"Main problems for a customer in repair: 1) clear price up front... 2) good expectations on the process... 3) a fair price compared to the value of the product." – RP1*

Internal risks that repairers shared included damages caused by inexperienced staff mishandling components, defective parts that occasionally bypass quality checks, all leading to the repairer to absorb the costs. Both businesses shared to be explicit with consumers when a product is deemed Beyond Economical Repair (BER). Fragmentation challenges in spare parts market hinder repairer's volume-driven repair business models, underscoring why vacuums are less viable (lower demand, higher complexity).

> *"Laptops have too many parts to stock locally... Repairs take days due to sourcing."; "We specialise in smartphones / tablets... other electronics are logistically harder." – RP2*

The platform should prioritise consumer needs over repairer needs, recognising that serving consumers boosts repair demand and revenue in return. Needs as cost, time, and feasibility transparency, are confirmed by professionals as critical.

The platform's focus on out-of-warranty repairs is key to support repairer's businesses by generating higher demand in those scenarios. The platform should still objectively compare repair options and transparently flag Beyond Economical Repair (BER) cases rather than promote repair by all means to generate repairers' profit.

Takeaway

5.4 Digital Platforms Deep Dive

5.4.1 Platforms Categorisation

To design meaningful and scalable interventions, it's essential to first link the strategic role of the platform in relation to broader digital market dynamics. As identified by Hagel et al. (2014) in a report for Deloitte Center for the Edge, there are three major business archetypes in today's economy, shown in Fig. 5.6

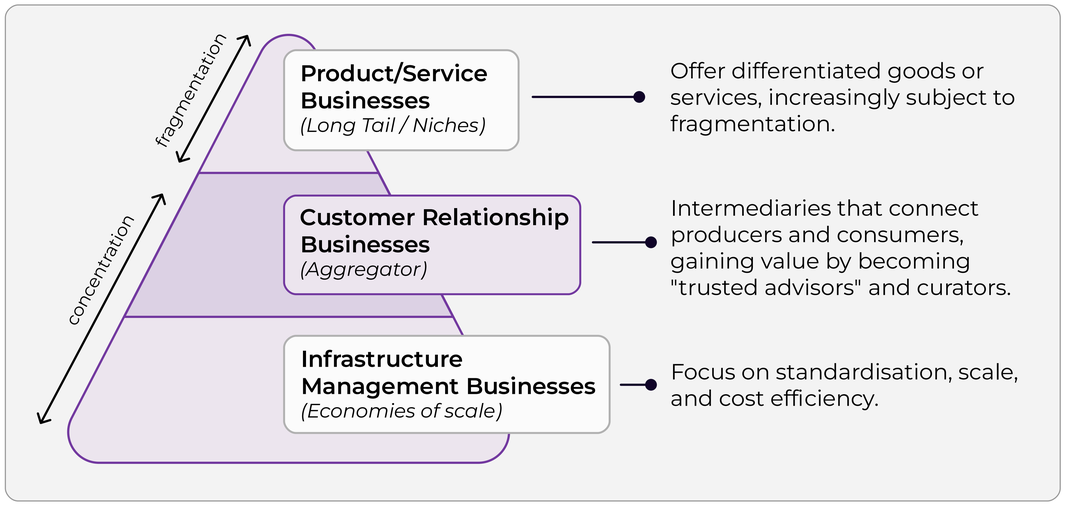


Figure 5.6 Platforms Categorisation and Positioning

In the case of a platform connecting consumers with repairers, the platform aligns with what Hagel defines as a Customer Relationship (C/R) business.

Takeaway

Following Hagel's logic, C/R businesses thrive in an environment of consolidation, where platform trust and matchmaking capacity become strategic differentiators. As industrial mass-customisation of repairs is infeasible due to high transaction and coordination costs, aggregation platforms play a crucial role.

To add to that, Chris Anderson's "Long Tail" theory (Anderson, 2006) highlights how fragmented offerings, like the wide variety of niche repair services, create opportunities for platforms to connect these services with specific customer needs. Rather than scaling through supply ownership, these platforms gain strength by organising fragmented producers into consolidated, trusted networks.

Aggregator Typologies

Aggregators can be further differentiated based on how they relate to supply (Fig. 5.7) (Thompson, 2017).

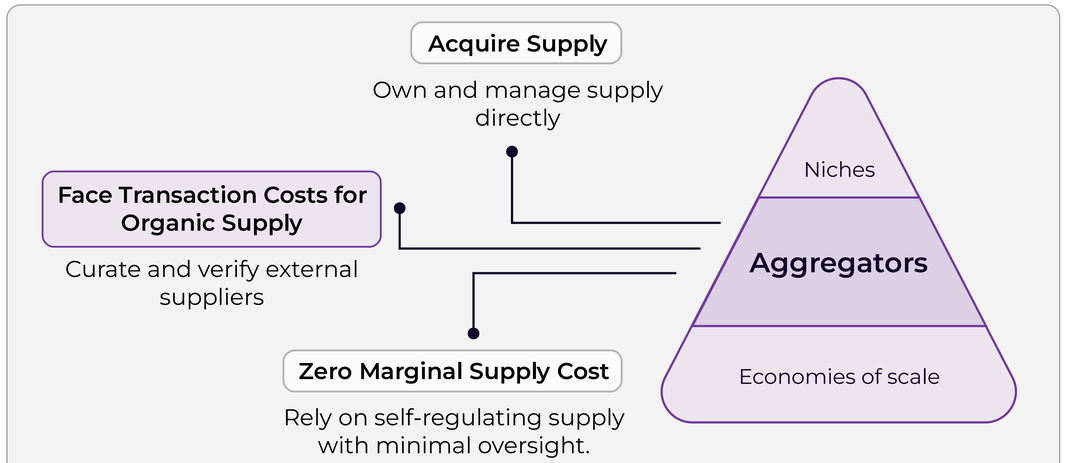


Figure 5.7 Aggregator Typology

The current repair platform (Nationaal Reparateursregister) aligns most closely with the second type, facing transaction costs to assure quality and consistency, where vetting and validation of supply partners is essential for trust. This project does not aim to change how supply partners are sourced, but instead focuses on optimising the user journey and decision-making process.

Takeaway

Platforms Clustering

While the market contains a variety of digital repair solutions, these can be grouped according to their primary driver, either consumer-oriented initiatives or business-led operations, with some hybrid models in between (Fig. 5.6). Community networks (e.g., Restarters, Repair Cafes) and government-subsidized initiatives (e.g., Graz Repariert, Nationaal Reparateurregister) fall under customer-driven ones. Business-driven platforms range from those offering on-site repair services (e.g., Zoofy, Witgoed Brigade) to backend supportive ones (e.g., RepairDesk). However, some platforms fall into a hybrid model, for instance, iFixit sustains its business through sales of spare parts and kits while also offering consumers solutions as community forums, and repair guides.

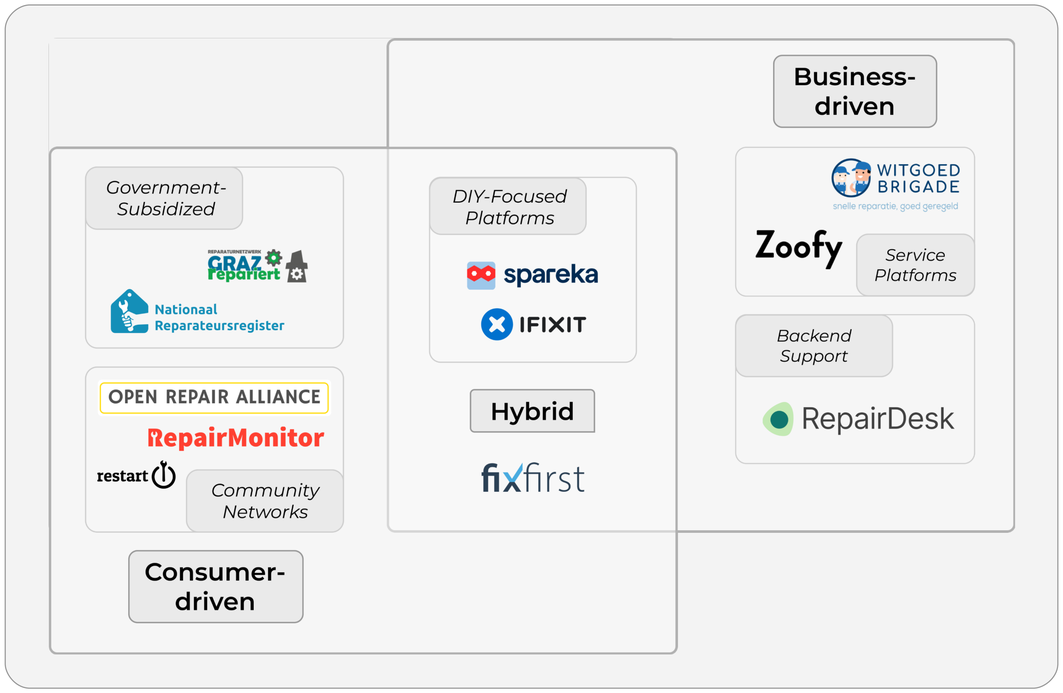


Fig. 5.6 Categorisation of repair platforms

Current Platform Positioning

Before setting the objectives and criteria for the platform design in this project, it is important to define the current strategic positioning of the platform, as represented by the Nationaal Reparateursregister, which serves as the foundation for this project (Table 5.3).

Table 5.3 As-Is Platform Definition

Aspect	Description
Platform Type	Aggregator model facing transaction costs for organic supply of authorised repair shops that meet established quality requirements.
Primary Objective	Enable consumers to easily find reliable and qualified repair companies for electronic devices.
Business Model	Non-monetary value exchange (e.g., visibility, trust, lead generation).
Core Value Proposition	Present affiliated companies that meet strict requirements set by the government, businesses, and manufacturers, and simplify the consumer journey in finding a repair shop.

While the Nationaal Reparateursregister provides basic functional value, primarily acting as a directory of certified repair shops, it does not address fully consumer needs and behavioural factors. Its aggregator model offers limited added value beyond what general mapping tools already provide, apart from a quality mark. This narrow focus highlights the need for a more strategically designed platform that builds repair willingness.

Takeaway

5.4.2 Benchmarking of Existing Platforms

Current repair platforms (e.g., repair directories) often act as passive listing services rather than active enablers of repair (Güsser-Fachbach et al., 2023a). Lechner et al. (2021) argue that these directories fail to stimulate repair demand due to limited visibility and user engagement. Emerging efforts like the EU-wide repair platform scheduled for 2027 (European Parliament, 2025) indicate recognition of this problem, but they still operate on infrastructure-level access, rather than addressing the full repair journey.

In line with this infrastructural focus, the Council of the EU has proposed that national platforms (including the Nationaal Reparateursregister) must include multiple key components.

Those are searchable directories of repair professionals, the location of Repair Cafés, the European Repair Information Form (for standardized repair quotes), and listings for refurbished goods (Council of the EU, 2023). However, in the Dutch case, the latter two are still absent.

Although grounded in the Nationaal Reparateursregister, this project moves beyond the limitations of current EU regulatory requirements. Rather than serving solely as a listing directory, it aims to introduce a interventions that addresses real needs that actively increase willingness to repair.

Project Scope

In contrast, no comparable national repair incentive scheme exists or is planned in the Dutch context.

> This project scopes the platform beyond policy-driven or financial incentives, focusing on activating other behavioural drivers to encourage repair.
>
> **Project Scope**

To compare how other platforms achieve willingness beyond economic incentive, Table 5.3 benchmarks four platforms based on their existing value propositions.

The comparison also highlights how these platforms address project's defined consumer needs, specifically in the areas of cost, time, feasibility, information, and trust, which have been scoped as primary focus.

Research Activity Objectives

- Evaluate if predefined needs (e.g., cost, time) align with real user priorities in the context of professional repair in the Netherlands.
- Identify and categorise explicit, tacit and latent needs.
- Inform the creation of the customer journey map.

Table 5.3 Digital Platforms Benchmark

Countries Scope	FR (France)	GB (United Kingdom)	DE, GB, AT, FR	International
Platform	spareka	restart	fixfirst	IFIXIT
Cost & Viability	French Repair Bonus Program; Spare parts market and pricing; Fixed on-site repair price;	Hosting SME businesses on platform map; 50% Repair Voucher	Repair voucher program; AI cost estimates aligned with repairer-specific pricing framework; Membership tiers	Free guides and community advice; Spare parts market and pricing
Time & Duration	Available remote diagnosis within 30 minutes; Self-repair duration indication	-	24 / 7 ai-phone assistant; Smart scheduler adapted to availability;	Active and big community forum with quick responses
Information Clarity & Accessibility	Step-by-step guides; FAQs; Maintenance advices; YouTube channel; Repair Forum;	Repairers Map; Restart Radio Podcasts; Repair Campaigns Calendar; Restart Repairers Forum; Fixometer Global Impact Stats	Repairers Map, Service Provider Profiles	Hi-res images and markup tools; Video instructions; YouTube channel
Mental Valuation & Feasibility	Chatbot diagnosis; Difficulty level; 8m+ spare parts;	eSpares Advice Center (Repair Guides)	Remote diagnostics; AI chat & error diagnosis; Repair form submission with photos;	Difficulty level; Community-edited guides; iFixit repair kits; 119m+ manuals
Quality & Trust	2m+ completed repairs; 900+ tutorials; Customer Sentiments; Repair Partners; QualiRépar certified repairers	Fetch ratings from Google (SME with 80% > positive reviews); At least a one-month warranty on repairs.	Recommend a repairer form; Self-regulated supply with minimal oversight on quality of providers; EU-funded badge	Expert community responses and advices; Badge system in Answers; Community moderation; 100+m repairs; Quality Guarantee

Comparative Takeaways

Platforms like Spareka and iFixit often retain users within their ecosystems by directing them to proprietary resources, e.g. self-repair guides, spare part marketplace. Conversely, Google Gemini's as a repair solution utilises external sources, fulfilling a more mediatory role, yet the resources it redirect to are not monitored for quality.

> Instead of creating new guides, the platform’s focus should be on integrating existing resources, while curating content based on quality checks.
>
> **Takeaway**

Different platforms target consumer trust in different means. Restarters does that through aggregating repairers, that score above 80% and have at least 10 reviews on Google. Spareka employs the QualiRépar label, backed by France’s government Repair Bonus. Cooperation, as seen in Graz Repariert, enhances efficiency and service quality through knowledge sharing, joint spare parts acquisition, and collaborative repair efforts (Lechner et al., 2021).

> The platform’s key focus should therefore be to maintain an integrative role between stakeholders, while still keeping a lead in quality control.
>
> **Takeaway**

Multiple platforms, including JaFix, Witgoed Brigade, FixFirst and Spareka utulise AI within their platforms. The main and recurring way of using it is in a chatbot format to help locate guides and repair service option. Spareka outperforms all, though, leveraging a decision tree model, to guide consumers through diagnosis while linking to their proprietary guides and spare part marketplace,

> Adapting a decision making model with large model capabilities, but extending it beyond chatbot functionality and resources listing, is a key opportunity space.
>
> **Takeaway**

Finally, community repair initiatives, including Restarters Fixometer, Open Repair Alliance, and Repair Monitor, though seemingly unrelated to professional repair platforms, offer valuable practices in data collection and open-source sharing. This data mostly includes key information, such as device type, model, year of production, symptoms, problems, and outcomes (e.g., fixed, partially fixed, or deemed end-of-life, with reasoning), offering ground for further conclusions on repair scenarios. While professional repair stores collect similar data, they often restrict access, sharing it only with business partners or manufacturers. This limits open knowledge on out-of-warranty repairs.

> Leveraging data from community repairs allows the platform to give consumers data-informed predictions, e.g. an estimated community repair success rate, or estimate on symptom likelihood based on device information.
>
> **Takeaway**

5.5 Implications to Platform Design

The findings of this chapter lead to a strategic redefinition of the platform's role from a mere directory of repair professionals to a mediating infrastructure that connects, aligns, and empowers both supply and demand in repair. This resulted in a new overarching platform objective for Mediation (Fig. 4.10).

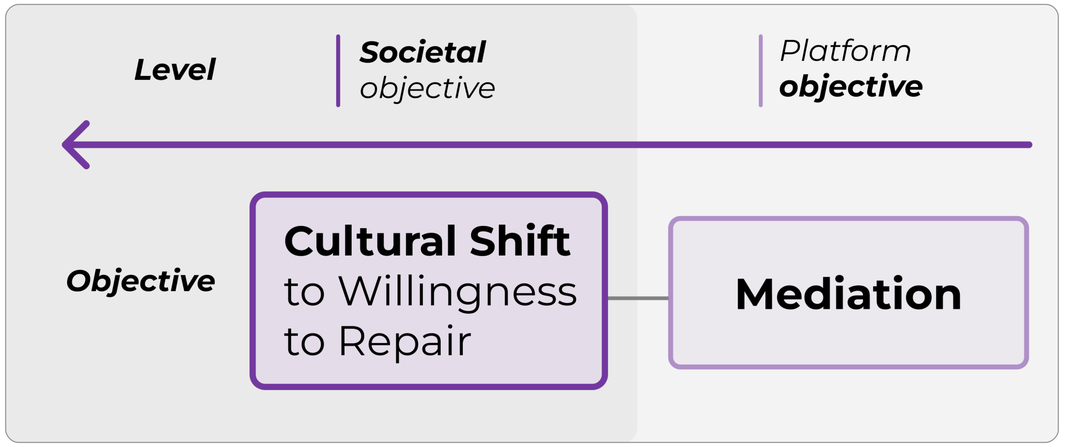


Figure 5.7 Platform Objectives from Chapter 5

Mediation
Objective

The platform serves as a trusted, unbiased intermediary that integrates professional solutions and stakeholder perspectives.

This chapter takeaways contributed to newly identified and other criteria to the platform as explained in Fig. 5.8.

Legend Criteria | Implication from chapter

Non-biased Governance

The chapter's stakeholder analysis and value tension mapping revealed conflicts and power imbalances within the repair ecosystem. Professional repairers, community repair initiatives and others often operate with varying access to tools and parts, risking fragmentation and undermining consumer confidence.

Therefore, non-biased governance means the platform must remain neutral and inclusive across all repair types, rather than prioritising professional services alone. It also means avoiding assumptions about users' repair preferences or capabilities based on personal data, to respect diverse repair motivations and needs.

Integrative Strategy Newly Derived

The benchmarking of existing repair platforms revealed that current solutions tend to operate in isolation, focusing either on parts sales, lead directories, or community forums without connecting these into a seamless repair journey.

Based on these insights, the chapter concludes that a successful platform must adopt an integrative strategy creating meaningful connections between fragmented actors. This includes, for example, leveraging community-generated data and repairer cost information to optimise consumer guidance and decision-making.

Fig. 5.8 Criteria from Chapter 5

RQ.4: *How can a repair platform navigate stakeholder roles, dependencies, and tensions?*

> ***Sub-RQ.4:*** *How should it position itself relative to existing repair solutions?*

This chapter elaborated on how a repair platform can navigate stakeholder roles, interdependencies, and tensions by moving beyond a static directory model toward a mediating infrastructure that actively connects and aligns both supply and demand in repair. Mapping the Dutch repair ecosystem revealed that professional repairers, consumers and other intermediaries operate within fragmented networks, with overlapping needs but also value tensions. Addressing these tensions requires the platform to facilitate value exchange without privileging one actor group over another.

In answering how the platform should position itself relative to existing repair solutions, the chapter benchmarked current intermediaries and found that many function as narrow lead-generation tools or price-comparison services, often neglecting integrative functions such as process flow coordination or relationship building. This analysis underscored the strategic opportunity for differentiation by positioning the platform as a trusted, unbiased mediator that integrates professional repair solutions with diverse stakeholder perspectives, rather than adding value solely on transactional speed, cost or its repairers' network size.

These findings led to a strategic redefinition of the platform's role, formalised in the new Mediation objective, and the criteria to adopt non-biased governance and pursue an integrative strategy.

6.

Platform’s Objectives, Criteria and Opportunities Framing

Summary

This chapter consolidates the strategic direction of the platform by translating prior research findings into actionable design guidance. It begins by clarifying the design focus, outlining the future vision, overarching project scope, and objectives that will guide subsequent decision-making. The chapter then defines design criteria that specify how these objectives should be realised in practice.

Building on this foundation, the opportunities framing synthesises key insights to identify areas where the platform can create the most meaningful and differentiated impact. Together, the objectives, criteria, and opportunity spaces establish a structured framework for guiding future design choices.

Content

6.1 Design Focus
6.2 Design Criteria
6.3 Opportunities Framing

6.1 Design Focus

6.1.1 Future Vision

A future vision statement is used as a guiding principle and expression of the desired future, Fig. 6.1 captures previously defined project objectives and criteria together, highlighting what the design aims to achieve on societal-wide level, how by explaining the platform goals, and define clearly when, where, and who will realise this vision (Simonse, 2024).

Vision:

In 2030, Techniek Nederland has achieved a full cultural shift in repair willingness and trust in professional services. Leveraging the Nationaal Reparateursregister, it offers a fully transparent diagnosis pathway, with insights into repair costs, time, and failure diagnosis from the moment an electronic breaks down to making a repair decision.

Societal Goals

Core aspiration for societal-wide behavioural change.

Platform Goals

Transparency as main goal, and cost, time, and early diagnosis as sub-goals.

Where, When, Who

Timeframe of vision, central leading entity, and key repair journey moments.

Fig. 6.1 Future Vision

6.1.2 Design Objectives

A project scope has been established and reflected based on research findings. Fig. 6.2 captures a high-level overview of what the project has predefined as in and out of scope, and will further take as selection criteria for project's opportunities and solutions.

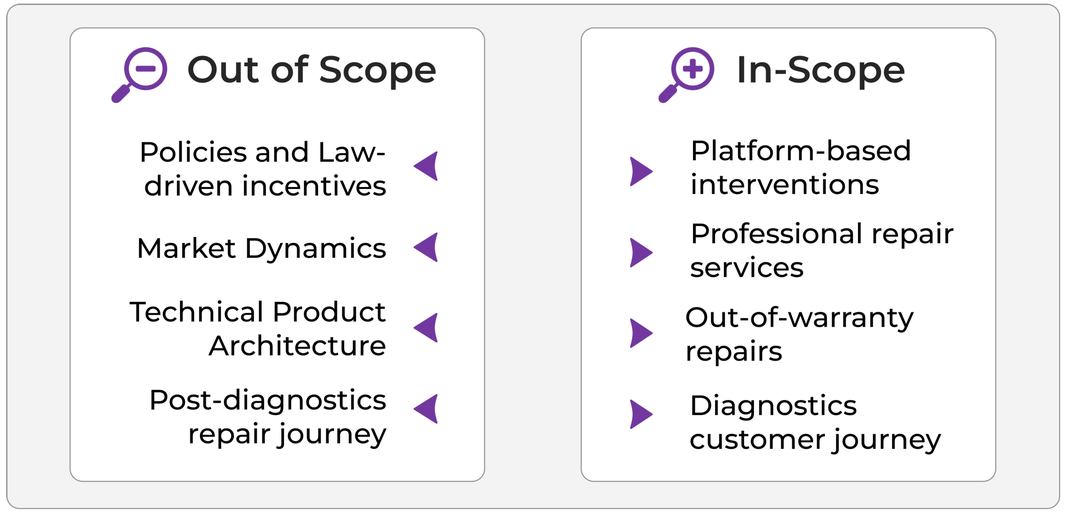


Figure 6.2 In and out of project scope overview

Through this report multiple project objectives have been defined from the implications after each chapter. A top-down design approach was employed to organise those, starting with overarching societal objectives and systematically decomposing them into platform-specific objectives, down to criteria/requirements that are free of solution bias. By decoupling the design process from biases inherent in the existing platform (i.e. Nationaal Reparateurregister), this approach allows for a higher degree of abstraction and the development of more visionary, future-focused criteria and interventions (Hartson & Pyla, 2018). As a reflection of all objectives, a multi-level framework specific to this project was developed with a clear linkage and distinction between objectives (Fig. 6.3).

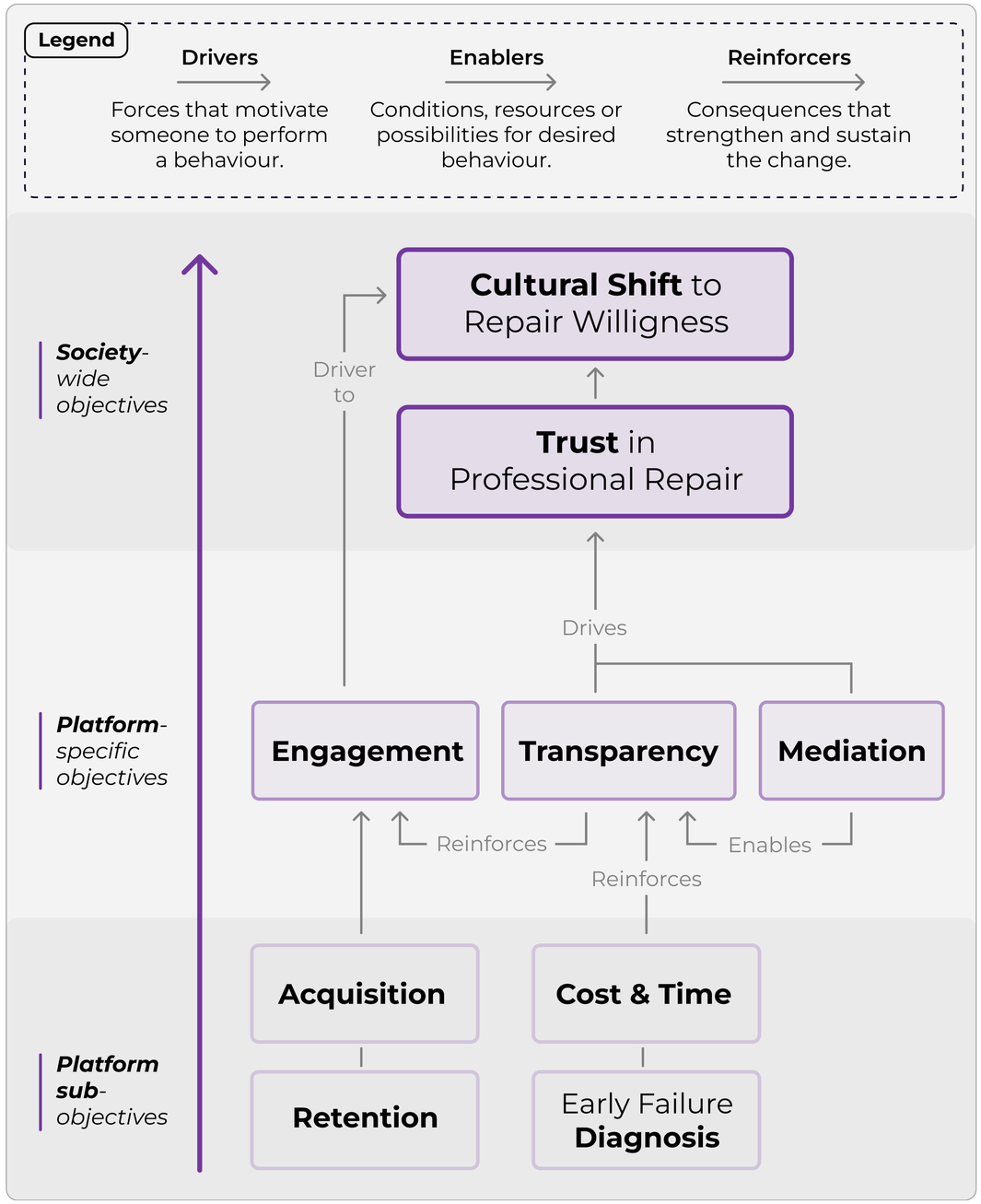


Figure 6.3 Society and Platform Objectives

Understanding the interplay of enablers, drivers, and reinforcers among the framework is crucial for creating lasting behavioural change. A description elaborating on what each of those elements represents is attached in the legend of Fig. 6.3.

This project proposes three key platform-specific objectives derived from research activities, Transparency (*Chapter 3*), Engagement (*Chapter 4*) and Mediation (*Chapter 5*). Whereby, Engagement and Transparency split further into multiple sub-objectives that define further their scope. Each objective description includes key criteria and related sub-objectives, providing a clear and structured scope for design decisions. The complete objective descriptions are as follows:

Transparency Objective	The platform establishes transparency across early failure diagnosis, time estimation, and cost clarity through a data-driven, clear, and hyper-contextual pathway.
Mediation Objective	The platform serves as a trusted, unbiased intermediary that integrates professional solutions and stakeholder perspectives.
Engagement Objective	The platform drives user acquisition and retention by relevant entry points and ongoing value delivery.

6.2 Design Criteria

While objectives represent WHAT the platform aims to achieve, criteria define HOW these objectives are operationalised through specific design requirements. This project uses the MoSCoW prioritisation method for dividing criteria and ranking them across must, should and could ones. The presented criteria were also derived and grounded in research throughout the chapters, and are consolidated with linkage to the platform objective they relate to in Fig. 6.4. Below are summaries of the key criteria groups and their definitions:

Transparency

For the transparency objective, the requirements are grouped based on where they apply within the platform's operation, e.g input (what information comes in), process (how that information is handled), and output (what the platform delivers to users).

Input → Data-Driven
All decision-making and platform logic **must** be grounded in contextual data rather than static assumptions.

Process → Multi-Tier & Hypercontextual
The journey from problem to solution **must** be tiered (offering different levels of involvement or detail depending on user needs) and adaptive to context, such as device type, urgency, or user knowledge.

Output → Clear
The results or outcomes provided to users **must** be unambiguous, decision-supportive, and understandable without expert knowledge.

MoSCoW	*Platform Objectives (O)*	*Category*	*Criteria*
Must	Transparency	Input	Data-driven
		Process	Multi-tier & Hypercontextual
		Output	Clear
Should	Mediation	Governance	Non-biased
		Strategy	Integrative
Could	Engagement	Acquisition	Value-based
		Retention	

Figure 6.4 Platform Criteria

Mediation

Governance → Non-Biased
The platform **should** not favour specific brands, repair providers, or commercial interests in how it ranks, displays, or recommends services and outcomes. It should also avoid using personal identifiers in ways that could bias how the platform perceives and treats users.

Strategy → Integrative
Platform design **should** connect fragmented landscape of repair solutions, bringing together existing services, resources, and expertise into a single, coherent space. It should ensure that solutions are optimised collectively rather than in isolation.

Engagement

Finally, Engagement criteria defined as "could have" will be reported as recommendations. This allows to focus on must and should have criteria as part of building this project's platform and establishing a targeted scope.

Engagement → Value-based
User acquisition and retention **could** be driven by relevant entry points and value offerings that address real user needs.

6.3 Opportunity Framing

In the context of this project, an opportunity is defined as an unmet customer need, pain point, or desire (Torres, 2021). A strong opportunity gives room to understand the problem, come up with a hypothesis, and run experimentation, and has adapted the following well-known in creative facilitation formula of "How Might We" (Fig. 6.5), whereby the target user was defined back in Chapter 4, and the intended action is framed in this chapter through the project's objectives.

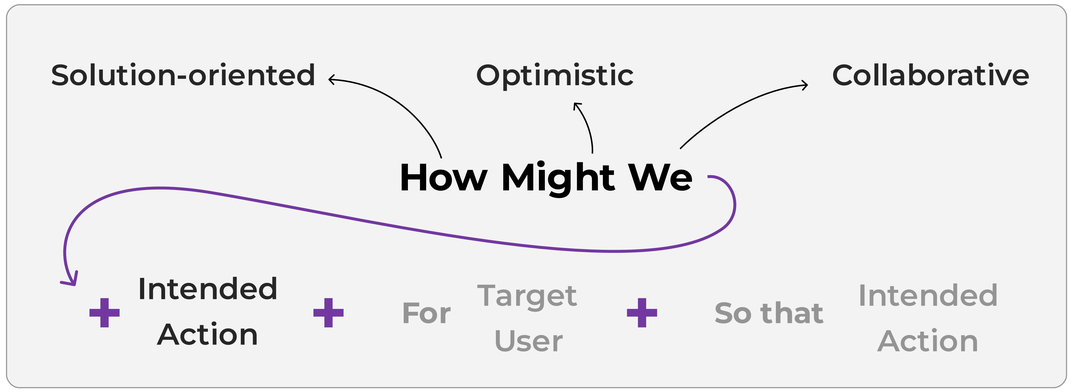


Fig. 6.5 "How Might We" Formula

The process of defining opportunities began with translating exploratory research insights into opportunity prompts, ensuring alignment with overarching project objectives. Identifying the right opportunities was iterative, requiring repeated evaluation, narrowing, and refinement based on research findings. Following a methodology adapted from Politecnico di Milano, each opportunity prompt included four key elements as elaborated in Fig. 6.6.

While justification and assumptions served as internal scoping tools, they were excluded from further external brainstorming activities to avoid bias. A full overview of all opportunity prompts is available in Appendix N.

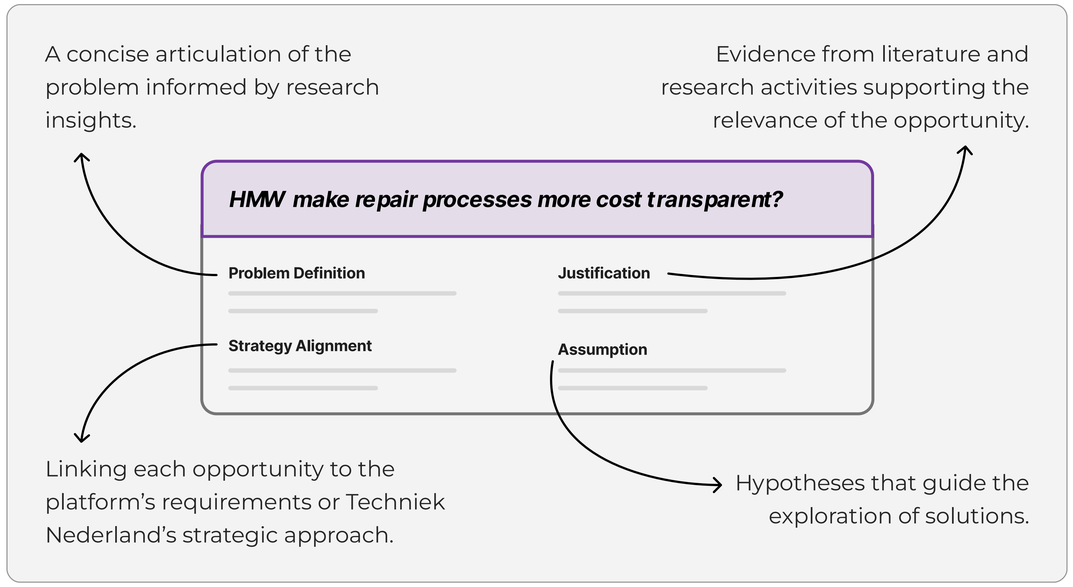


Fig. 6.6 Opportunity Prompts Structure

To connect the problem definitions to actionable opportunities, an Opportunity-Solution Tree (OST) was created. This tool is a structured framework to guide the development of actionable interventions by systematically exploring and prioritising opportunities derived from exploratory research insights (Torres, 2021). This project takes advantage of the OST primarily to connect Strategy (top-level objectives and desired business results) and Discovery (Opportunities identified through research and interviews, linked to strategic alignment), with a simplified model used for clustering and selecting opportunity spaces in Fig. 6.7. The full model is attached in Appendix O.

The final selected opportunity spaces reflect the scope and objectives that this project has predefined. Mediation opportunities, as ones staying on broader level and risking the ideations to not land on concrete intervention solutions have been excluded (Fig. 6.7).

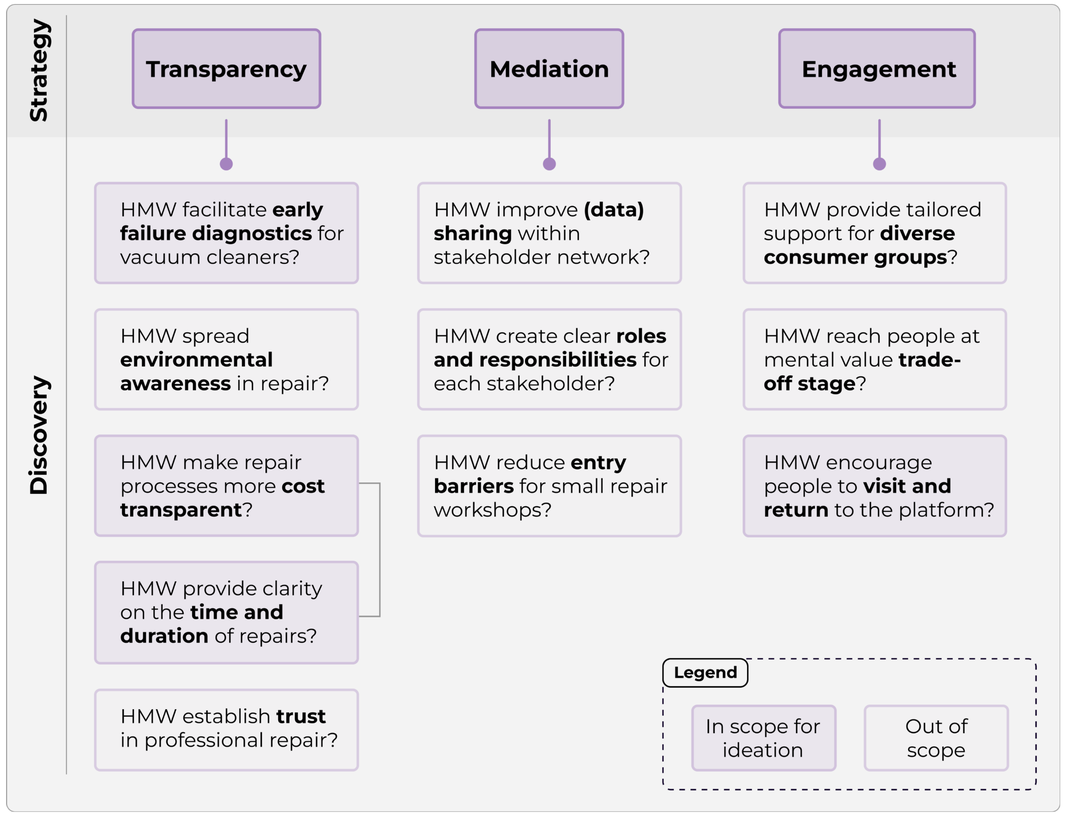


Fig. 6.7 Simplified Opportunity Solution Tree (OST) Model

Based on further learnings and iteration, all opportunities were narrowed down to three core ones, as reflected in Fig. 6.8. These opportunities were selected based on their alignment with the platform's scope and objectives. Each opportunity is formulated as a "How might we" question, grounded with a supporting problem statement, and linkage to the platform's objective. These opportunities will serve further as a foundation for directing the ideas brainstorming activities and subsequent concept development.

Legend

Opportunity | Problem Statement | Strategy Alignment

HMW facilitate early failure diagnostics for vacuum cleaners?

Many consumers lack clarity on repair feasibility and struggle to identify the actual issue, often believing their product is beyond repair. Although resources like videos and repair forums exist, information overload and misinterpretation frequently lead to exaggerated perceptions of brokenness, driving premature disposal.

Transparency Design Objective

HMW make repair processes more cost and time transparent?

Serviced repairs outside warranty are often costly in the Netherlands due to high labour and spare part prices, making new budget vacuum cleaners (€100–€150) seem more viable than repair. Lack of transparency around pricing, and unpredictable repair times (48 hours to 3 weeks), further discourage consumers from choosing repair.

Transparency Design Objective

HMW encourage people to visit and stay in the platform?

The platform struggles with low consumer awareness and poor integration into the typical post-breakdown journey, resulting in limited traffic and engagement. This reduced visibility weakens its value for professional repairers, who see little business potential or reason to join the network.

Engagement Design Objective

Fig. 6.8 Final Opportunity Selection

While trust was initially considered as a standalone opportunity and was included within brainstorming activities, it was later reframed as a societal-level ambition since establishing trust within the repair industry is inherently complex, spanning multiple levels and dimensions. As such, trust is not represented in this final selection of platform opportunities, but rather serves as an overarching principle that connects and reinforces the platform's long-term direction across all interventions.

7.

Ideation and Platform Interventions Selection

Summary

> ***RQ.5:*** *What platform interventions should be prioritised and why?*

This chapter builds on the research insights, scoping, and requirements established earlier in the project, using them as a foundation for the ideation activities.

It begins by outlining the ideas generation activities, including brainstorming sessions with stakeholders and designers. The chapter then presents an overview and selection of the ideas. Finally, it discusses the implications of these ideas for the platform design, highlighting how the concepts inform key capabilities and further considerations.

Finally, the most prominent ideas from the research activities and creative sessions are evaluated against the requirements of this project's platform to help select and advance towards the final design.

Content

7.1 Ideas Generation Activities
7.2 Ideas Overview and Selection
7.3 Implications to Platform Design

7.1. Ideas Generation Activities

7.1.1 Personal Ideation

Initial ideas for the platform design were developed through personal reflection during the project's research phase. An exploratory sketching activity was used to generate and document these early concepts, helping to visualise possible platform interventions and interactions. Figure 7.1 presents a sample of these initial ideas sketches.

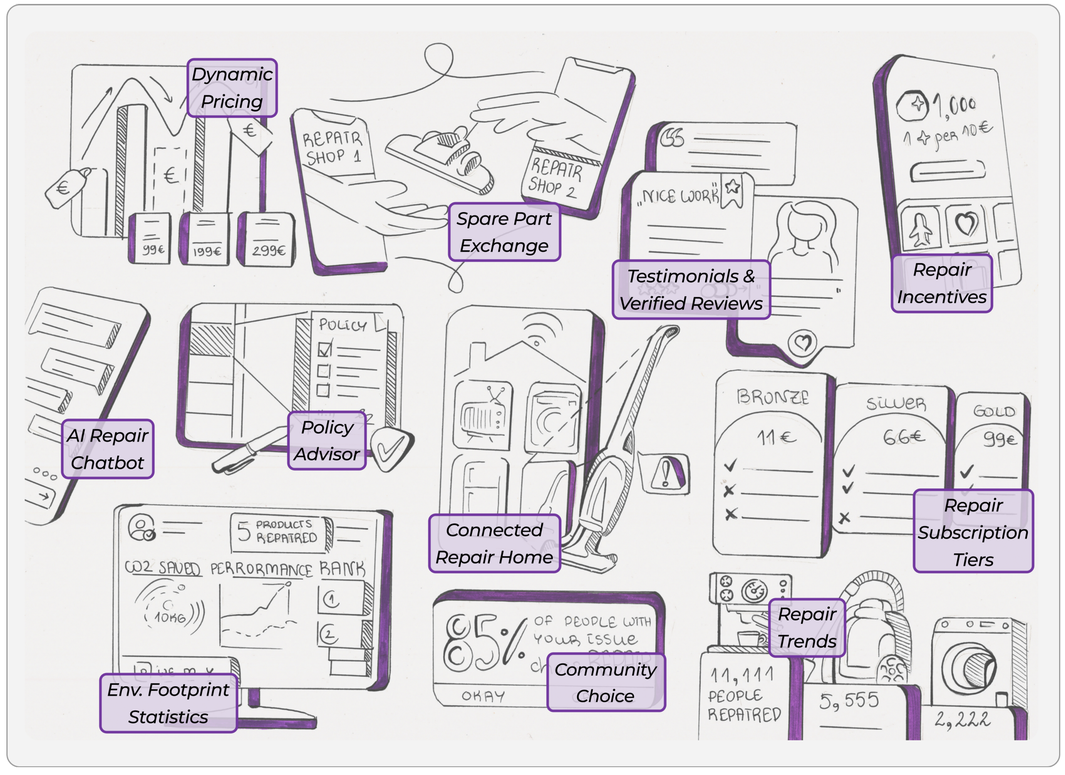


Figure 7.1 Exploratory Sketches (Impression Image)

7.1.2 Research Activities Derived Ideas

In parallel, additional platform-relevant ideas were derived from qualitative data gathered through expert interviews and stakeholder conversations within the repair ecosystem. These ideas were extracted through thematic coding, then documented with accompanying descriptions and supporting quotes in Appendix P.

7.1.3 Brainstorming Sessions

To further expand the ideation process and generate opportunity-directed ideas aligned with the platform's main objectives, two structured brainstorming sessions were conducted, one with professional designers, and one with repair stakeholders.

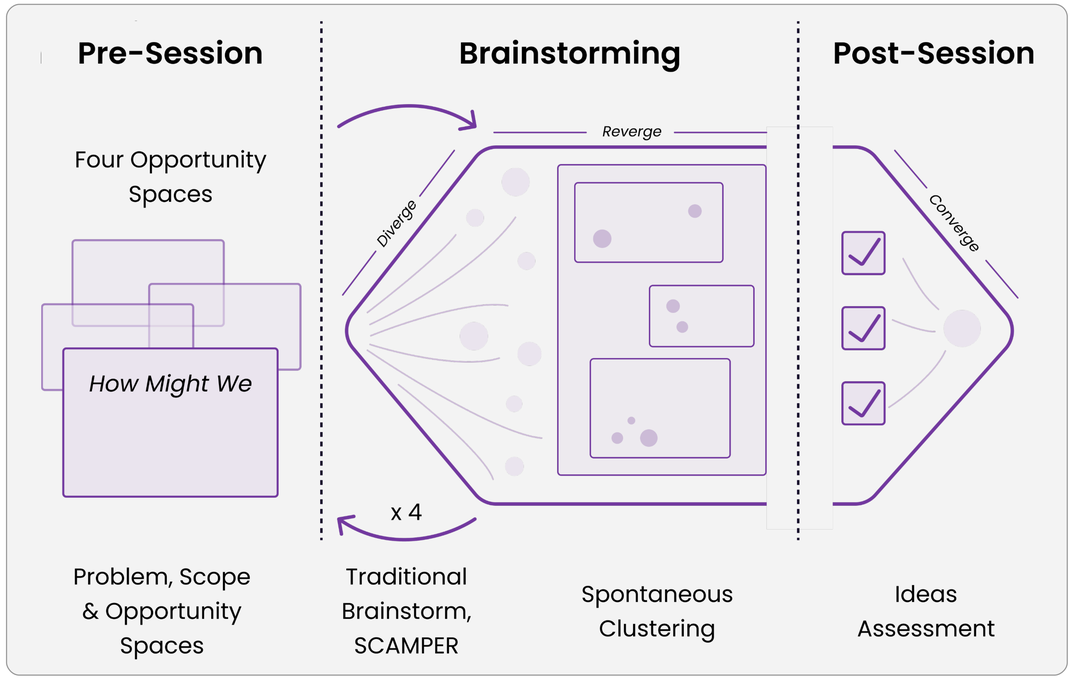


Figure 7.2 Brainstorming Sessions Setup

Prior to the sessions, participants were provided with a brief outlining the platform's scope, constraints, and strategic goals. This ensured the relevance and applicability of ideas generated during the sessions. The sessions were guided by the "How might we" (HMW) questions introduced in Chapter 6, each associated with a clearly defined opportunity space and problem statement.

The ideation approach followed the Integrated Creative Problem Solving (iCPS) framework, utilizing methods such as HMW framing, traditional brainstorming, SCAMPER, and spontaneous clustering (Figure 7.2). SCAMPER was used as a background prompt to promote divergent thinking and encourage participants to go beyond conventional assumptions. Given that this project addressed a well-defined problem space, which had already been thoroughly researched, the focus of the sessions was not on problem-finding. Rather, participants worked from clearly formulated problem statements, which were introduced prior to the each round.

Each brainstorming session followed four rounds, one per opportunity space, with clustering of ideas performed only after all rounds were completed. This decision helped to preserve creative momentum during the diverging phase and shifted the focus to synthesis and comparison only after the full spectrum of ideas had been explored.

The stakeholder workshop was held online using Miro and Microsoft Teams as supporting platforms, while the designer workshop was conducted in person.

Stakeholders' Brainstorming

The six participants of the stakeholder workshop were from different parts of the repair stakeholder map, Those included a repair consultant, a manager at an online retailer, two managers at repair services, an owner of a repair platform, and a project manager from Techniek Nederland, totalling six participants. All generated ideas from this session are available in Appendix Q (Fig. Q.1).

Designers' Brainstorming

The three participants selected for the designer workshop represented the three master's programmes within the Faculty of Industrial Design Engineering at TU Delft (Design for Interaction, Strategic Product Design, and Integrated Product Design) giving a unique perspective and diversity in the generated ideas. All participants were screened before participation that they have repaired an electronic either professionally or by themselves, in order to ensure some basic understanding of the problem area. Fig. 7.3 gives an impression from the session's setting. All clustered ideas are in Appendix Q (Fig. Q.2).



Figure 7.3 Impression image from designers' brainstorming

7.2. Ideas Overview and Selection

All ideation activities resulted in an extensive range of ideas. Converging through techniques such as dot-voting was intentionally avoided during the brainstorming sessions. This decision was made to preserve the exploratory and divergent nature of the sessions and to prevent premature narrowing of the solution space. Instead, the final evaluation of ideas was conducted post-session, applying multiple assessment layers grounded in the platform's established scope, strategic objectives, design criteria, and informed by design intuition.

Table 7.1 presents examples of ideas that were not taken forward, categorising them based on the reasons for exclusion. While some ideas may have failed to meet only a single criterion, others were excluded due to cumulative misalignment across multiple assessment layers. The table serves to illustrate how decisions were made, emphasising the rationale behind convergence.

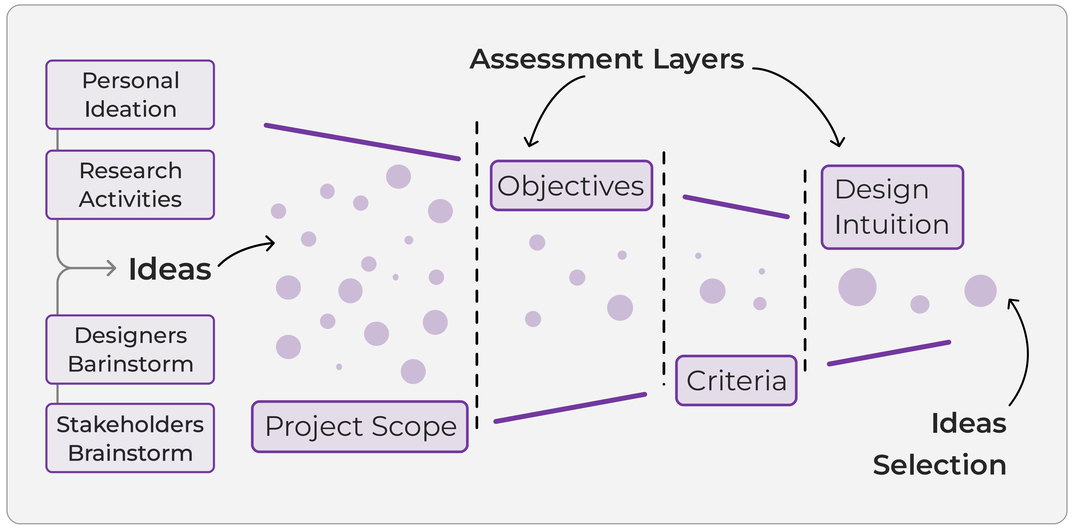


Figure 7.4 Ideas Selection Process

Table 7.1 Design Ideas Misalignment Types

Ideas	Misalignment Type	Reason for Rejection
Policy Tracker	Scope Misfit	Does not deal with policies and law-driven incentives
Spare Part Exchange (B2B)	Scope Misfit	Falls outside platform's consumer-facing scope
Connected Homes Integration	Scope Misfit	Requires IoT infrastructure beyond current platform scope
AR-guided repair help	Scope Misfit	Likely DIY-oriented, which diverges from platform's focus on "Delegates" as target user.
Gamified Public Ranking	Objective Misfit	Encourages competition rather than transparency
Dynamic Pricing	Objective Misfit	Conflicts with platform goal of transparency and fairness
Behavioural Profiling	Criteria Misfit	Could undermine the platform's value-based positioning and introduces risk on user privacy
Verified Reviews	Criteria Misfit	Visibility bias by repairers with more visibility attract more jobs, creating self-reinforcing loops
Testimonials, User Stories	Criteria Misfit	Introduce social proof bias and may obscure more data-driven information.
Repair Now, Pay Later (Klarna)	Design Intuition Misfit	Reinforces purchase-style consumer behavior
"Done in 48h or Free"	Design Intuition Misfit	Promises unrealistic turnaround and may reduce trust if unmet

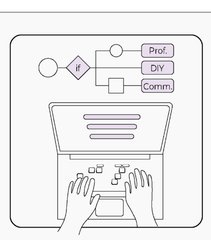
Rejected ideas also played a critical role in strengthening the project's direction. They helped define the boundaries of what the platform should not become and highlighted key user sensitivities and platform constraints. For instance, while ideas like dynamic pricing could offer commercial potential of repair services, they risk undermining perceived fairness

Takeaway

Following the assessment process, a refined set of nine design ideas was selected for further development. These ideas were chosen based on their responsiveness to the defined design criteria such as being data-driven, hypercontextual, etc. To make this alignment explicit, Figure 7.5 presents each selected idea together with a concise overview of its functionality, and how the idea supports or risks design criteria.

Priority Repair Decision Model

A framework for prioritising repairs based on urgency and feasibility

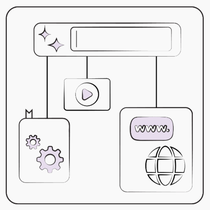


Hypercontextual *Adapts to urgency, appliance, and failure.*

Clear *Risk of misguiding users if back-end logic determines incorrectly severity.*

Sources Repository

An AI-powered database that redirects users to relevant existing information.



Data-driven *Uses historical data from many repair cases.*

Non-bias *Risks bias if sources are limited to brand-provided or regional data.*

Integrative *Anchors information from multiple data sources.*

Prompt Design

A prompt-building tool that guides users in crafting precise prompts for diagnosis.

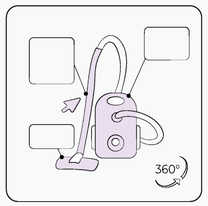


Clear *Reduces friction and ambiguity in user interaction with AI.*

Value-Based *Empowers users with autonomy and better outcomes.*

Exploded Diagram View

An interactive visual breakdown of product components for easy part searches.



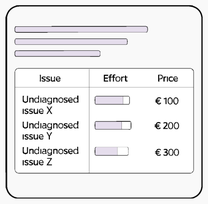
Clear *Might fail to support all failures (e.g. internal), assumes some user technical knowledge.*

Hypercontextual *Model- and brand-specific view for relevance.*

Integrative *Can embed links to spare parts or service options.*

Preliminary Advisory Report

An overview of undiagnosed issues, summarising user-reported symptoms.



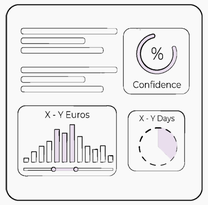
Clear *Gives users an at-a-glance understanding of their situation.*

Hypercontextual *Adapts to symptom patterns, and user inputs.*

Non-bias *Relies on factual input, but interpretations risk assumptions*

Cost & Time Estimator

Provides accurate projections as diagrams of repair expenses and duration.



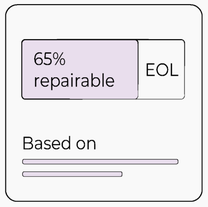
Data-driven *Aggregates case histories and repairer data.*

Hypercontextual *Adjusts for brand, issue, location.*

Integrative *Connects backend logic to front-end decision-making.*

Repairability Rate

A scored metric based on actual repair outcomes, not just design potential.



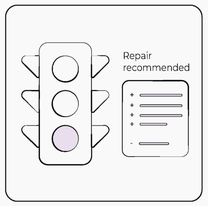
Non-bias *Can currently rely only on available community-submitted data.*

Data-driven *Derived from historical fix success.*

Clear *Conveys expectations at a glance, though may need explanation.*

Repair Traffic Light

A visual colours metaphor indicating whether a repair is recommended.



Clear *Visual simplification of repair difficulty supports quick decision-making.*

Non-bias *Risks oversimplifying complex issues.*

Table 7.5 Ideas Selection and Criteria Overview

7.3 Implications to Platform Design

The selected ideas form the foundation for platform prototyping in the next chapter. Their alignment with user needs and the platform's scope, objectives, and evaluation criteria ensures a coherent and strategically guided design direction.

Individually, none of the ten selected interventions can fully achieve the platform's goals of transparency, engagement, and mediation. Their strength lies in the way they interconnect as a coordinated ecosystem, enabling users to access relevant information, compare and evaluate options, and ultimately reach informed decisions prior to engaging with professional repair services.

The interdependence between interventions also reinforces the platform's layered structure. Downstream tools such as the Cost & Time Estimator, Repair Traffic Light, and Cost Breakdown are heavily dependent on upstream processes like issue identification and contextual filtering. Without these, output-facing interventions risk producing vague, generic, or misleading suggestions, undermining user trust and the platform's decision support role.

The platform's strategy is to add value through cohesive interventions' integration, aligned with the mediation objective.

> Integrative platform strategy

Takeaway

Moreover, across all interventions, it becomes clear that AI capabilities are not just peripheral enhancements but foundational enablers to nearly all of the ideas.

AI supports those through three core capacities, being gathering and structuring diverse repair data (Know), enabling decision-making through classification and prioritisation (Think), and generating outputs like suggestions and recommendations (Act).

For example, the Repairability Rate and Priority Repair Decision Model lean more heavily on Think, processing past data and context to support personalised advice, while the AI Source Repository is enabled by Know, aggregating and organising information from varied sources.

AI is a structural enabler, not an add-on to the platform's interventions, requiring careful consideration of how, where, and when AI capabilities are activated.

> AI as the platform's enabling core

Takeaway

An important implication of the ideation process is the identification of Prompt Design as a foundational, time-sensitive intervention. Given its strong reliance on AI capabilities, Prompt Design will be developed separately and earlier as a transitional concept, advancing the full platform's introduction. It serves as both a practical tool and a societal introduction to the responsible and effective use of AI in the repair context.

Prompt design will set the foundation for broader AI integration within the platform.

> Prompt Design as AI platform precursor

Takeaway

8.

Platform Design, Evaluation and Future Roadmap

Summary

This chapter shows how the research, user needs, and design ideas from the project have come together into a clear direction.

The chapter follows a backcasting approach, starting with the end goal, the future platform, and then working backward to identify the necessary actions for achieving it. The chapter presents an evaluation to project's objectives, criteria as well as a user evaluation study of final design.

Finally, the chapter culminates in a strategic roadmap that acts as a long-term guide toward realising both the platform and its broader societal impact.

Content

8.1 Structuring the Platform Strategy
8.2 Desired Future Platform Design
8.3 Near-term Platform Intervention
8.4 Design Evaluation
8.5 Strategic Roadmap

8.1 Structuring the Platform Strategy

To guide the development of the platform in a structured and future-oriented way, this chapter uses a backcasting approach. It starts with defining a desirable future outcome and then works backward to identify the steps required to reach it. In this project, the future platform vision serves as the anchor point (Fig. 8.1), and has been already defined in Chapter 6. From there, the design process traces backwards to define what platform interventions need to be realised to move towards that end vision.

The project maps both near-term (Horizon 1) and long-term (Horizon 2) designs along this trajectory, whereby also this chapter structure adopts the same approach to explain its findings.

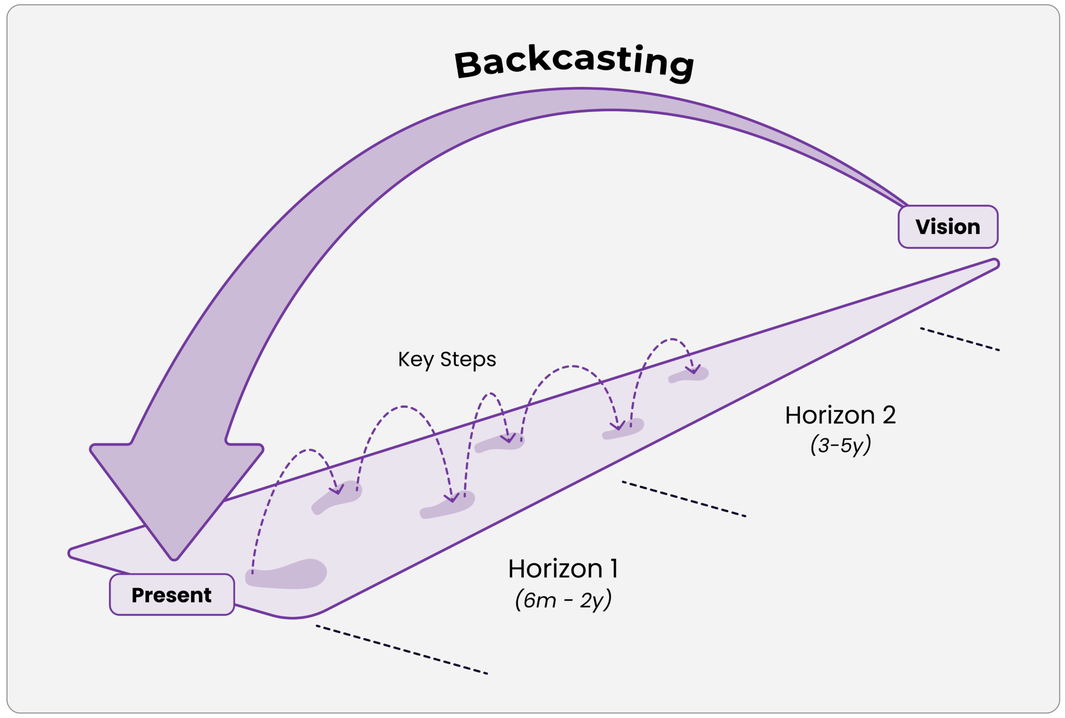


Figure 8.1 Backcasting Approach to Platform Design

8.2 Desired Future Platform Design

8.2.1 Concept Overview

The final platform concept, referred to as Horizon 2, represents the most comprehensive and ambitious vision of the project. It integrates the majority of ideation outcomes and aligns most closely with the project's long-term objectives, evaluation criteria, and desired societal impact.

The platform user journey is split in four main journey stages (Fig. 8.2). The process begins with a **Device Identification** phase, where users are asked to enter basic product information. This is followed by an **Issue Assessment** step that adapts the journey based on the user's knowledge, awareness level, and severity of the issue. Based on this, the platform guides users through a tailored **Step-by-step Diagnostic** flow, ultimately generating an AI-supported final **Repair Advice**.

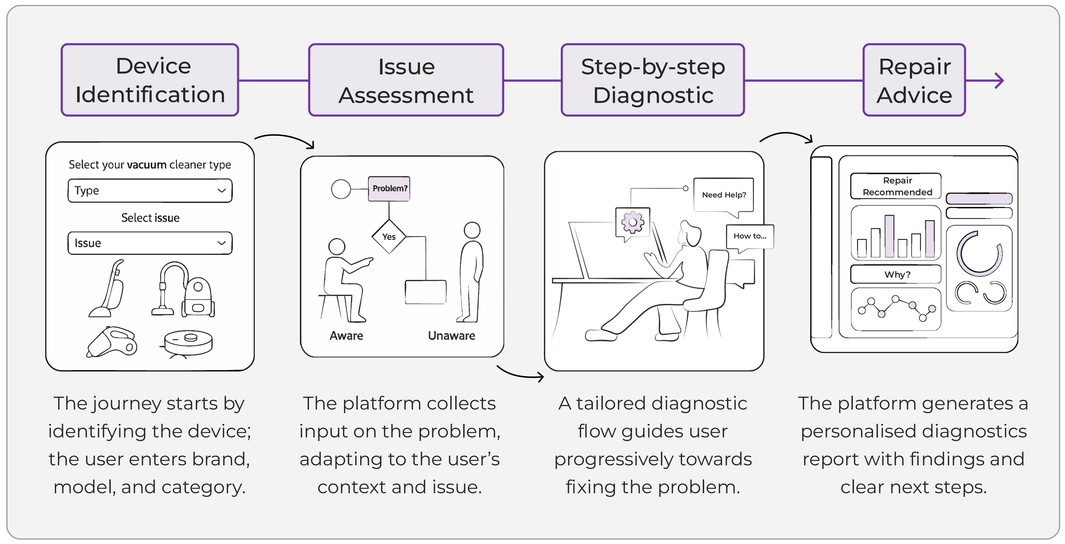


Figure 8.2 Storyboard to Platform's Main Stages

The platform structure is built around three key interactive components, each corresponding to the platform's design criteria categories. These are **the output and input fields, and the progress bar (process)**. The input and output field is the main area where personalised advice and decision support tools are displayed. The progress bar provides users with a clear overview of their current stage in the diagnostic journey. The input is supported by a chatbot functionality, which registers all data that is input enabling follow-up questions to it (Fig. 8.3). Together, these components support a guided user experience. The full user flow is available in Appendix R.

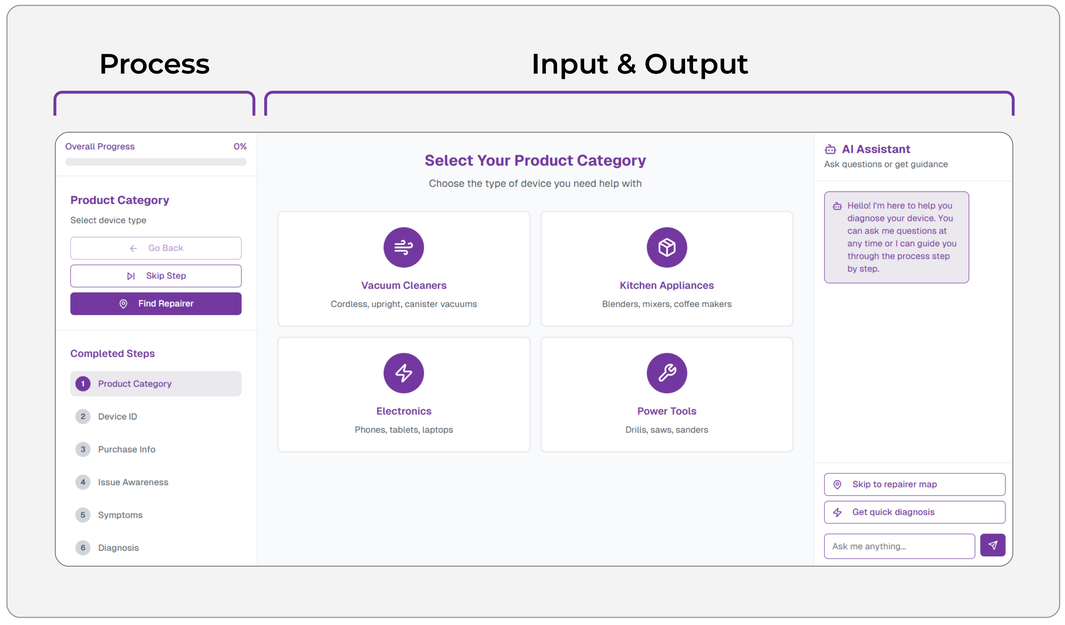


Figure 8.3 Platform Main Screen Components

8.2.2 User Flow

The user journey begins at the platform's landing page, where visitors are welcomed with a clear outline of the main value proposition, the main steps of the platform flow and the option to start a registration-free product diagnosis (Fig. 8.4).

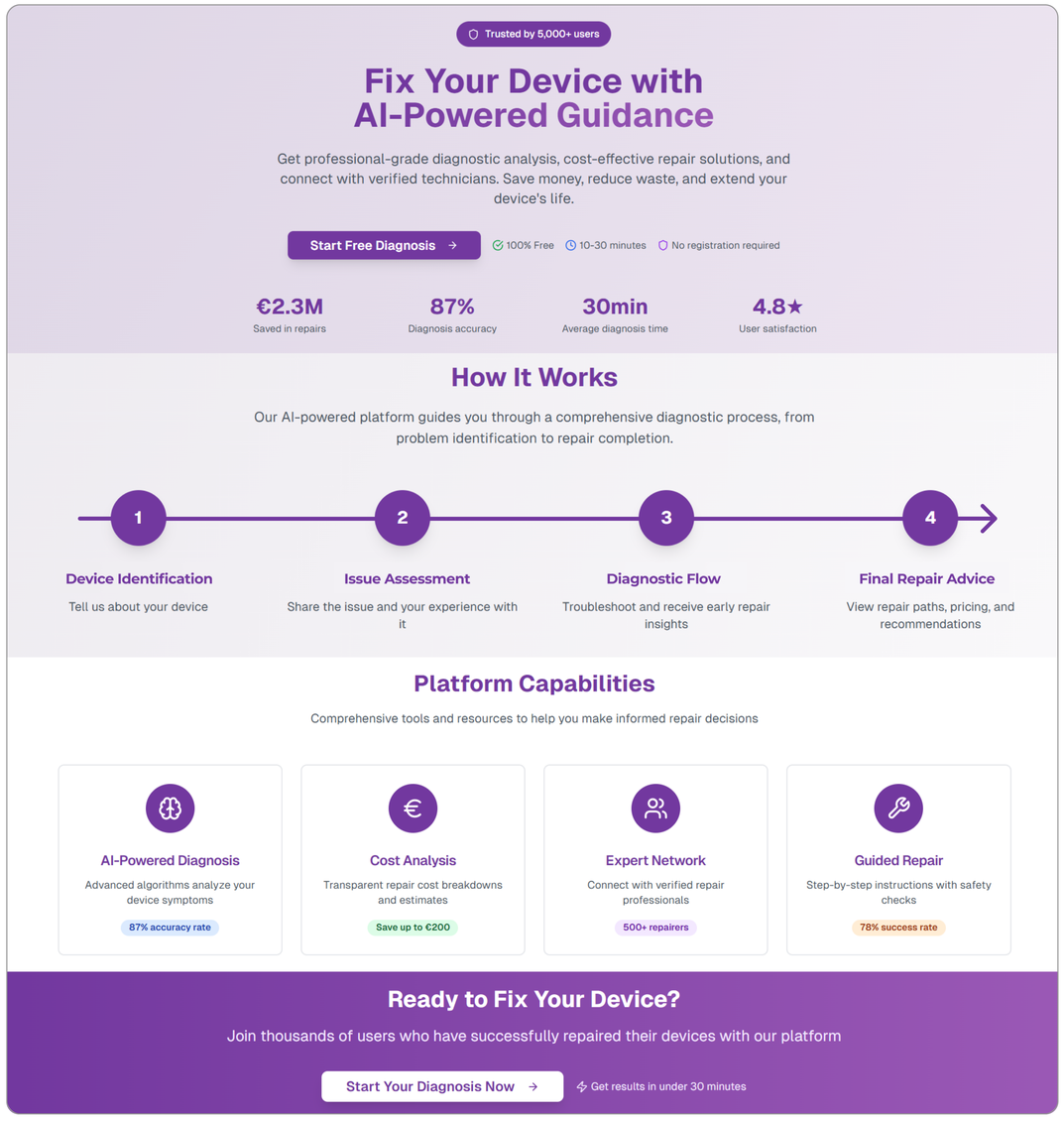


Figure 8.4 Landing Page

Device Identification

The onboarding process begins with selecting the product category of the malfunctioning device (Fig. 8.5 (1)). To enrich the diagnostic outcome and contextual accuracy, users are prompted to enter provide details in priority order, serial number, model, and device type (Fig. 8.5 (2)). After identifying the device, the platform asks for the purchase date to check for active warranties and, where applicable, redirect users to official repair services (Fig. 8.5 (3)). This step helps filter out cases better handled under statutory or commercial warranty.

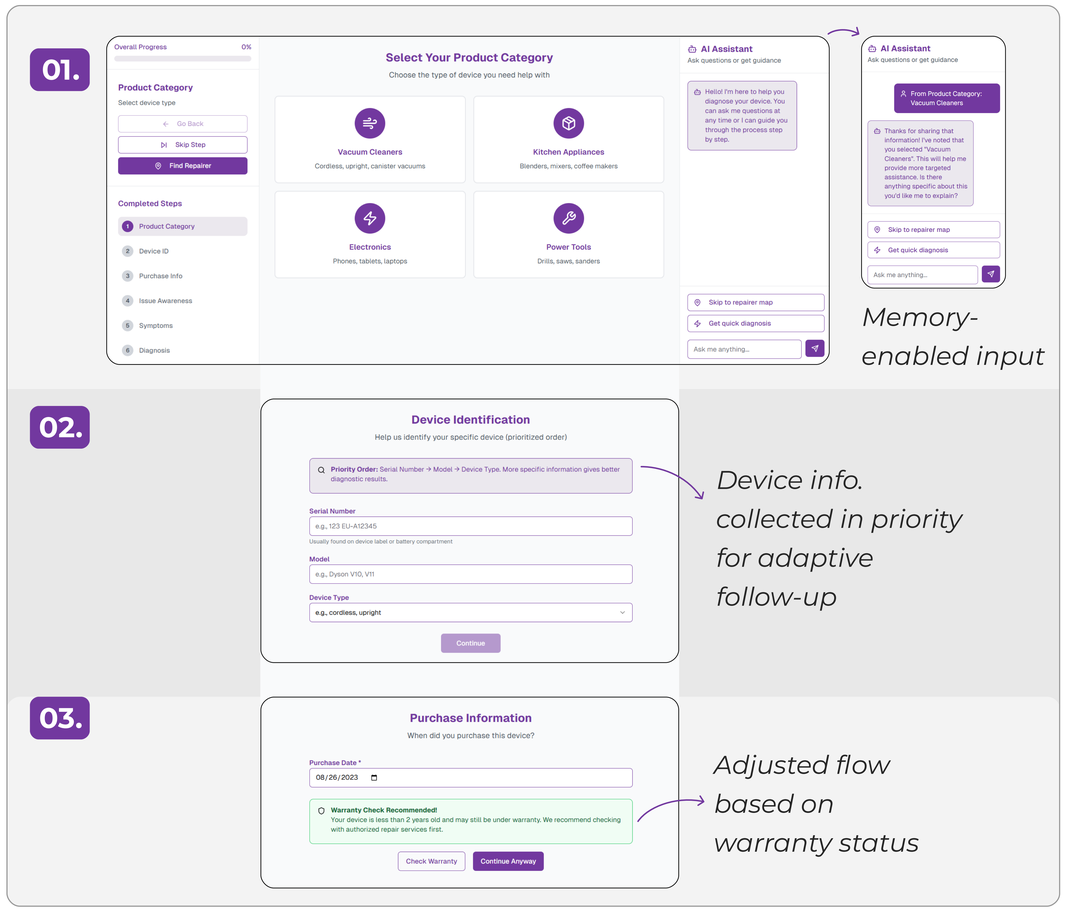


Figure 8.5 Device Identification Flow

Issue Assessment

The platform begins issue identification by asking users how well they understand the problem, offering three pathways tailored to the level of support provided (Fig. 8.6):

- *"I don't know what's wrong"* - guided, symptom-based diagnostic flow, ordered by failure frequency data (e.g., according to Repair Monitor data, Dyson battery vacuums over 5 years old have a 26% chance of battery degradation).
- *"I know something about the issue"* - interactive exploded view of the device, with clickable parts for repair-worthiness insights and instructions.
- *"I fully know what's failing"* - prompt for a direct AI chat input and instant access to a map of verified repair professionals.

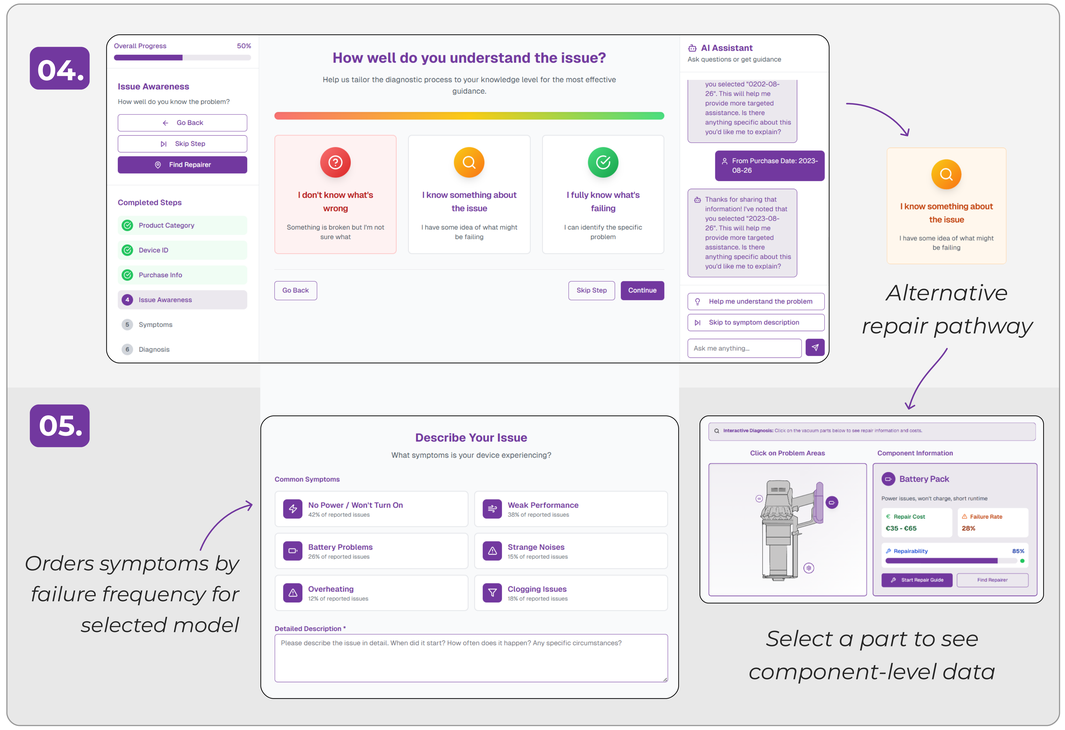


Figure 8.6 Issue Identification Flow

Diagnostic Flow

After identifying issue, users follow a structured diagnostic flow that begins with low-cost, low-effort checks and escalates to more complex interventions. For instance, choosing “No Power / Won’t Turn On” prompts basic steps, such as verifying the charger before diagnosing battery faults. Troubleshooting steps link to curated external guides (e.g., manufacturer manuals, iFixit) that are pre-screened for quality and relevance (Fig. 8.7 (6)). Milestone guard checks are built into the flow to halt progress when disassembly or advanced skills are required. At these points, users can opt for an advisory report summarising findings and remaining possible faults, with cost estimates*, repairability scores*, and a green/yellow/red effort flagging (Fig. 8.7).

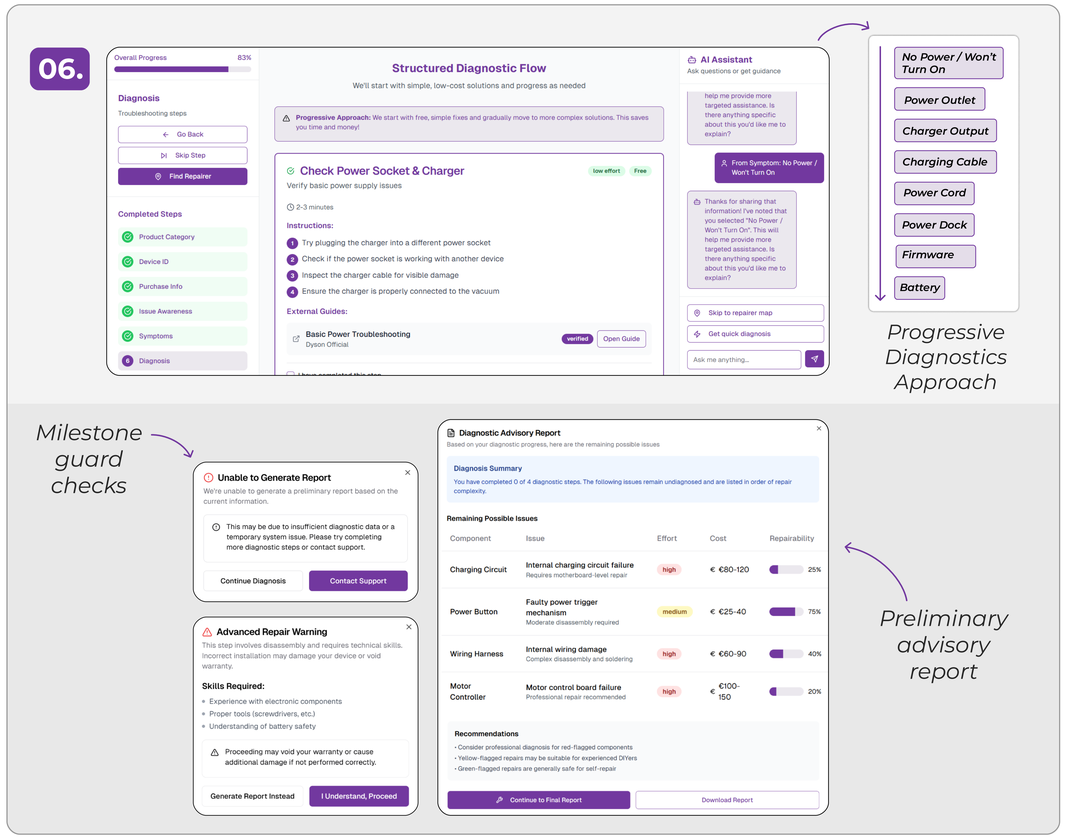


Figure 8.7 Step-by-Step Diagnosis Flow

Final Repair Advice

Once the diagnostic process concludes or reaches an advanced stage, the platform presents an overview of the diagnosed issue, including the failing part and AI confidence level*. It then provides a clear summary covering repair costs, potential savings (compared to replacement), and a final recommendation (Fig. 8.8). Users can access a detailed breakdown of the fault reasoning, cost&time analysis (labour, parts, other expenses*), and the reasoning behind the recommended repair pathway. A traffic light colour-coding and recommendation reasoning provide an unbiased decision cue. The complete report is available for download, enabling users to share it with professional repairers after.

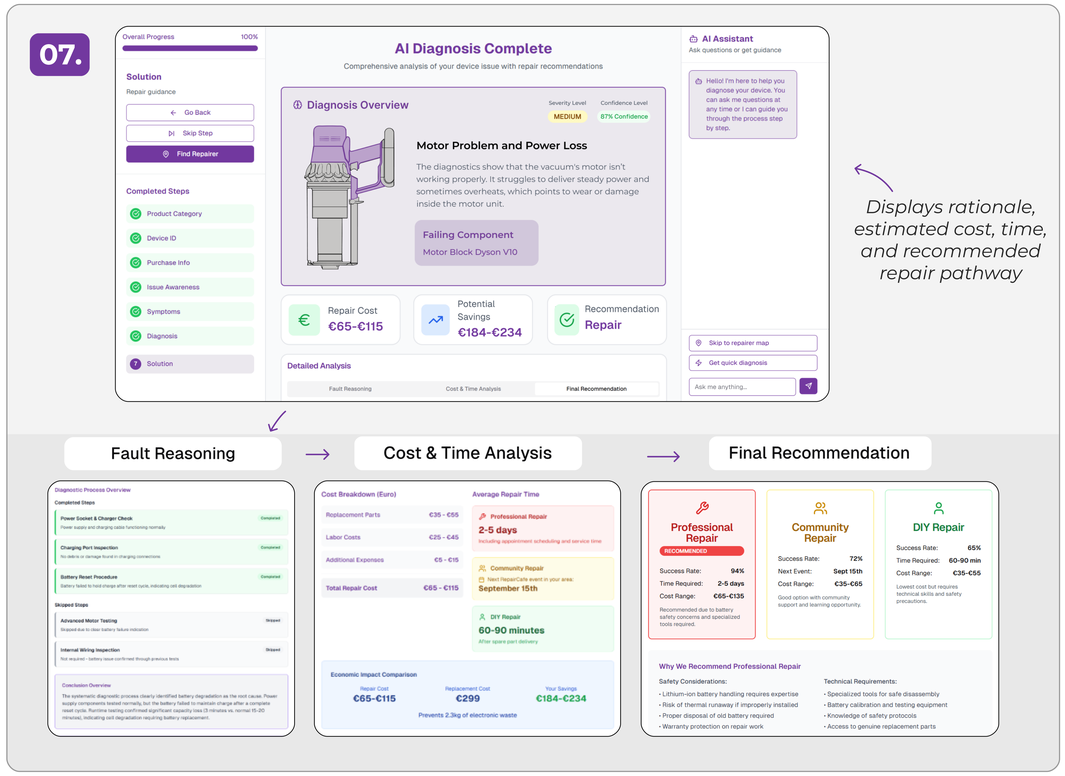


Figure 8.8 Final Repair Advice Flow

**All numerical indicators (e.g. repairability) are illustrative and should not be interpreted as definitive or final assessments.*

8.3 Near-term Platform Intervention

8.3.1 Concept Overview

Since Horizon 2 platform design is a more futuristic vision to repair behaviour and way of diagnosis in future, a more near-term, and manageable design serving as a transition to this way of diagnosis is designed.

Consumer interviews revealed that users primarily trust AI for software-related issues, with limited confidence in hardware diagnostics. While major industry players drive developments, organisations like Techniek Nederland can also influence AI adoption and better usage of it in repair via prompting.

Using API services to train and integrate reasoning models into the platform presents great opportunity to meet the requirements and goals of this project as exemplified in Horizon 2. However, managing the input, output, and training of these models in-house is a complex undertaking. As a short-term solution to still leverage the capabilities of AI models for electronic diagnostics, the proposed approach focuses on designing a prompt generator to educate and help platform visitors to use AI effectively in their electronics diagnostics and to encourage a higher adoption and thus more willingness to repair products.

The design draws from case studies such as Spareka's diagnostic chatbot and iFixit's step-by-step guides to define prompt structure, style, and content, while establishing clear boundaries for AI-generated outputs. Two main components structure the system, a structural outline of the prompt that adapts dynamically to device type, model, and problem description (Chapter 8.3.2), and a platform user flow guiding users in creating tailor-made prompts (Chapter 8.3.3).

The storyboard in Fig. 8.9 illustrates the main user flow stages of interaction for generating a tailored AI prompt. Users begin by entering **device details**, including type, model, and other required information. They then provide **diagnostics context**, sharing past checks, available tools, and optional contextual details. Next, users **personalise** the prompt by setting tone, persona, and repair experience level. Finally, the **generated prompt** is reviewed, edited, and exported for use.

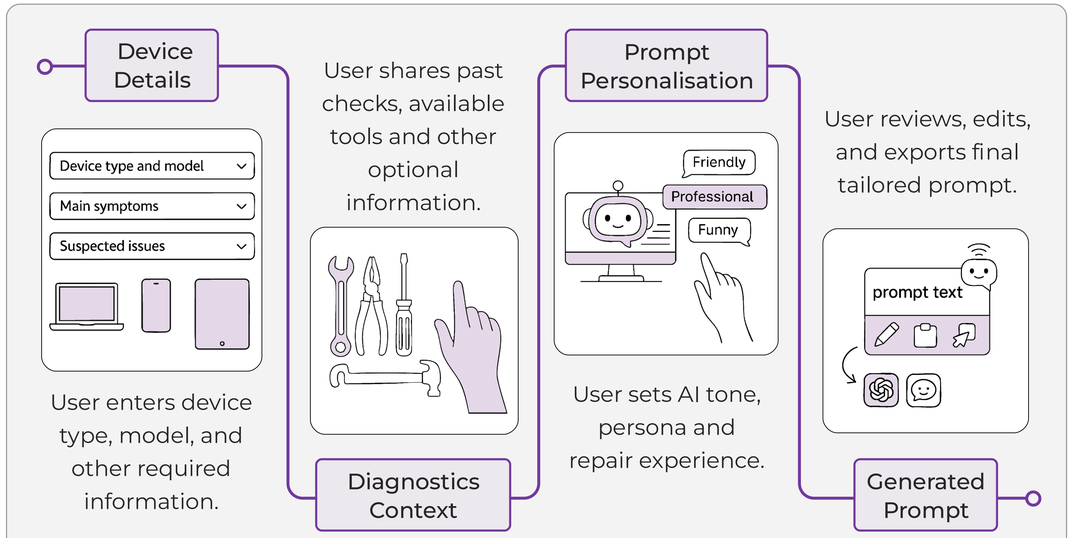


Figure 8.9 Storyboard to Prompt Studio's Main Stages

8.3.2 User Flow

Designing a prompt is not a one-size-fits-all solution, instead, it must balance specificity and context to optimise the AI-generated output for the device and issue being diagnosed, necessitating a user interface to facilitate this.

To make this tool both easy to use and informative, the design follows a familiar survey-like interface. This approach builds on Jakob's Law, which suggests that people prefer digital experiences that work like ones they already know (Nielsen, 2024). By mimicking the structure of common online surveys, the platform reduces the learning curve, minimises cognitive load, and keeps things intuitive.

Device Details (Required)

This first section collects the essential information needed to generate a contextually relevant and accurate prompt. Users are asked to fill in details like device type and model, main symptoms and describe the issues in their own terms (Fig. 8.10 (1)).

These are the required information points that help the AI generate a meaningful and targeted response after. Tooltips and placeholder examples guide users to provide the most useful data (e.g., "Vacuum starts normally but loses suction after 5 minutes" for an exemplar issue description).

Diagnostic Context (Optional)

Next, users can enrich their prompt with contextual details to improve the relevance of the response. These optional questions are designed to fine-tune the interaction and might include:

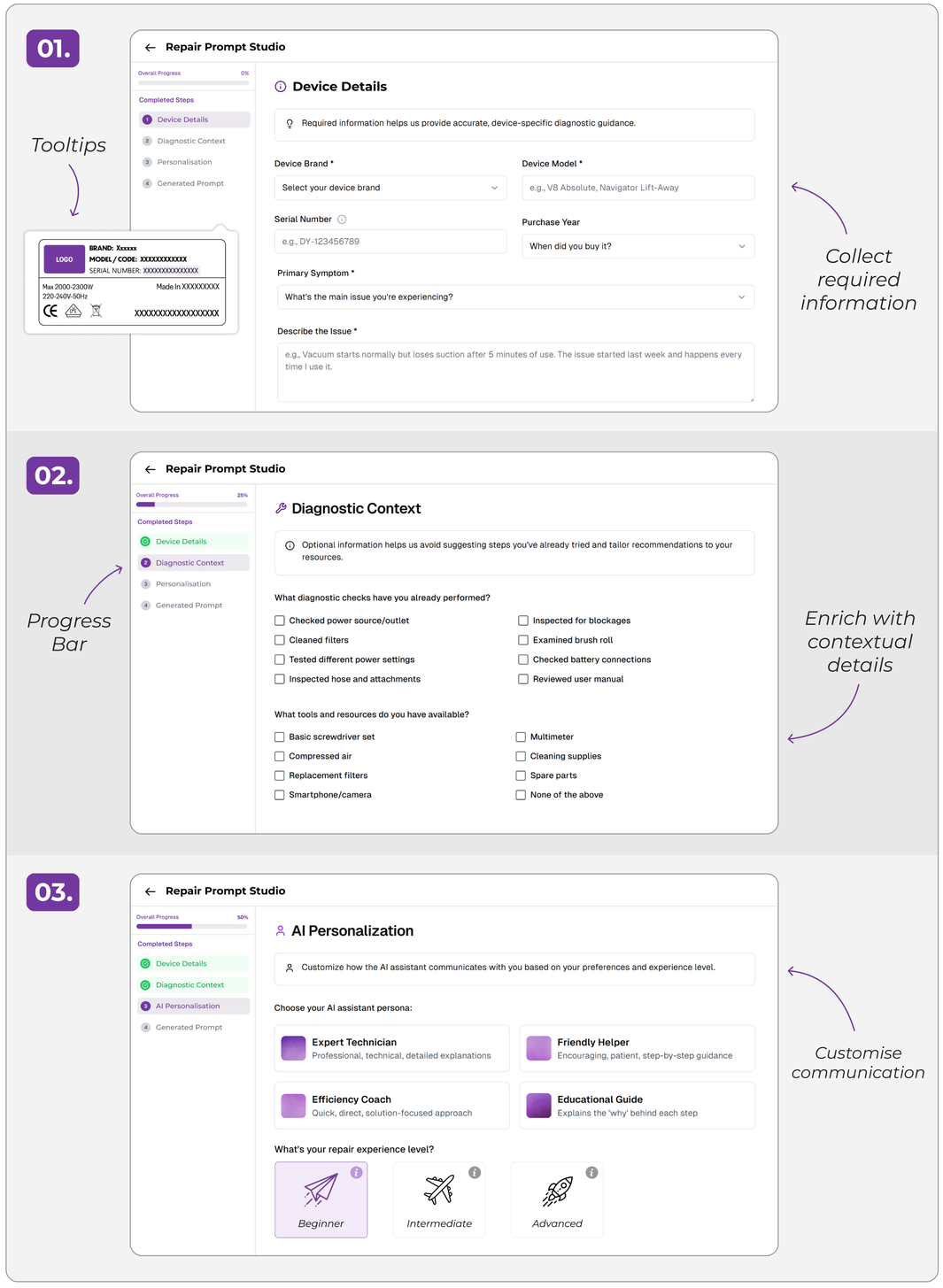


Figure 8.10 User flow of prompt creator tool

- What diagnostic steps have already been taken
- Which tools the user has access to

Providing these details allows the AI to understand the user's situation more deeply and avoid recommending steps that have already been attempted or suggesting procedures that require unavailable tools.

Personalisation (Optional)

In this stage, users can select how they would like the AI to behave during the conversation, such as:

- Choosing a persona for the AI (e.g., friendly helper, expert technician)
- Indicating their own repair skill level (beginner to advanced)

Together, these selections make the interaction feel more tailored, supportive, and aligned with the user's confidence and prior knowledge.

Final Generated Prompt

At the end of the flow, users are presented with a complete summary of their generated prompt, combining the device details, diagnostic context, and personalisation settings. This screen allows them to carefully review and edit the text before using it, ensuring clarity, accuracy, and alignment with their intended goals. Users can then copy the prompt or export it directly to an external AI tool, such as ChatGPT or another assistant, enabling seamless integration with their preferred diagnostic workflow. This step also reinforces transparency, as individuals can see exactly how their inputs and choices have been translated into the resulting prompt output.

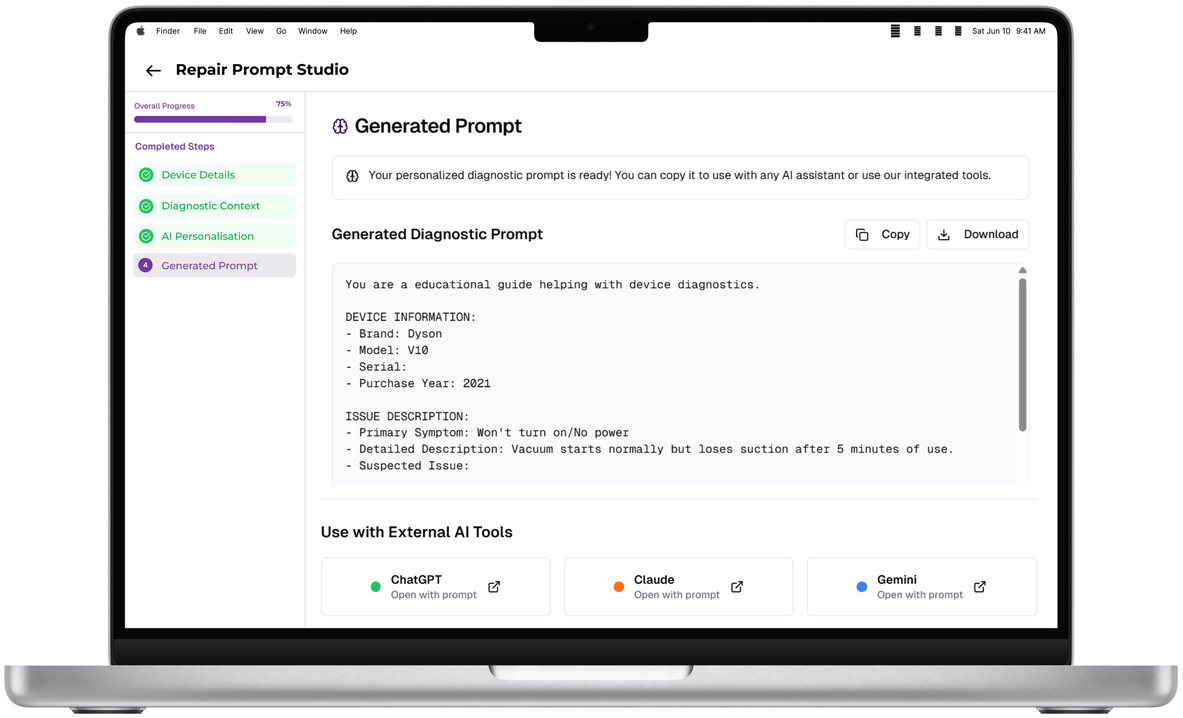


Figure 8.11 Final Generated Prompt Screen

The final prompt structure employs the PROMPT Design Framework to set a well-isolated component-to-component structure. This framework guides prompt composition for generative AI by specifying a Persona, Requirements, Organisation, Medium, Purpose, and Tone (PROMPT) (Sarah Hartman-Caverly, 2024). The example provided in Appendix S illustrates one device-specific adaptation used to test the usefulness of chatbot interactions; in practice, prompts should be tailored dynamically to each device and context.

8.4 Design Evaluation

8.4.1 Objectives & Criteria Review

This chapter evaluates the desired future platform design against the established must-have and should-have criteria derived from the project's core objectives in Ch. 6. Using the Harris profile's four-point qualitative method, the evaluation compares Horizon 1 and Horizon 2 concepts, highlighting where each excels or falls short (Fig. 8.12).

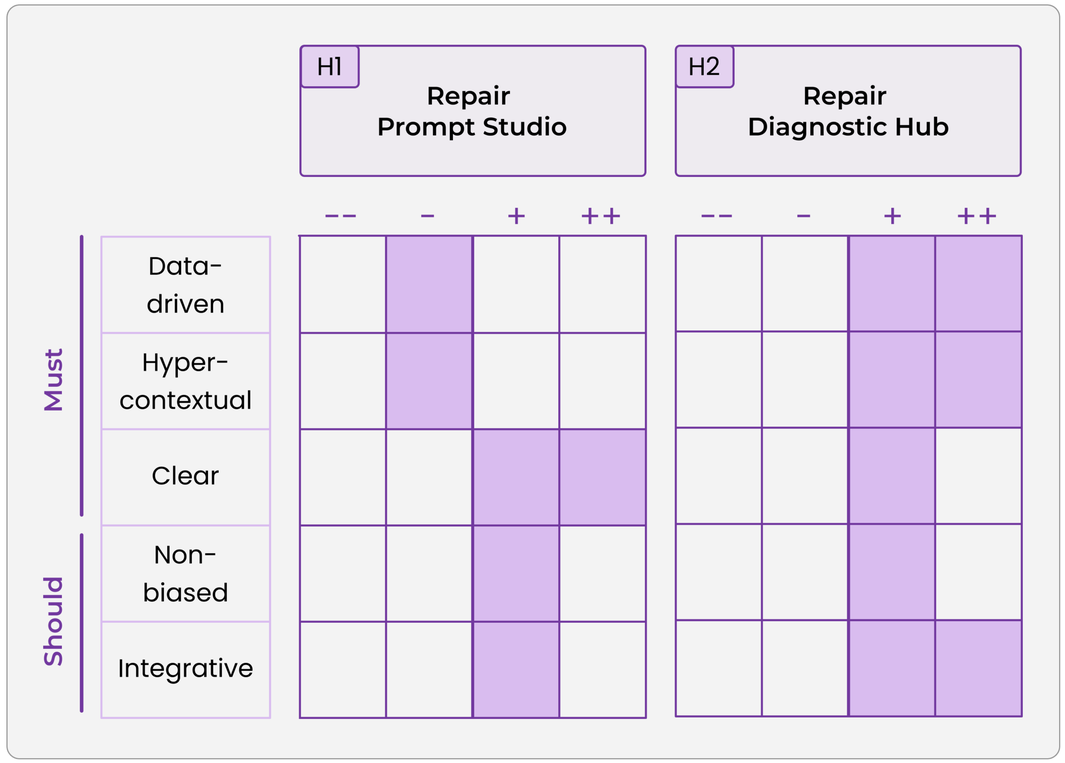


Figure 8.12 Criteria Addressability Overview

The analysis is organised by objectives, beginning with the foundational requirements to achieve Transparency, followed by the objective of Mediation. The full objectives and criteria definitions are available in Chapter 6.

Transparency Objective

The transparency objective centres across early failure diagnosis, time estimation, and cost clarity through enabling a data-driven, clear, and hyper-contextual repair pathway.

Input → Data-Driven
Horizon 2 platform draws on multiple currently accessible and credible data sources to inform its diagnostic and repair guidance. These included insights from community repair data for estimating repairability and symptom frequency patterns, existing repair guides, manufacturer's data on warranty terms, and repair network data supplying cost and time estimates across common failure types.

In Horizon 1, data integration is minimal, relying primarily on static or generalised content, and leveraging other LLM models to execute the prompts. Horizon 2 advances significantly through API-enabled, real-time data aggregation. As discussed in Chapter 2, repair-related data, although abundant in community contexts, remains underutilised in practical repair decision-making. The Horizon 2 prototype demonstrates how, if systematically structured and paired with professional repairer datasets, this information could be transformed into informed and contextually relevant estimates for users.

Process → Hypercontextual
This design integrates principles from Fogg's Behavioural Model, central to this research, by tracking user abilities and embedding appropriate trigger points within the interface to prompt the next step. The personalisation-privacy paradox (Aguirre et al., 2016) remains relevant to its operation, as tailored pathways depend on user data, yet some users may resist sharing certain information.

In Horizon 1, hypercontextuality is largely absent, relying on fixed sequences and generic guidance, with personalisation occurring only through external LLM interactions. However, the guidance toward preparing and structuring personal data in H1 lays important groundwork for more contextual outputs.

Horizon 2 advances hypercontextuality by using user-provided data from the outset—adapting to device type, model, and user experience level. The adaptability ranges from a guided, start-to-finish diagnostic path for novices to direct repair network access for experienced users, with safeguard checkpoints and preliminary reports to help users recognise when professional intervention is advisable.

Output → Clear
Horizon 1 offers clarity through its simplicity, featuring straightforward interfaces with limited input boxes and basic visual elements, making it easy for users to follow without feeling overwhelmed. However, this simplicity also limits the platform's capacity to provide rich repair-related information which can hinder clarity by subsequent interactions with external chatbots.

Horizon 2, in contrast, provides significantly more space for diverse visual outputs designed to aid repair decisions, increasing the information density presented to users. While this enhances transparency by exposing more detailed data, it also introduces a trade-off of the higher information load that risks overwhelming users, potentially reducing clarity. Managing this balance is critical, as outlined by Cognitive Load Theory (Van Merriënboer & Sweller, 2005) and Feature Fatigue concepts (Thompson et al., 2005).

Mediation Objective

The mediation objective centres on positioning the platform as a trusted, unbiased intermediary that integrates professional repair solutions and diverse stakeholder perspectives.

Governance → Non-biased
In Horizon 1, the platform primarily enforces non-bias by excluding personal data such as age, gender, etc., preventing social scoring and complying with AI Act restrictions. Externalising the use of other LLMs for repair offers little active platform governance over potential biases.

Horizon 2 leverages AI trained on multiple diverse data sources to reduce skewed outputs and incorporates explainability (XAI) functions, allowing users to access AI-generated rationale. Trust in non-biased outcomes is enhanced with confidence levels and visible diagnostic pathways. Nonetheless, the inherent challenge remains that users tend to overtrust anthropomorphic AI output (Cohn et al., 2024), which still presents a risk to the platform's neutrality. Furthermore, the risk of over-representation of certain brands or models in the training data persists, reflecting that ongoing governance is needed.

Strategy → Integrative
Horizon 1 provides limited integration, primarily redirecting users to external chatbots. Its interventions act as curated gateways but do not address the user experience where repair solutions remain siloed.

Horizon 2 advances this strategy by aggregating diverse data sources, ranging from symptom patterns from Open Repair Alliance and Repair Monitor to cost and time from partnering repair stores, or consolidates repair-versus-replacement savings using market pricing data (e.g., Tweakers). This holistic data and solutions integration enables an optimised repair pathways within a single platform interface.

Engagement Objective Recommendations

Implementing strong value propositions within the platform is essential, but once these are in place, acquisition and retention become the next decisive challenges. Building on earlier findings that engagement is driven by value-based strategies as criteria where entry points and ongoing use are aligned with real user needs. This section explores how the proposed platform can reach and retain users through recommendations rather than prescriptive solutions.

Acquisition Strategies

To translate these propositions into user growth, several campaign concepts were developed to make the platform's benefits visible at decision-making touchpoints. One approach, shown in Fig. 8.13, uses poster material to present how platform capabilities and AI as an enabler serve customer for more informed repair decisions. This poster is designed to adapt across digital and physical media. Complementing this, additional designs position the platform directly inside repair partner stores (Fig. 8.14), inspired by the way Booking.com leverages its presence within partners to drive user trust and adoption. By visually signaling that participating repairers are connected to the platform, these touchpoints communicate its reliability and help position its services as a natural part of the repair journey.

A backcasting-inspired PR/FAQ document, adapted from Amazon's product development methodology, further serves as both an acquisition tool and an internal alignment instrument. The PR part of it (Fig. 8.15, full text in Appendix T) distils the envisioned customer experience and platform benefits into a clear narrative. As internal tool, this approach ensures that stakeholders share the same mental picture of what the platform is meant to achieve, rather than working from fragmented assumptions.

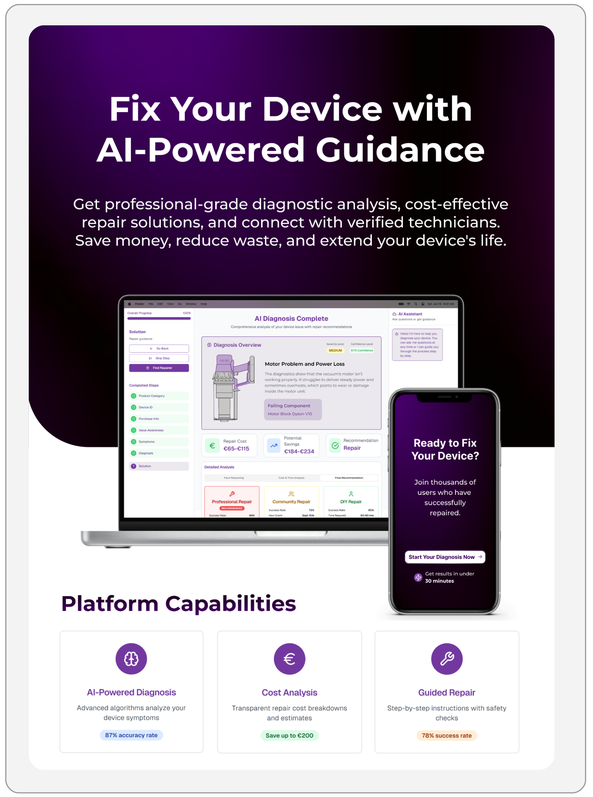


Figure 8.13 Platform's Digital Touchpoint



Figure 8.14 Physical Touchpoints

The FAQ section (Appendix T) complements this by addressing anticipated questions from stakeholders, media, and potential users.

Although companies such as Amazon and Booking.com are profit-driven and operate in different sectors, their approaches demonstrate how consistent messaging, visible credibility cues, and partner integration can rapidly build user trust. These strategies are transferable by aiming for a similar challenge of convincing users to choose a platform at a critical decision moment.

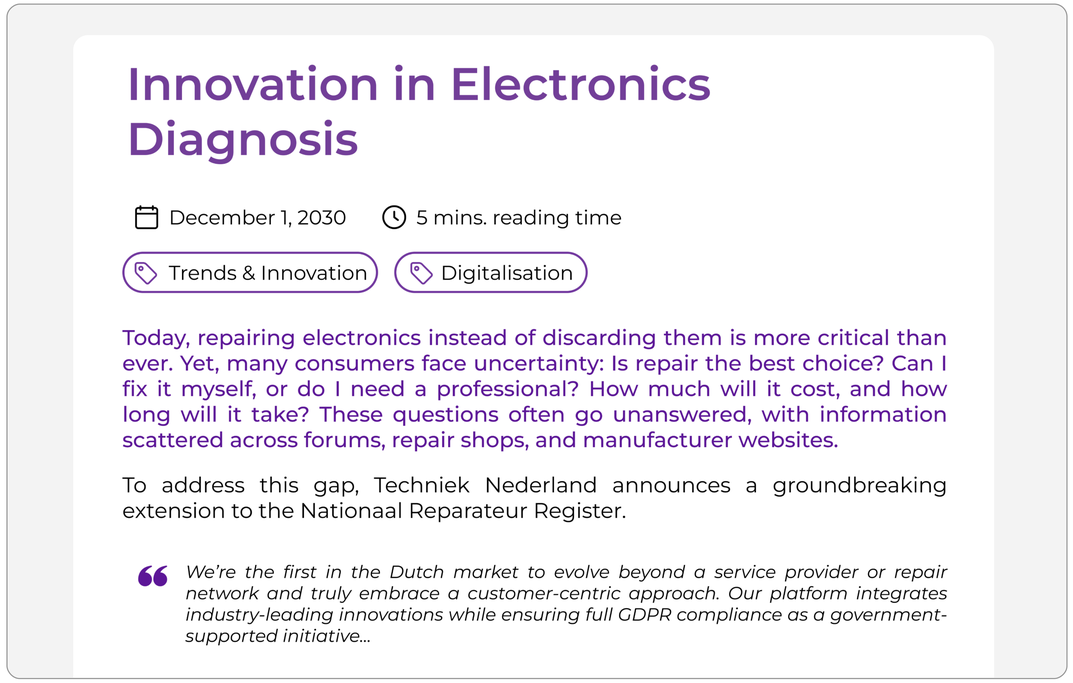


Figure 8.15 Excerpt from PR/FAQ document

Alongside these awareness-building concepts, the platform's positioning was discussed during the brainstorming workshop. Participants highlighted the need to distinguish the platform from the Nationaal Reparateursregister, whose regulatory focus imposes constraints not aligned with the platform's expanded vision. To support this separation, several logo concepts were developed (Fig. 8.16) for creating an endorsed brand under Techniek Nederland. This tries to communicate the platform's identity as an innovation-driven, user-oriented service rather than a compliance tool.



Table 8.16 Endorsed Brand Proposals for Horizon 1 and Horizon 2

Retention Strategies

Retention strategies applied in the platform build on the theoretical toolkit by Toxboe (2023), discussed back in Chapter 4.2.2. The interventions in Table 8.1 translate to the value-based criteria by helping users navigate complex repair tasks while maintaining clarity and transparency. Ones like progress tracking, status signalling, visual guides, and multi-stage task simplification not only reduce cognitive load but also reinforce users' sense of control and confidence in the platform. Overall, these mechanisms demonstrate that retention is not simply about repeated usage, but about embedding meaningful value in every interaction, ensuring that users perceive the platform as trustworthy, helpful, and aligned with their real repair needs.

Table 8.1 Retention Pattern Examples (full list and definitions in Appendix U)

Intervention Point	Retention Pattern	Explanation
Progress Bar	Zeigarnik Effect	Helps users track progress and stay motivated
Traffic Light Colour-Coding	Choice Closure	Helps users make clear, confident decisions by signaling status.
Exploded Diagram and Annotations	Picture Superiority Effect	Visual guides make users feel involved and improve understanding.
Download Report	Sunk Cost Fallacy	Letting users keep a report increases commitment to their repair effort.
Multi-stage split	Tunneling, Reduction	Simplifies complex tasks by focusing users on one step at a time, making decisions easier.
Safeguard pop-up checks	Illusion of Control	Gives users a sense of control by confirming important choices.

8.4.2 User Evaluation

To evaluate the potential of the final platform proposal, the envisioned platform was presented individually to a group of participants. This activity was designed with the following objectives in mind:

Research Activity Objectives

- Assess how effectively the platform supports users in completing a diagnostic journey, in line with defined project objectives and design criteria.
- Identify strengths and areas for improvement to enhance overall user experience and willingness.

The activity involved five participants who match the profile of the platform's potential users. Each session lasted between 30 and 45 minutes. The session structure adhered to the framework outlined in Fig. 8.16, covering introduction, platform walkthrough, and semi-structured discussion on user experience and perceptions.

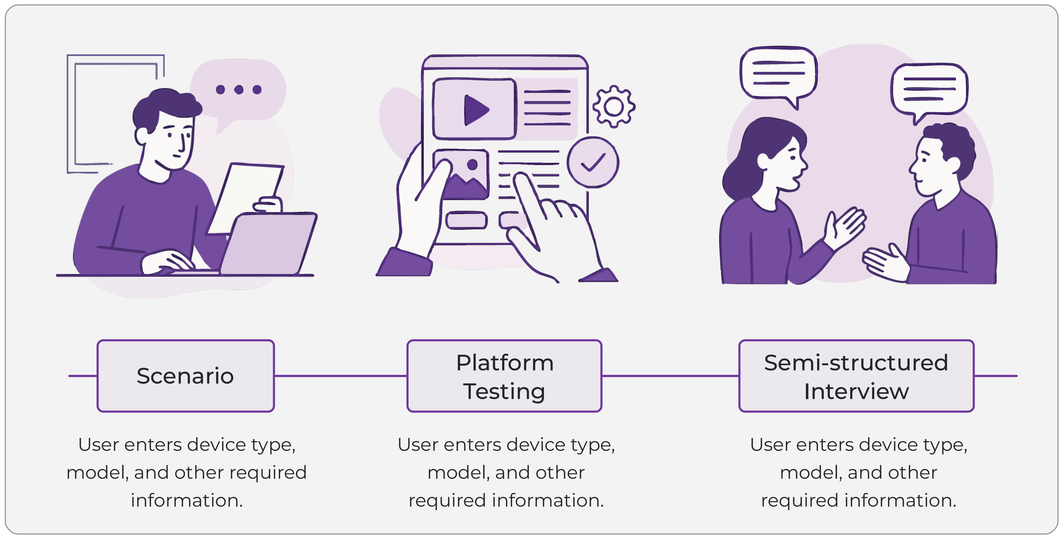


Figure 8.16 User Evaluation Session Setup

Discussion of User Evaluation Outcomes

The user evaluation revealed several key insights that directly relate to the platform's core criteria and objectives, highlighting both strengths and areas for refinement.

Users generally reported that investing about 30 minutes interacting with such platform would lead them to an increased willingness to repair their devices. This aligns with behavioural "sunk cost" effects, where users are more likely to follow through after committing effort.

> *"I think I always intuitively knew that if I put this, this is going to be the next step and I wanted to know what is the information that I will get out of it" – P4*

However, this increased willingness was compromised by challenges with information density. While the platform's transparency, including providing detailed diagnostics, repairability scores, and cost estimates, built trust, the volume of information sometimes overwhelmed users, threatening clarity.

> *"It was quite detailed on why something is not working why would I need a professional repair person and why I cannot do it myself" - P5*

> *"You also receive a lot of information in the end. But then it becomes too much information heavy for a simple thing." — P1*

Next to all information, some participants requested clearer trust signals, such as brand affiliations, to establish credibility.

> *"This is Dyson's way or HP's way... have the platform way of diagnosis backed by manufacturer's way." –P1*

> *"Does it have tie-ups with these companies? There should be something saying that we collaborate with these brands... it builds more trust." — P4*

Users also noted a systemic shift introduced by the platform in reducing human-to-human interaction. Instead of calling repair centres, the platform centralises diagnostics and repair recommendations online. Some participants expressed fear with this change, given existing social norms and preferences for personal contact.

> *"It's going against some social trends... everything is online or digital... you are removing humans... Wouldn't this take longer than me just calling the call centre?" — P1*

However, other users recognised this systemic change as a way to bridge the gap between professional repair knowledge, previously accessible only by direct visit or calls, and the end user.

> *"It's bridging a knowledge gap between me, solving the problem, and the repairer. Because in the past, I can only go to the professional repairer and ask them... Or I can take a picture with chatbot, but it's fuzzy... I don't know whether chatbot can do that." – P3*

Beyond the broader tensions, participants also shared reflections on more specific platform capabilities. The process flow and its step-by-step progressive approach was appreciated as it was associated with familiar troubleshooting experiences.

> *"It doesn't overwhelm you with all the steps but it's one step at a time because this is for example also usually what they do when you call someone if your wifi is not working." — P4*

The detailed repair reports and the preliminary advisory report were generally perceived as a positive function, particularly when engaging with professional repairers after. However, certain technical metrics, such as "repairability", remained unclear for some users, suggesting that transparency in itself does not guarantee comprehension.

Finally, the willingness to adopt the platform were not solely dependent on the platform's capabilities and added value. In some cases, participants emphasised the need for personal recommendations or social validation in order to be convinced.

> *"Someone needs to really recommend this platform to me and say that this works really well" - P4*

The evaluation underscores a clear trade-off between transparency and cognitive load. While detailed diagnostic information and data-backed decisions significantly enhance user confidence, the volume and complexity of information pose risks to user clarity and completion of the repair journey. Furthermore, the platform's digital centralisation challenges existing social norms around human interaction in repair but also opens the door to democratising access to expert knowledge.

These findings indicate that the platform's success depends on balancing all project's objectives and criteria, ensuring that improvements in data-driven information do not come at the expense of clarity.

Additionally, the systemic shift in user-repairer interaction requires careful attention to social acceptance, underscoring the importance of the transitional outcomes offered through Horizon 1. The following chapter will build on these evaluation insights to propose concrete recommendations for future work.

Takeaway

8.5 Strategic Roadmap

The strategic roadmap (Fig. 8.18) visualises the project's implementation trajectory, translating the platform's design strategy into a structured outline. The roadmap highlights key elements across value drivers, technology, and partner/resources, linking each to the respective horizon. As a strategic, rather than a tactical roadmap, it is designed to provide stakeholders with a straightforward understanding of the platform's long-term vision and high-level goals, rather than prescribing every operational step. The roadmap spans two horizons, each linked to its respective platform concept:

- **Horizon 1 – Assist:** Introduces the Repair Prompt Studio, enabling consumers to build diagnostic prompts and use better AI-supported guidance. It focuses on validating workflows, integrating initial technologies, and aligning early stakeholder engagement while gaining initial actionable insights from repair data.
- **Horizon 2 – Resolve:** Establishes the RepAIr Platform, a fully adaptive platform that centralises repair data, integrates solutions, and creates a unified ecosystem. This horizon aims to reshape the consumer repair journey, improve diagnostics, and come the closest to fostering a cultural shift toward repair willingness.

The roadmap also operationalises the five key platform criteria (Fig. 8.17), showing how each evolves across horizons: from static, linear, and siloed approaches toward dynamic, adaptive, and integrative solutions that enhance decision-support, transparency, and contextual relevance throughout the repair experience.

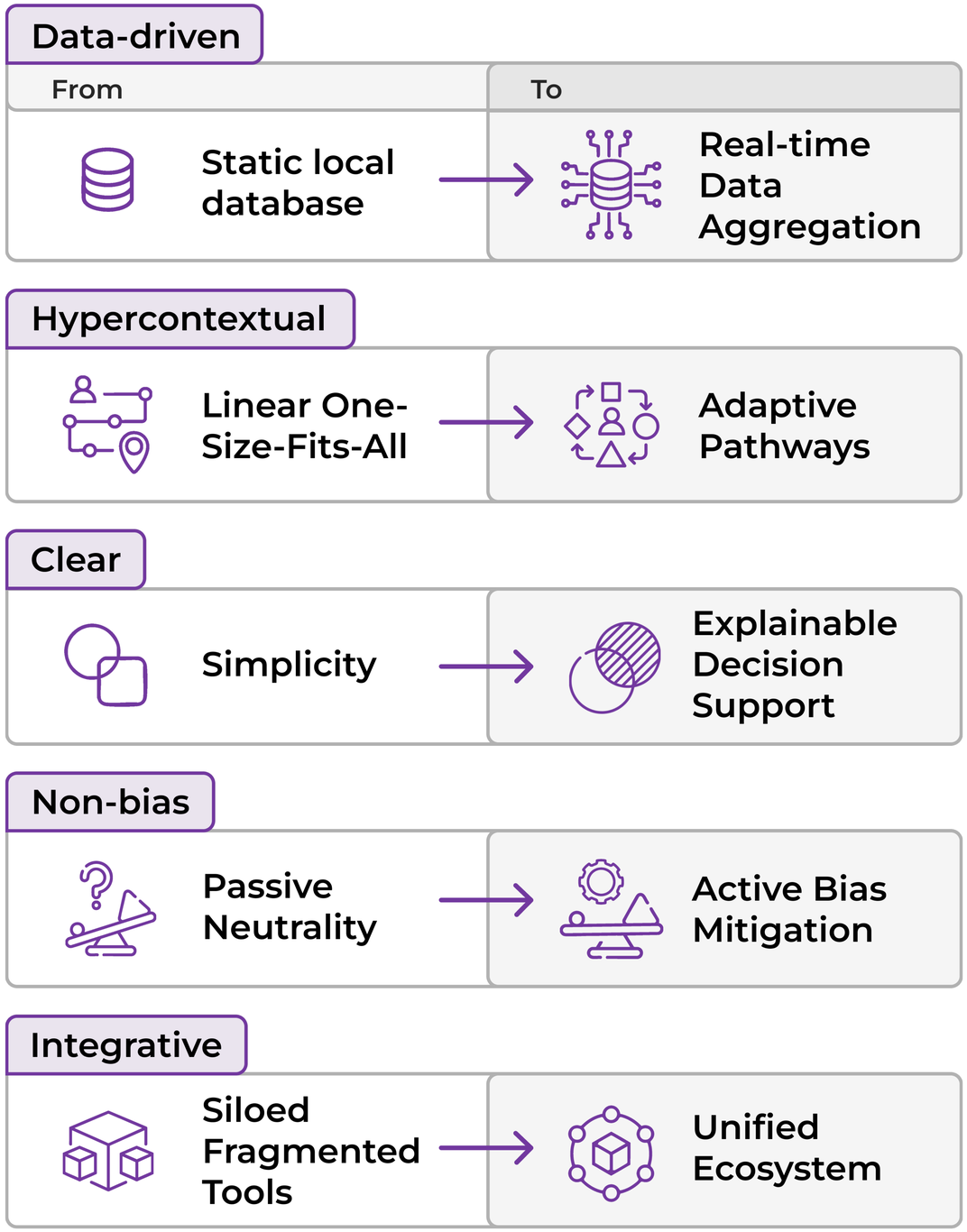
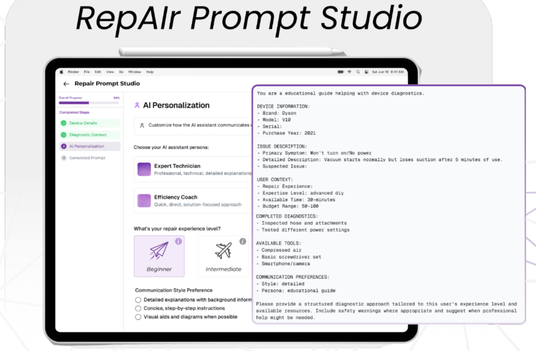
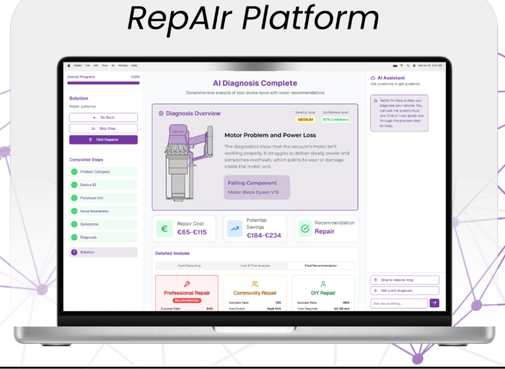


Figure 8.17 Criteria-Informed Transitional Shifts

	2026 Horizon 1 | Assist	2028-2030 Horizon 2 | Resolve
	Assist repair journey with basic AI prompt creation	Expand to personalised user pathways, and ecosystem integration
Value Drivers	"What's broken? How do I fix it?" →	"What's the best fix for my context?"
	Self-efficacy	Autonomy, Integrated Transparency
	Clarity	Personalisation, Predictive insight
Concept Proposal	RepAIr Prompt Studio	RepAIr Platform
Technology		
Data layer	Local and Static Database →	Dynamic API Data Aggregation
Logic Layer	Prompt Generation Module →	AI Decision Engine
Interaction Layer	Guided question flow →	Adaptive pathway logic
Partners & Resources	Manufacturer: Device specs, warranty terms	DIY Platforms: Repair guides; Repair Shops: Repair data
	LLM Providers: AI Capabilities; Repair Register: Verified network	Community Initiatives: Failure datasets





Future Vision

A full cultural shift in repair willingness and trust in professional services. Leveraging a repair platform, the industry offers a fully transparent diagnosis pathway, with insights into repair costs, time, and failure diagnosis from the moment an electronic breaks down to making a repair decision.

Figure 8.18 Strategic Roadmap

9.

Project Discussion

Summary

This chapter covers the project's contributions, acknowledges limitations, outlines recommendations for future work, and provides a personal reflection on the research process, methodological choices, and learning outcomes.

Content

9.1 Contribution
9.2 Limitations
9.3 Recommendation for Future Work
9.4 Personal Reflection

9.1. Contributions

This project generates contributions at the intersection of academic research and industry application, bridging behavioural insights, ecosystem understanding, and digital interventions in repair. The contributions are organised into the following consolidated themes:

Translation of Behavioural Factors into Digital Interventions
Efforts to extend the lifespan of electronic devices have largely centred on technical fixes and expert-driven strategies (Jaeger-Erben et al., 2020), even though psychological and social behaviours are increasingly recognised as decisive factors (Makov & Fitzpatrick, 2021). Existing scholarship has extensively mapped repair barriers (Terzioğlu, 2020; Tecchio et al., 2019; Roskladka et al., 2023), yet these insights rarely translate into actionable measures in real-world contexts. This project proposes a shift from simply identifying barriers to understanding the underlying consumer needs they reflect. By clustering these into eight core needs and categorising them as explicit, tacit, or latent (Sanders & Stappers, 2012), it highlights both their addressability and varying complexity. In parallel, the project conceptualises repairer needs, a dimension underexplored in prior literature, to create a more holistic view of backend priorities. To move from theory to practice, the project targets the intention–behaviour gap in repair (Ajzen, 1991), embedding digital triggers that adapt to user motivation and ability, building on Fogg's Behaviour Model (2009). The outcome translates abstract behavioural theory into actionable interventions, offering a novel pathway for extending device lifespans beyond technical approaches.

Toward a Unified Diagnostic Pathway for Professional Repair
This project advances existing research on repair journeys (Russel et al., 2022; Lefebre, 2019; Svennson-Hoglund, 2022; Pozo Arcos, 2021) by embedding those conceptual models into the specific context of professional service repair.

Through collaborative workshop, literature synthesis, and detailed journey mapping, the project defines five core stages of the professional diagnostics process, focusing its outcomes on stages where consumer drop-off is highest (breakage and information-gathering). These insights feed directly into the Klantreis Elektronica Reparatie initiative, strengthening its ambition to create a unified electronics repair journey within the Netherlands.

Understanding Ecosystem Complexity and Interdependencies
Building on the perspective of Russell et al. (2022) that repair systems function as interdependent networks rather than linear value chains, this project analysed these through an ecosystem approach. By involving stakeholders across manufacturers, repair professionals, and policy groups, the project mapped dependencies and flows, translating varied perspectives into clear set of value tensions. This ecosystem-level understanding provides a foundation for designing interventions that are sensitive to the inherent complexities of the systemic repair dynamics.

Systemic Shifts for Consumer-Focused Repair Platforms
This project funnelled behavioural and systemic insights into objectives, notably transparency, mediation, and engagement, whereby the way to achieving those was guided by derived criteria. While these criteria were derived for the scope of this project, they translated into broader systemic shifts that digital repair solutions should pursue as a progression from static, siloed, and linear tools toward adaptive, explainable, and integrated platforms, aligning platform interventions with the complex web of consumer needs and motivations in repair.

Designing Evidence-Based Platforms
This project conducted an analysis of current digital infrastructures, identifying market gaps and unaddressed user needs in existing solutions.

Recognising that existing solutions remain limited to passive directories and content libraries (Güsser-Fachbach et al., 2023a; Lechner et al., 2021) and that, without accounting for the diversity of consumers' technical competencies, attitudes, and motivations, repair offerings remain fragmented and ineffective (Bayraktaroğlu et al., 2024), this project translated research-informed criteria into an interactive, actionable prototype. The design is framed within a roadmap from proof-of-concept to complex implementation, positioning AI as a structural enabler rather than an add-on tool. These solutions demonstrate how a digital platform can still reshape repair behaviours and existing practices towards a more transparent repair culture.

9.2 Limitations and Future Work

While this project delivered valuable contributions in exploring how a platform can increase repair willingness, the findings should be interpreted with awareness of practical, technical, and contextual constraints. Each research activity was evaluated together with its limitations throughout the preceding chapters; here, a higher-level overview is presented. These limitations highlight the boundaries within which the results hold and signal clear opportunities for further work, with each limitation linked to a corresponding recommendation.

Legend | Limitations | Recommendations

Prototype Fidelity

> The final prototype functioned as a mid-fidelity simulation, focusing on interaction flows, content structure, and core functionalities through a controlled example. While effective for demonstrating the concept, it lacked fully functional data integration, dynamic adaptability, and finalised heuristics or information architecture considerations. User feedback therefore reflects perceived potential rather than experiences with a fully operational system. The prototype was optimised for desktop and has not been adapted for mobile, despite market trends toward mobile-first digital interaction.

> Progress toward a high-fidelity, functional prototype integrated with live data sources. Extend the platform to mobile design for better outreach.

Regulatory and Ethical Considerations

> The system has not undergone formal assessment under AI governance frameworks such as the EU AI Act.

While no personal data is collected, automated decision-making capabilities and repair recommendations still raise transparency obligations. Additionally, integration with the Nationaal Reparateursregister introduces dependencies on regulatory requirements, which were not addressed within this project's scope.

Conduct a full AI compliance review and explore policy alignment strategies early to ensure scalability beyond current legal and registry constraints.

Technology as a Tool, Not a Solution

The project strategically leveraged AI but risked overemphasising it as the central solution. The choice of AI emerged from problem-focused research, but future implementation must avoid positioning AI as a "magic wand" and be cautious to the "black box problem" of AI models.

Continue applying a tool-agnostic design approach, validating AI's role against alternative methods. Integrate evaluation criteria that measure AI's added value relative to other design choices.

Contextual Breadth and Generalisability

The project focused on vacuum cleaners as a representative product category to ground research insights and demonstrate a clear use case. The behavioural triggers, data strategies, and platform interventions developed here may not fully translate to other consumer electronics categories with different usage patterns, lifespans, failure profiles and mental valuation.

Comparative studies across product types should validate the scalability and adaptability of the proposed design solutions and identify where category-specific modifications are required.

Evaluation and Representativeness

The evaluation activities, including interviews on consumer and repairer needs as well as the final prototype assessment, involved a limited number of participants, recruited primarily through convenience sampling. This restricted the diversity of user categories and stakeholder groups represented. Similarly, the brainstorming workshops engaged a selected subset of participants, which may have excluded perspectives from other important repair ecosystem actors and consumer segments. In addition, insights translated from EU-wide literature may not be fully transferable to the Dutch context, despite efforts to adapt and evaluate them locally before application.

Future research should adopt broader and more systematic recruitment strategies to include underrepresented groups and stakeholder categories, ensuring more balanced, cross-sectional input.

9.4 Afterword

Reflection on Outcomes

While reflections on each research question and chapter outcomes have been shared throughout the report, this section takes a step back to reflect on the project's outcomes from a more personal point.

The project pursued an ambitious set of directions, aiming to challenge conventional practices in an industry that is relatively slow to adopt innovations and marked by polarised viewpoints. Many of these complexities were necessarily filtered due to the project's scope, balancing ambition with the constraints of a time-bound, individual master's project. Design, with its inherent fuzziness, often brought me to uncertain or open-ended conclusions, and visuals that were more exploratory than final. I learned to embrace this ambiguity while deliberately focusing on clarity. Balancing depth with simplicity was never easy, but it pushed me to turn insights into clear interventions instead of getting lost in detail.

This project showed me again the value of iterative processes, refining ideas, testing, and learning as I went. While not all outcomes manifested fully, the project still achieved coherence across its elements, the design criteria guided the development of solutions, objectives framed research and design decisions, and prototypes embodied both practical and conceptual insights. Some avenues remained unexplored, and certain ecosystem complexities were necessarily simplified. Yet, as my mentor constantly reminded me, "designing is deciding," and good design isn't about keeping every option open, it's about making deliberate choices, setting boundaries, and moving forward. Taken together, the project's outcomes form a structured foundation that demonstrates the value and relevance of the proposed platform.

Reflection on Learning Objectives

At the start of this project, I formulated five learning objectives (LO), which, after refinement, I filtered here into three. Looking back, having this archive of my past intentions provides a rich lens to critically assess my outcomes, and how my perspective has shifted along the way.

LO1: Deepen my understanding in the topic through activities and stakeholder interactions.

With hands-on experience at a manufacturer's headquarters, five years in design, and pockets overflowing with ready-to-go activities, I stepped into this project with a healthy dose of confidence. My first instinct was to try everything, speak to everyone, and be everywhere at once, but very quickly I realised I was jumping headfirst into deep waters. It was in that moment that I shifted from a "can-do-everything" mindset to a more selective, evaluative, and reflective approach. I learned to choose carefully which activities to pursue, which workshops to attend, and which paths to follow. Yet, the greatest realisation was learning when and where to cross the lines between different modes of work, moving fluidly between independent research and collaborative exploration, literature and hands-on experimentation, and iteration and concept testing. Yes, conducting dozens of interviews, visiting Repair Cafés, professional repair shops, and organising ideation sessions myself revealed a richness of perspectives, layers of knowledge that no literature could convey. Still, it was knowing when to dive in and when to step back, that revealed the greatest insights in this project.

LO2: Strengthen facilitation skills through co-creative workshops with diverse stakeholders.

From my earliest experiences in my master's, I knew I thrived in participation and creative facilitation, which is why I chose this learning objective. Yet, this project pushed me to rethink my urge to try every new tool, experiment with every technique, and run all three diamonds of facilitation. Structuring my understanding before inviting others made workshops more than idea-generating sessions, they became spaces to observe patterns, capture what matters, and sense the dynamics between stakeholders. I realised that effective facilitation is as much about timing and clarity as it is about creativity. By experimenting boldly but selectively, I strengthened not only my facilitation skills but also my sense of when and how to channel energy for the greatest impact.

LO.3 Improve academic writing and visual communication by delivering a compelling thesis.

With the submission of this thesis, I have a tangible reflection of that goal. The process has been highly iterative, perhaps one that could go on indefinitely, but I am submitting this report, with all its visuals, guides, annotations, and structure, feeling a genuine sense of accomplishment. While minor flaws undoubtedly remain, this is by far the project I am proudest of in terms of cohesion and output.

And as my chair reminded me, "less is more" is often considered a cliché, but it is a cliché for a reason, and one particularly relevant that should guide me in my work. Balancing completeness with clarity remains a challenge for me to date, but I am learning to embrace it. And I hope my journey comes through in this work, and that anyone who has read this far can appreciate the effort and care embedded in it.

Final takeaways

In sum, this project has been a guided exercise in critical reflection and decision-making, helping me define the kind of designer I strive to be and the areas of design where I feel I add the most value. It pushed me to focus on critical usage of design activities, and to reflect on how each step contributes meaningfully to my final outcome. As a designer, I have always had a perfectionist, pixel-perfect mindset, but this project challenged me to step back, take a strategic perspective, and reason deliberately about my choices.

Beyond marking the close of my studies at TU Delft, this project has served as the final stepping stone in my academic journey and student life, shaped over five years as an international student completing both my Bachelor's and Master's in the Netherlands. Looking ahead, the uncertainty of what comes next is both exciting and daunting, but I am ready to dive into the pool of possibilities with the same passion and confidence that carried me through the start of my journey as an Industrial Designer.

Use of Artificial Intelligence

Beyond serving as a key enabler within my final concepts, AI tools supported various aspects of the research process. They were used to:

- Refine language, check grammar, and unblock writing flow.
- Assist in vibe-coding the final digital interfaces, extracting patterns and interaction styles from existing designs to inform concept iterations, as well as converting final design outcomes into interactive clickable prototype for user testing.
- Generate some custom illustrations for the report through prompted designs using *Sora by OpenAI*.

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