TU Delft Delft University of Technology Faculty of Architecture and the Built Environment

BOSCH

Developing a service solution for the return of Bosch DIY drills

TU Delft x Bosch GmbH

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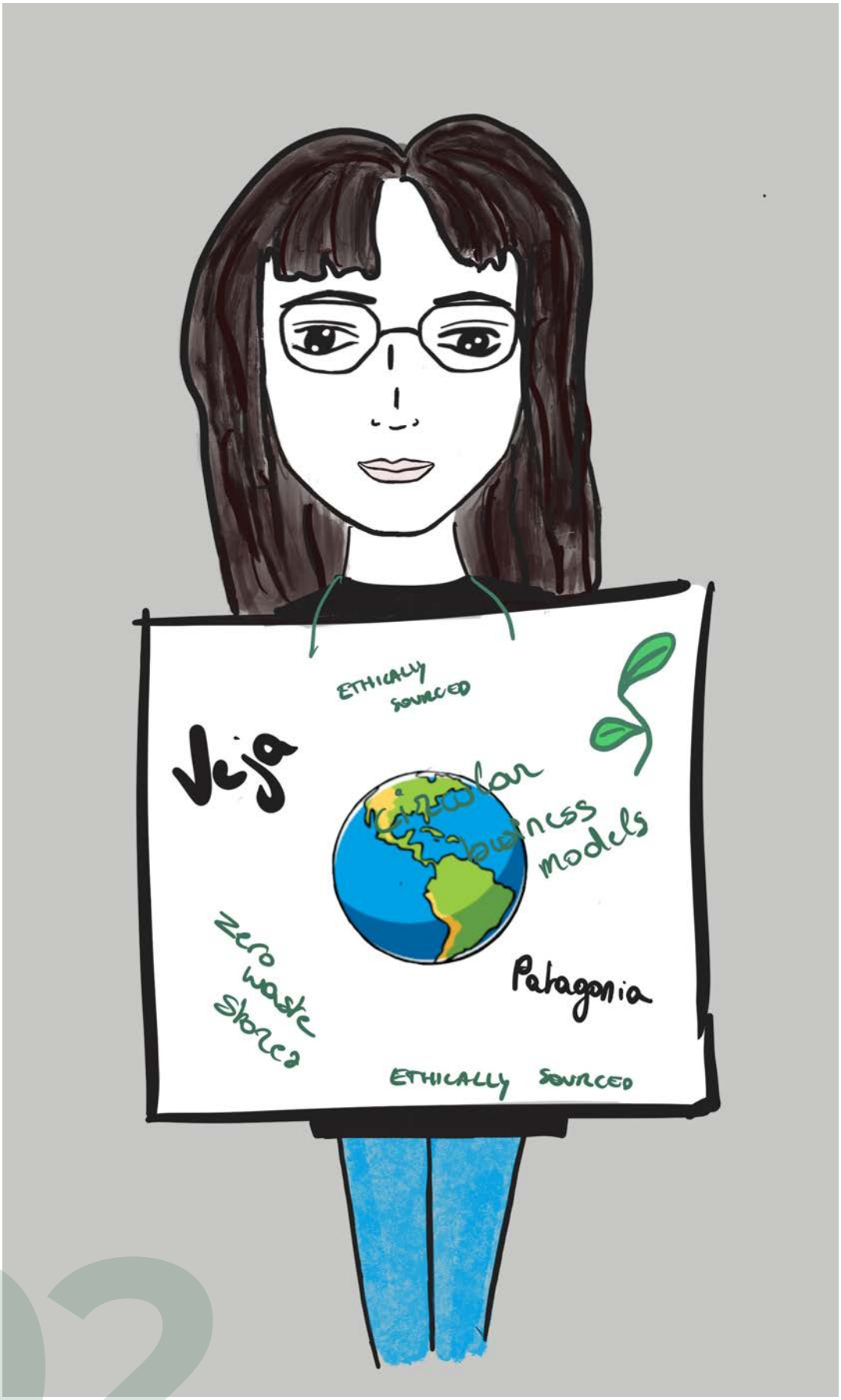
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circular business models
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Preface & Acknowledgement

As an someone who is playfully referred to as a walking notice board on sustainability matters among friends, I was eager to expand my knowledge in this field. Thanks to the collaboration between Bosch GmbH and Tu Delft, this experience was particularly gratifying due to the hands-on aspect of the project.

First and foremost, I extend my heartfelt appreciation to Dr. Rebecca Walter, Dr. Fabian Hermann, and my supervisors, Prof. Dr. Ir. Ruth Mugge and Prof. Dr. Ir. Conny Bakker. Their guidance and insightful feedback helped me foster a critical mindset essential in the realm of sustainability.

During my engagement with Bosch GmbH, I was inspired by the enthusiasm of the employees and had the privilege of learning from individuals across various disciplines. The exchange of ideas, encouragement, and constructive feedback I received from them were instrumental in shaping my work.

Furthermore, I would like to acknowledge and express my gratitude to my family, especially my father, mother, and sister, whose messages of encouragement during challenging times provided unwavering support. I am also deeply appreciative of my friends, whose uplifting interactions, music, conversations, culinary gestures and even an encouraging gift served as sources of solace amidst my demanding schedule. Your presence and gestures of kindness have meant the world to me.

Once again, I extend my sincere appreciation to all those who have contributed to my journey of learning and growth.

Executive summary

Developing a service solution for the return of Bosch DIY drills.

This thesis explores user motivation and barriers in returning Bosch drills from the DIY Tools range, with the goal of proposing an effective return service. Stakeholder analysis, literature review, and customer research were conducted to inform the design process.

The objective of this research was to identify key factors influencing the development of the return service. Stakeholder analysis and meetings with the company provided insights into major stakeholders, including the company, legal regulations, customers, and the environment. A literature review revealed pain points in reverse logistics and guided the selection of a behavioral model. Extensive customer research was conducted to understand the customer perspective on EOU reverse logistics. Design guidelines were formulated based on these findings.

The stakeholder analysis emphasized the importance of satisfying all major stakeholders for the success of the return service. The literature review identified pain points in reverse logistics and highlighted the significance of incorporating behavioral change elements. Customer research underscored the pivotal role of customers in the success of the return service. Based on these findings, design guidelines were established, such as designing a comprehensive solution that integrates data from various consumption stages, utilizing the same data carrier as a touchpoint, and simplifying the return process while enhancing customer motivation. Motivational elements, particularly emphasizing the sustainability aspect, were identified to encourage customers to choose the return service.

The research led to the development of the QR code solution, an integral approach that offers easy accessibility for customers, incorporates multiple customer stages, and collects usage data for reverse logistics purposes. This solution not only benefits customers but also has the potential to streamline post-return processing. Additionally, the proposed return service aligns with potential future legal requirements regarding the digital product passport.

This thesis provides valuable insights into user motivation and barriers to returning Bosch drills, resulting in a suggested return service. The research findings inform design guidelines for creating an effective and user-centric return process, ensuring stakeholder satisfaction and promoting sustainability in reverse logistics. The proposed QR code solution offers an accessible and data-driven approach, while also preparing for potential future regulatory requirements.

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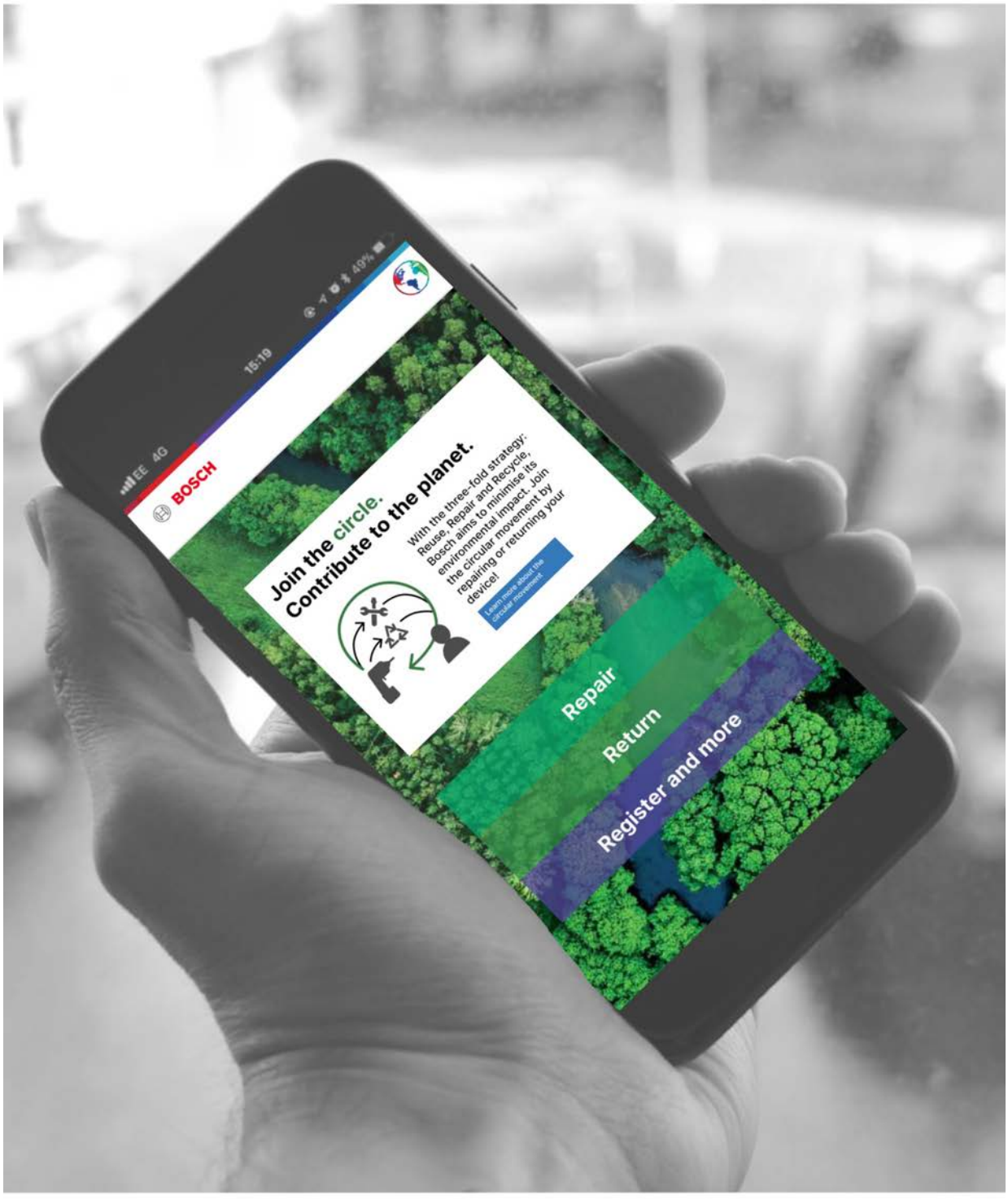
15:19
BOSCH
Join the circle.
Contribute to the planet.
With the three-fold strategy: Reuse, Repair and Recycle, Bosch aims to minimise its environmental impact. Join the circular movement by repairing or returning your device!
Learn more about the circular movement
Repair
Return
Register and more

Contents

(HD Wallpaper: Person Near Yellow and Bl

ack Cordless Power Drill, Women, Diy | Wallpaper Flare, n.d.)

USED ABBREVIATIONS:

EOL = End of life. EOL 'traditionally means that they end up being disposed and/or recycled.' (Ylä-Mella et Al., 2022)

EOU = End of use. 'End of use devices mean that they carry the potential of extending life through reuse, with or without upgrade or refurbishment.' (Ylä-Mella et Al., 2022)

PT = First time mentioned on p. x, stands for PowerTools, a department in Bosch

DIY = Do It Yourself. DIY tools is the name of a product line within Bosch.

Bosch = Bosch GmbH will be referred to as Bosch throughout tthe report.

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1. Introduction

1.1 The company
1.2 The project
1.3 Factors of influence

This chapter provides an introduction to Bosch GmbH, highlighting its current position and efforts in the context of the circular economy. It outlines the company's goals and initiatives in this domain. Furthermore, the chapter explains the project undertaken in this thesis, including its scope and the methodology employed to address the project's objectives. Subsequently, a stakeholder map is developed, encompassing all the key actors involved in the development of a return service solution. Drawing on the stakeholder map and leveraging previous knowledge obtained from the company, this chapter presents the key factors identified that are crucial for consideration throughout the project.

1.1 The company

1.1.1 Introduction

Robert Bosch GmbH is an international technology and service company active in four different business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. Bosch strives to deliver high-quality products that spark enthusiasm and improve quality of life.

1.1.2 Sustainability

Bosch wants their products to help conserve natural resources by acting in an economically, environmentally, and socially responsible manner. Six different focus areas have been defined by Bosch to set a framework for these durable goals. One of these focus areas is 'circular economy'. For Bosch's circular economy strategy, 'four levers' are used as a guiding thread. They consist of: 1) increasing material efficiency, 2) enabling second life of the products, 3) recycling materials and 4) compensating the emissions with carbon offsets (Robert Bosch GmbH, 2021). Lever two (enabling second life) is, according to Bosch's 2021 sustainability report (p.27), the 'most complex lever in the circular economy strategy, but it also offers the greatest potential'. The report communicates that this lever is addressed through:

1. Extending the lifetime of their products.
2. Providing a leasing system for home-appliances.
3. Optimizing their customer support.
4. Easing repairs.

(Robert Bosch GmbH, 2021)

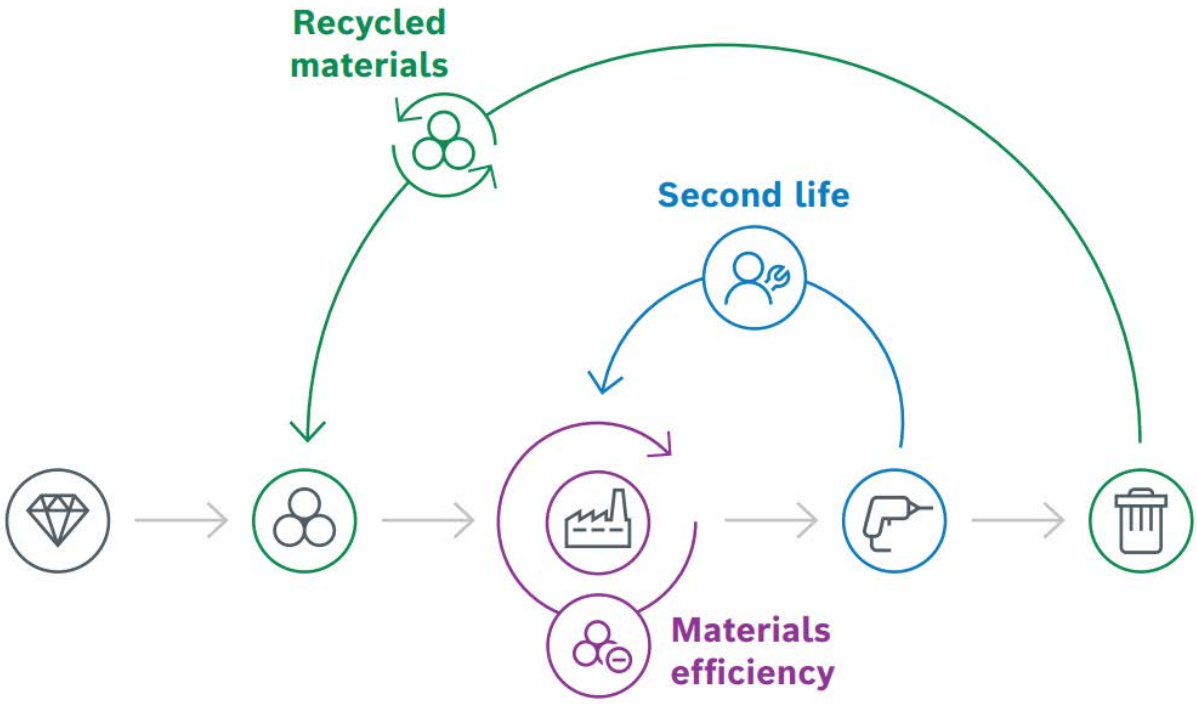


Figure 1: Circular economy strategy of Bosch with the three first levers (Robert Bosch GmbH, 2021).

1.1.3 The project

To assist Bosch in developing a circular economy, this thesis aims to provide a means for Bosch consumers to return their end-of-use (EOU) devices to the company, as no proper channel currently exists for this purpose. By creating guidelines and design solutions for optimized return processes, solutions concerning lever two (enabling second life) and lever three (recycling materials) are mostly addressed. Eventually by creating this return service, Bosch would be able to develop a (more) circular economy where the returned drills could be refurbished, recycled, or partly reused through part harvesting.

1.2 The project

1.2.1 Introduction

At the start of the thesis, Bosch proposed various potential directions to contribute to the circular economy. Further collaboration with the company in the initial months of the thesis led to the scoping of a return solution specifically for cordless drills. During this process, the target audience for this return service and objectives Bosch aimed to accomplish through the project were also further clarified.

First, the scoping of this thesis will be discussed which was decided upon through meetings with Bosch. This is followed up by the stakeholder analysis where key influencing factors for the development of the return solution were identified.
The ultimate objectives of these returns and the intended target group will be discussed further in section '2.1. The company.'

1.2.2 Project scope

a. The product
Two Bosch departments were of interest to create a return system for: PowerTools and E-bike. Seen the time constraints of this master thesis, there had been chosen to put focus on PowerTools.
Powertools (PT) offers two product lines, namely DIY tools (referred to as "Green tools") and professional tools (known as "Blue tools"). The DIY cordless drill has been selected as the subject for the development of a return system after discussions with PT. This drill is the highest selling product in the Powertools inventory. By choosing the most popular item, a large portion of Powertools' customer base can be catered to, making it a suitable starting point for future return services within this department. The return system includes both the battery pack and the bare tool (i.e., drill without battery) as eligible items for return.
As mentioned in section '1.1 The company', this master thesis mainly tackles lever two of Bosch's circular economy strategy. This means that the cordless drill would be in their end of use phase (EOU). An end of use device means 'that they carry the potential of extending life through reuse, with or without upgrade or refurbishment.' (Ylä-Mella et Al., 2022)

b. Product return
When looking at a general overview of the different processes present in reverse logistics, this thesis focuses on the product retrieval and collection of the DIY cordless drills. What is in scope for this thesis has been circled on the following image from Alkahtani et al. (2021).

c. Consumer
Since this master thesis is in collaboration with Bosch Germany, the B2C (business to consumer) market within Germany will be considered. Meaning customers located in Germany.

d. Project process
Through discussions with the different Bosch departments and analyzing the different stakeholders with a stakeholder map, factors of influence regarding the solution space could be identified. These 'factors of influence' were important factors to consider and explore during the development of the project and were thus in scope. More about them can be read in '1.3 Factors of influence'.
To visualize these, figure 3 was made. As can be seen, the user/ customer played a major role during the project and is thereby an integral part of the solution. Sustainability, legal regulations, and the company were also considered during the project, however, less extensively.

e. Project result
The deliverable of this master thesis is a service blueprint of the return solution. Result-wise, the emphasis on the user's side also had an impact on the final result. Although both the front-end and the back end of the return solution were developed by means of a service blueprint, the front-end received more consideration.
This is because the front-end is for a big part determined by the consumer's needs and wants which was the main research point during this thesis.
The backstage and supporting processes were also considered (back-end). However, less time was devoted to this meaning that logistical changes to realize the return solution are not elaborated on.

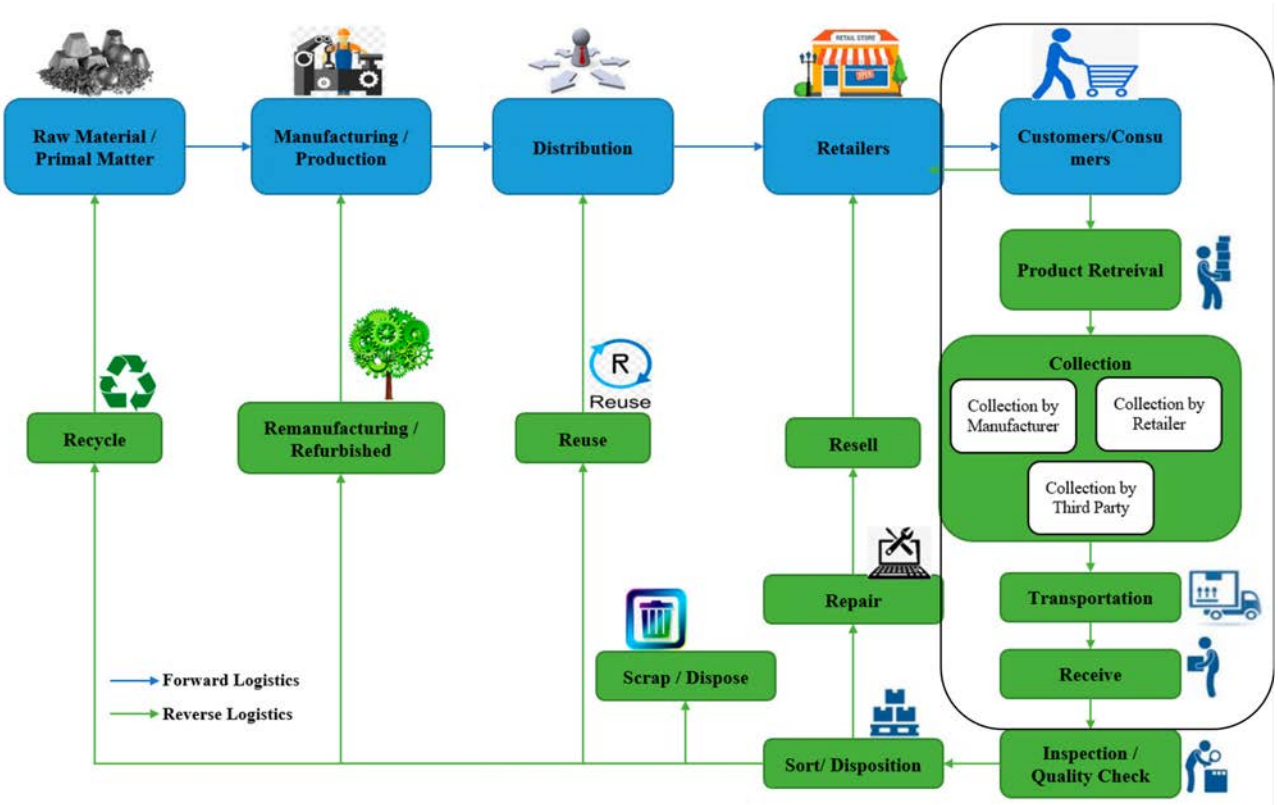


Figure 2: Basic concept of reverse logistics (Alkahtani et al., 2021).

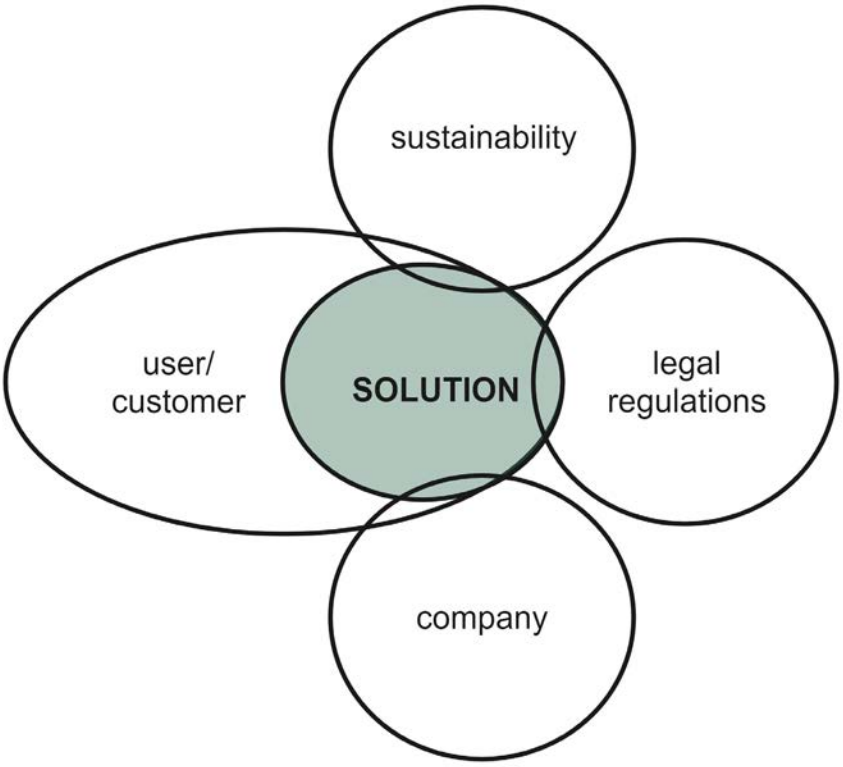


Figure 3: Different factors influencing the solution domain.

1.2.3 Method

During the project, the service design model was used. By using this model, the user's values and needs are mapped out so that the service - user interaction can tune to the user's daily life.
For a service design solution to succeed, continuous communication with stakeholders and the active participation of users is needed (Boeijen et al., 2020). To have continuous contact with the company stakeholders, biweekly meetings were organized with the Powertools (PT) department as well as biweekly meetings with my mentors from BMC UX. Next to these meetings, email contact was maintained, and additional meetings were planned to retrieve information from other Bosch employees.
To involve the user into the design process, interview sessions with Bosch customers were planned with the help of TestingTime. Aim of these interviews is to understand the current EOU process regarding cordless drills as well as the customer's experience when returning a product (barriers and triggers). Next to this, the users´ needs and wants were also checked.

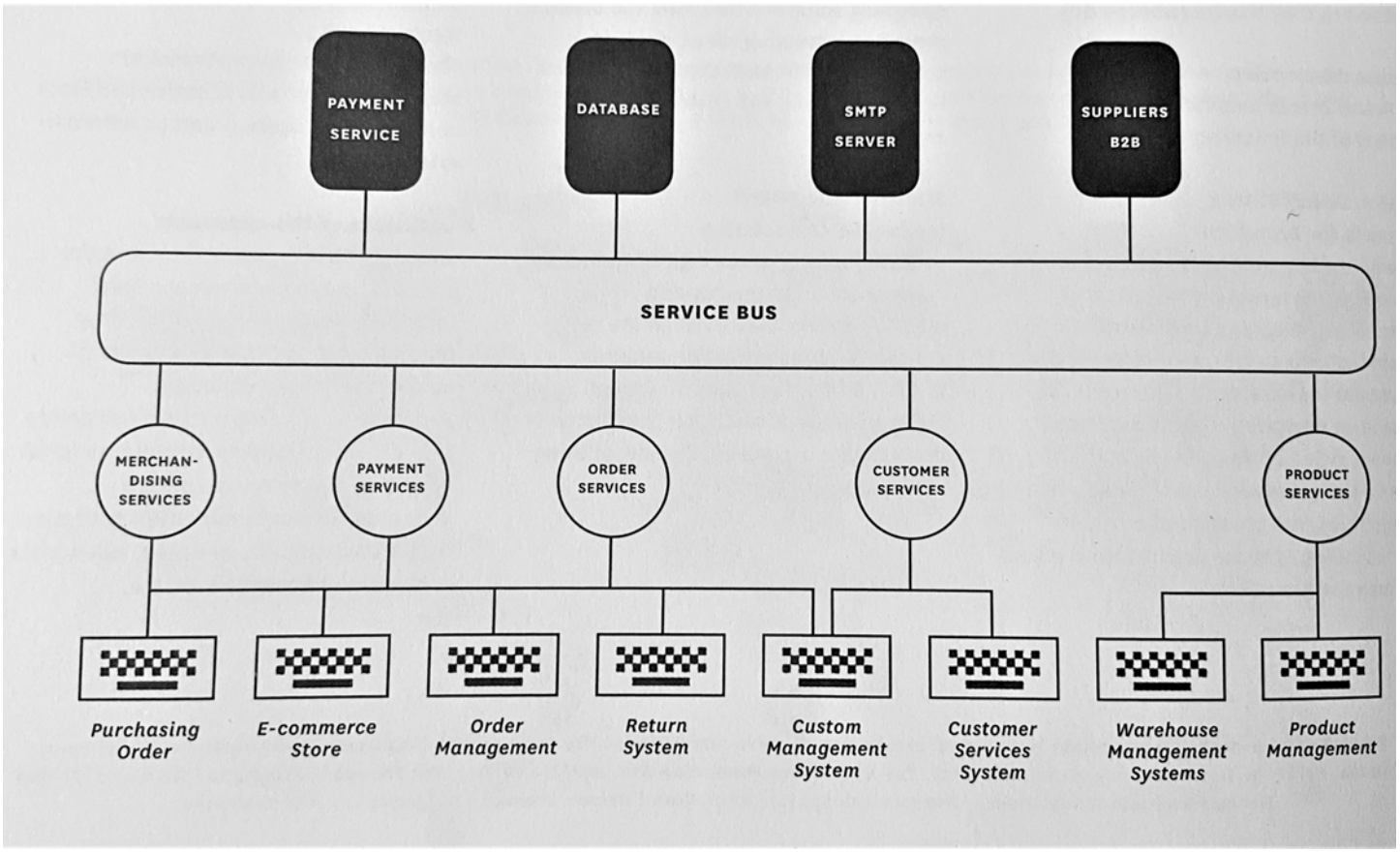


Figure 4: Example of service design from the Delft Design Guide (Boeijen et al., 2020).

1.3 Factors of influence

1.3.1 Introduction

This section analyzes the stakeholders involved in the project using a stakeholder map. The map examines their level of importance, potential roles, and concerns in creating and implementing a return solution. The analysis addresses the following points within the scope of the project:

1. Primary stakeholders who have significant influence in developing the return solution, and who are therefore considered for this project.
2. Secondary stakeholders who must also be taken into account when implementing the return solution.

By assessing the stakeholders' concerns, the analysis identifies important factors of influence for the project's development and implementation, which are discussed in the conclusion.

1.3.2 Stakeholder map

A stakeholder map was created based on each stakeholder's interest and influence on the following prime objective and articulation:

- Prime objective:
  Assist Bosch's circular economy strategy by tackling lever two: enabling second life during this project.
  More about lever two can be read in '1.1 The company'.
- Articulation:
  Create a return service for Bosch's most sold PowerTool.
  Every stakeholder will be addressed subsequently with their concerns.

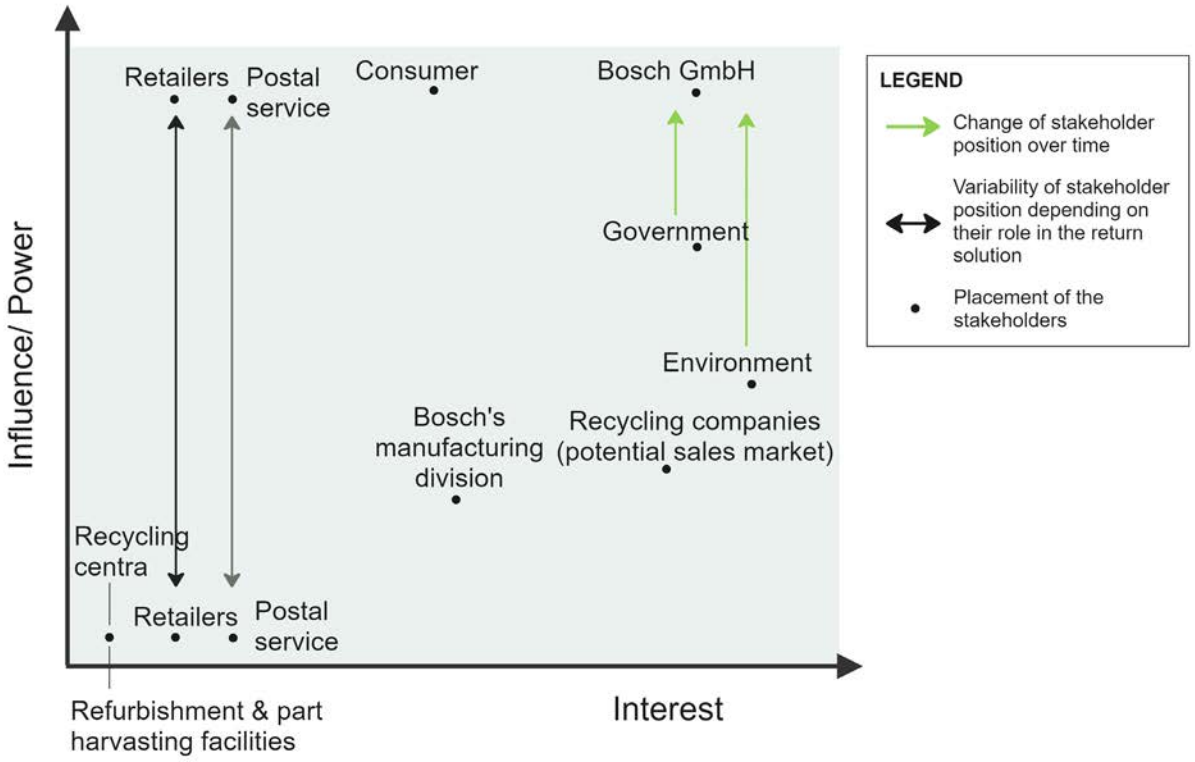


Figure 5: : Stakeholder map.

Bosch GmbH
Bosch's mission statement 'invented for life' refers to the products sparking enthusiasm, improving quality of life, and helping to conserve natural resources (Robert Bosch GmbH, 2023). By creating a return service for EOU cordless drills and enabling a second life for used products, Bosch could strengthen their strategic position. At the same time, Bosch also has sales and earning targets to achieve. Alongside the concern to help conserve natural resources, these economical targets are an important concern for Bosch as well.

On Bosch's website there can be read that there can be expected 'quality, innovation, excellent accessories and outstanding service' (Bosch Elektrowerkzeuge, n.d.). The return service would therefor need to align with Bosch's key characteristics.

Since Bosch would need to put the articulation into action, Bosch has the biggest power and influence. How Bosch will acquire this return solution is a major concern for them together with how to deal with the returns. Only the former, however, is in scope.

Consumer
The consumer's interest in a return solution would be personal and therefore diferring from consumer to consumer. Research, however, does indicate that for 74 percent of Germans, environmental pollution is a serious problem, and 69 percent fear climate change (Kirchner, 2022). Promoting the durable goal of the return service could therefore motivate the German customer to participate in the return service.

Next to this, the German customer has a lot of power concerning the implementation of the articulation (returning the drill) and is therefore placed on the same level as Bosch GmbH on the y-axis.

Governmental organisations
The European Green Deal wants to encourage a circular economony in 'the sectors that use the most resources and where the potential for circularity is high' (European Commission, 2020). Electronics and ICT are among these.

Since no real regulations have yet been set in place, the power of the government is still limited, however, taking into account that the European Green Deal will develop regulations in the upcoming years (European Commission, 2022), they are a major stakeholder to take into account. On the stakeholder map, this future change is indicated with a green arrow.
Since the government is actively implementing new regulations, their interest is high.

Bosch's manufacturing division
Manufacturers are at risk to face supply shortages in the near future because of political instability and further resource depletion (Achilles, 2022). Because these concerns are more related to the future of manufacturing processes, their interest is put on mediocre.

Since manufacturers would not have a lot of influence on product returns but are key in contributing to a circular economy, their influence is also put on mediocre.
Future concerns for manufacturers would include on how to make a shift towards a circular manufacturing process.

Recycling companies
The two main components that would be of interest for recycling would be the lithium ion batteries and the plastic of the cordless drill.

Currently, recyclers are unable to sell the recycled plastics at competitive prices because the cost of recycled plastics are higher than the costs of virgin plastics (Klawitter, 2020). Although the estimated recycling rate in Germany reached 67% in 2019 (Igini, 2022) with 'recycling rate' referring to the amount of waste collected with the aim to recycle, the actual recycling of plastic and usage of recycled plastics has lower figures. From the total amount of plastics processed for production in 2020 (measured in tons), 14% came from recycled plastics (Klawitter, 2020).

For lithium-ion batteries the same problem occurs, 'current routes to profitability for the recycling of lithium ion batteries are yet unclear' according to Lander et al. (2021). Since the recycling rate for lithium-ion batteries is less than 1% according to the International Resources Panel (2011), the industry is still in its early stages of development.

Recycling companies would have an interest in the articultion since they would have an increase in their potential sales market. However, funds to assist the industry's growth and development would be needed to make the recycled goods at competitive prices and with adequate recycling

efficiency.
The power of recycling companies is low regarding the return solution but high in regard to the prime objective: creating a (more) circular economy. Because of this, their power is put on mediocre.

Environment
A multitude of problems are currently related to the environment: difficulty to manage large quantities of waste, resource depletion, microplastics etc. Since the return solution wants to reduce current climate issues by assisting in a more sustainable economy, the environment is an important stakeholder. Because of this, the return solution should be the least taxing as possible on the environment. The interest is therefore very high.

The environment currently is of mediocre influence. However, as resource depletion will worsen, the environment's influence will keep increasing. This change is indicated with a green arrow on the stakeholder map.

74 percent of Germans, environmental pollution is a serious problem, and 69 percent fear climate change (Kirchner, 2022).

Image from BBC article: Germany floods: Where are the worst-hit areas? (Team, 2021).

Recycling centra
Recycling centers may experience a change in product disposal methods and a consequent reduction in revenue. However, certain materials are more profitable for recycling centers than others. Plastic and lithium-ion batteries, for instance, are currently not yielding high returns. Because of this, their interest is rather low as well as their power on the articulation and the prime objective.

Retailers
Retailers are currently part of the existing return solution since they occasionaly take back products when customers want to exchange, repair or discard them (more information about the latter can be found in 2.3 Legal Regulations). Despite this, retailers' primary goal is to sell the products they have in-store.
Giving them the task to take back more products, could discommode dealers and require extensive adaptation from their side. However, by promoting the EOU returns in the shops, the customer could refrain from buying a drill online since they can now do two things at once:

dispose the old drill and buy a new one. From this perspective, stimulating in-store returns together with the purchase of a new drill could be beneficial for retailers.
In case the retailer would be part of the solution, their interest would most likely be low but their influence would be high. In case retailers woul not have to take part in the return solution, they would most likely receive less return requests and thus would have a minimal influence nor interest. This is indicated on the stakeholder map with a black arrow.

Postal service
Postal service is also used currently to return products to Bosch for repair or exchange.

In case postal service would be part of the return solution, their interest would be low to mediocre since the demand would not drastically increase. Their influence would be high since Bosch would be very dependend on them to realise the return. In case the postal service would not be part of the return solution, they would most likely receive less requests and thus would also have a minimal influence nor interest. This is indicated with a black arrow on the stakeholder map.

Refurbishment and parts harvesting facilities
Limited information regarding the existence of refurbishment channels and firms specializing in parts harvesting for manufacturers was found during the research process. It remains unclear whether a sufficient number of such channels or firms currently exist. This lack of information could potentially pose a challenge to the implementation of the return service.

However, it is worth noting that Bosch, as the manufacturer of their goods, has the possibility to undertake parts harvesting internally, thereby bypassing the need for third-party involvement. Considering the potential for an increase in refurbishment activities and parts harvesting, it is anticipated that the current landscape may undergo changes in the future. Further research is necessary to ascertain the extent of these changes and their impact on the implementation of the return service.

1.3.3 Conclusion

Following from the stakeholder map and the stakeholders' position and concerns, the following factors have been identified for the creation and implementation of a return solution:

1.The primary factors and areas that require further investigation during this thesis.

The most influential factors in this project are the consumer, the government, the company and the environment, as identified in the project scope.

All stakeholders with high power and interest intend on contributing positively to the environment. Because of this, not much conflicting interests arise. One possible conflicting interest however is the product's price. From the stakeholder analysis, there is a possibility that Bosch would have to increase the product's price in case they would use recycled material from their drills. It is therefore imperative to find out during customer research how important the price is for the customer.

From research, sustainability seems to be a concern for over 70% of Germans (Kirchner, 2022). Because of this, it would be valuable to find out if sustainability would be an incentive for consumers to participate in a return solution. Next to this, it is crucial to understand the customer's wants and needs regarding the return experience and how it aligns with their perception of the brand, given the high power of the customer.

By looking at the government and the new regulations that will be set in place, there could be clarified that the European Green Deal would play a major role in the upcoming years. New regulations will be implemented in the near future concerning packaging and electronics. The latter with a focus on batteries (European Commission, 2022). Understanding where the requirements concerning this are headed would be of great value for developing criteria to choose the return solution. The European Green Deal also includes design recommendations

for packaging, such as the preference for paper or cardboard-based products that can be recycled or easily biodegraded (European Commission, 2021).). It is critical to consider these recommendations when designing a return solution that is environmentally friendly.

In regards to the company, it was determined that implementing a return service for EOU drills would be consistent with Bosch's mission to 'conserve natural resources'. It is essential to gain a better understanding of Bosch's internal objectives to ensure alignment of the return service with their goals. As obtaining a return service is the primary objective of this thesis and an important point of concern for Bosch, investigating the current return services offered by the company and the product in question would provide valuable insight. This leads to the following visualization:

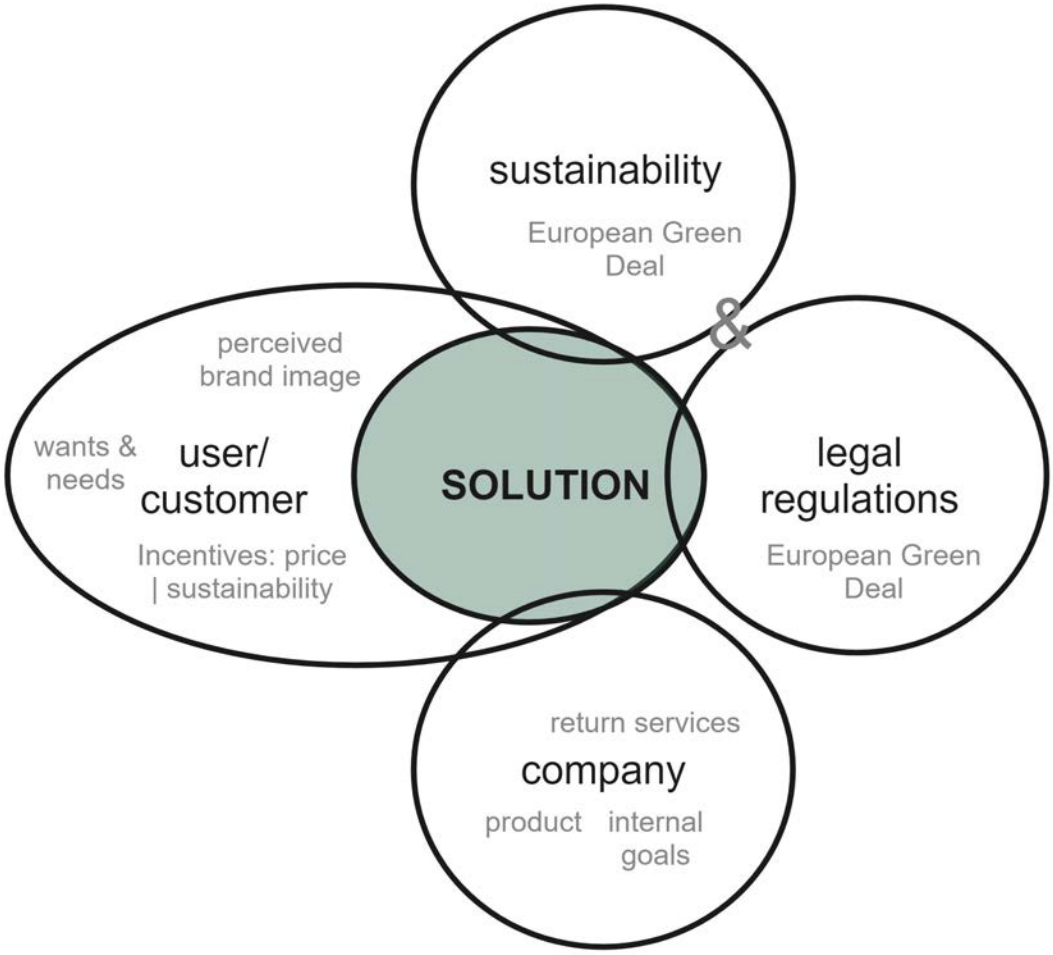


Figure 6: Stakeholder map with influential factors.

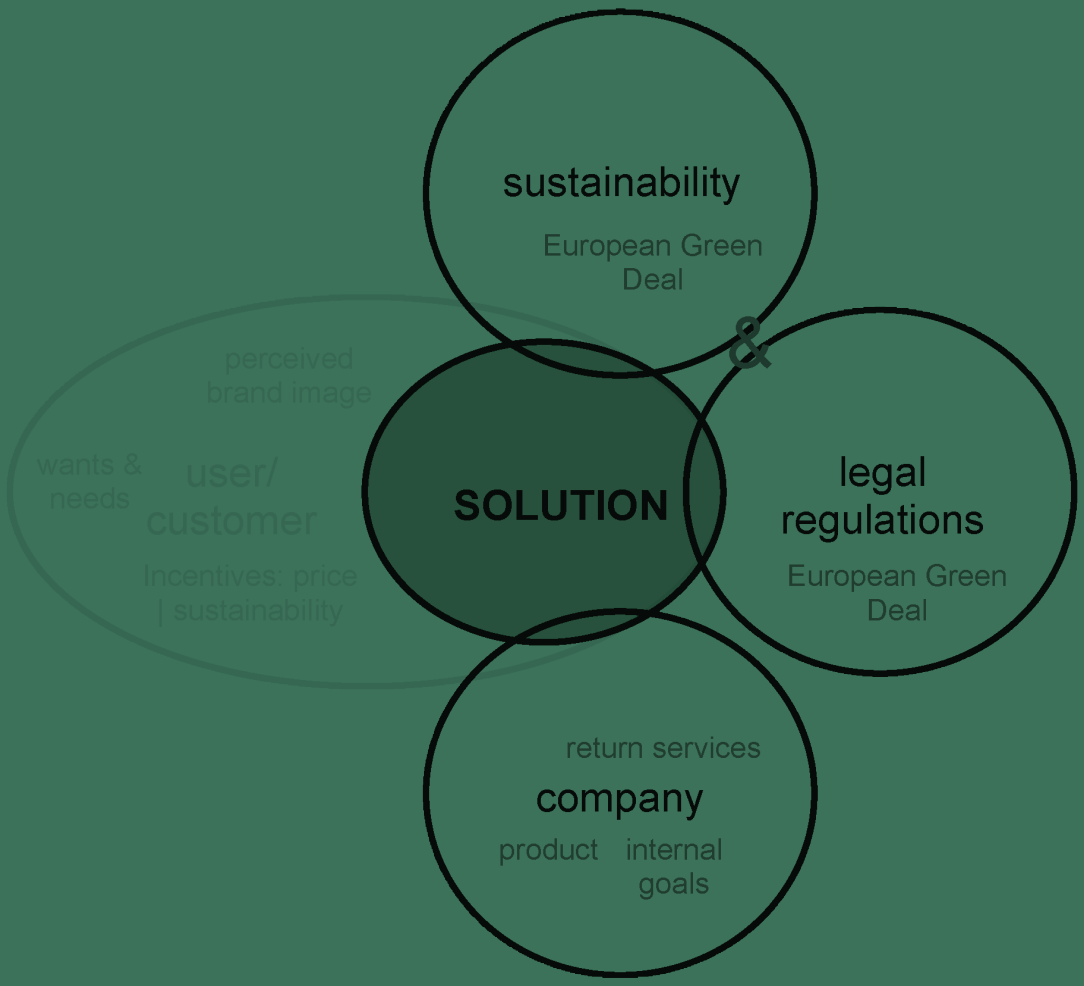
2.The secondary factors and considerations that need to be taken into account when implementing the return solution.

The implementation of the return solution may face some challenges, as evidenced by the stakeholder analysis conducted. Specifically, two return scenarios were considered during the analysis: returning the cordless drill via postal service or through retailers. However, the latter option is less likely to be interested in providing a return service.

In addition, the feasibility of the prime objective, which is to create a more circular economy within Bosch, may also pose difficulties. Although Bosch could engage in parts harvesting or refurbishment, a lot of unknowns are yet present as the development of the industry is in its early stages. The incorporation of recycled materials may also be challenging due to the current limitations of the recycling industry. To address this, Bosch could invest in ongoing research into recycling and maintain regular communication with recycling companies.

Furthermore, effective communication with the manufacturing division within Bosch is essential to facilitate the use of parts harvesting or refurbishment in Bosch's product design. This would require manufacturers to receive clear instructions on the requirements for incorporating recycled materials in their manufacturing processes.

Additionally, to establish material flows when recycling, Bosch could either enlist other companies to act as intermediaries between them and recycling centers or create a new division to regulate this process.



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2. Key factors

2.1 The company
2.2 Sustainability
2.3 Legal regulations
2.4 Conclusion

In this chapter, the following three key factors for this project are introduced: sustainability, legal regulations, and the company. The areas mentioned for further elaboration in the stakeholder analysis section will be discussed subsequently. Since understanding the wants and needs of the consumer is crucial to this thesis, a separate chapter is dedicated to discussing them in more detail.

2.1 The company

2.1.1 Retrieving information

All information that is discussed followingly is either retrieved through the German Bosch website or through the different company (sub)divisions. The different divisions that will be referenced to in this section are shortly introduced through the following figure.
Two main divisions (in black) were involved in the project: Powertools (PT) and Bosch Management Consulting (BMC). The subdivisions that were most often contacted are depicted in a bigger font.

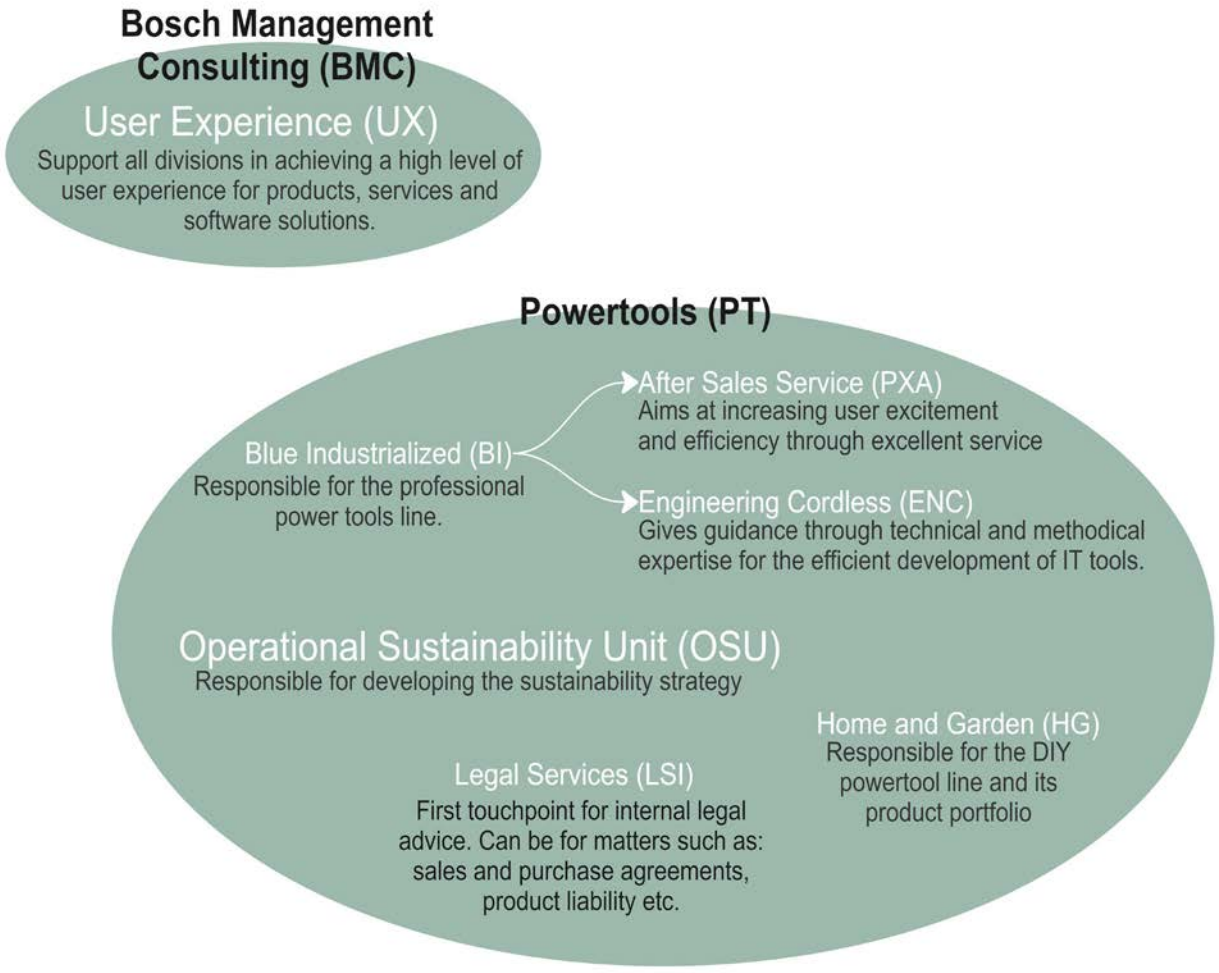


Figure 7: Divisions with their subdivisions within Bosch.

2.1.2 Internal Goals

Through identifying the research questions and interests of Bosch, the following research questions were addressed:

1. **Who is the target consumer group for the returns?**
2. **What is the current status quo of post-return processes within Bosch?**
3. **What is the intended destination for the returned drills?**

This section will discuss these internal goals first, followed by actionable steps addressing the research questions.
The return of the cordless drills would generate two interesting opportunities for Bosch. The first one involves the cordless drills' plastics and the second one, the batteries. To determine these opportunities, meetings with the OSU and the ENC unit were held. Each opportunity is discussed followingly.

Plastics:
The green colored plastics that are present in the cordless drills is Polyamide GF30. This is a plastic that is reinforced by glass fiber. Upon recycling, the green color that is characteristic to Bosch's PowerTools maintains, the glass fiber present in Polyamide GF30 however gets broken (OSU of Bosch GmbH, 2022). Currently, the percentage of recycled material that Bosch purchases as raw material is around five percent. They, however, 'intend to increase this share substantially in the coming years' (Robert Bosch GmbH, 2021). Upon recycling the green colored plastics, Bosch could 'reuse' its own material in a closed loop. Since the recoloring of (purchased) recycled materials is difficult, creating this closed loop for Polyamide GF30 would be interesting.
Although Bosch explored the possibility to refurbish and harvest drill parts less extensively, these post-return processes would also offer great value for Bosch in terms of their circular goals. Since these circular goals regarding refurbishment and part harvesting were less identified, European regulations were consulted as they form a significant factor in the development of the sustainability strategy of the OSU department (Bosch, 2023). By examining these regulations, possible circular opportunities and goals could be identified. The latter is discussed in section 2.2 and 2.3 of this thesis.

Battery:
The Lithium-ion batteries used in the battery packs of the drills contain valuable resources. Keeping them in circular economy loops is a declared goal of the EU (c.f. Horizon 2020 Research Program). Next to this, batteries could be reused in case their performance is still sufficient. However, manipulating the batteries, such as reusing specific components, would result in the loss of their certifications, rendering them unusable. This is due to the current regulations in place. Next to this, reusing and recycling the batteries would be of interest to avoid the mining of conflict minerals and to also recuperate the high-risk raw materials that are present in the Lithium-ion batteries.

1. Who is the target consumer group for the returns?

As mentioned previously, Bosch's internal goals regarding the cordless drill returns were a parallel process to this thesis. How these returns would be managed once they arrived were not yet clarified and the number of returns that needed to be reached, was not defined.

However, given that 5% of the material cost of a drill is attributed to the cost of the plastic, returning as many drills as possible would be necessary to make the recycling process economical. Due to the limited exploration of other post-return processes such as refurbishment and parts harvesting, it is challenging to determine how many drills should be returned for the return to be economical in those scenarios. However, from a sustainability standpoint, it would also be desirable to return as many drills as possible. This would mean that Bosch's entire customer base for the DIY tools would need to be targeted. Gaining additional insights about the company's customer base can therefore be highly valuable. This could help in gaining understanding of the DIY customer as well as how participant recruitment has been performed in the past. The latter would in turn help with

participant recruitment during this project.

2. What is the current status quo of post-return processes within Bosch?

As refurbishment and part harvesting are part of Bosch's post-return goals, it is necessary to determine the quality of the returned battery and/or bare tool. Therefore, both would need to be checked upon their return. Another option could be to ask consumers to evaluate the drill on certain aspects and based on that, advise them to either take the drill (and/or battery) to a recycling center or to return them. However, to simplify the solution from the consumer end, it has been decided that Bosch or a third-party capable of performing such, would take this post-return decision.

To keep options such as refurbishment and parts harvesting open, it would be crucial for the drills to be returned in good condition. Because of this, adequate packaging of the drills or a safe way to deposit them at a location would be required. This would also mean that throwing the drill (and their ACCU) in collection boxes as is often done with small batteries for example, would not be possible. Assuming that implementing the return service would be the most economically viable by using current existing return solutions such as Bosch retailers and the postal service, these two options were used as a starting point during this thesis. When the consumer would return the drill through postal service, clear packaging instructions should be given and careful handling by the carrier should be ensured. If the drill would be returned through retailers, a safe way to deposit the drill would be required. Since returning the drill through postal service or bringing it to a collection point requires different customer actions, it would be interesting to determine which one is preferred by the consumers during consumer research. Following the circularity strategies discussed in section 2.2 on sustainability, the preferred post-return option would be refurbishment of the drill. If refurbishment is not possible, salvaging specific drill parts would be the next most circular choice, and if this is not an option, recycling them.

Currently, Bosch does not have an internal closed-loop system for its recycled materials, meaning that the company does not reuse the recycled materials from its own products (yet). As mentioned earlier, there are currently also no established facilities for refurbishing, reusing, or participating in parts harvesting for cordless drills. Consequently, little is known about possible logistics and the economical viability of such a system and a lot of opportunity is still present from a circular perspective. Because of this, further assessment should be done on the back end of this thesis' return solution.

3.What is the intended destination for the returned drills?

Based on the information presented, it can be concluded that Bosch aims to utilize returns for a range of post-return processes, with recycling being the most extensively researched within the company's Power Tools division. As the return service process is still in its developmental stage, the identification of a definitive return location for the drills has not yet been established. Given that the quality check and post-return decision will occur after the drill has been returned, it is possible to return the tool through postal service or a common collection point, regardless of its condition. Current available options, such as returning the drills at a retailer or using postal service, have been selected as the initial focus of this thesis due to their likelihood to be (economically) feasible.

DESIGN REQUIREMENTS

1. The return solution should appeal to the entire DIY tools' customer base.

2. The return should be done in a safe way where the product is packaged as safely as possible, where packaging instructions are given in a clear way and where handling of the return is carefully performed.

3. Returning the drill through depositing it should be done in a scratch-free way.

ACTIONABLE STEPS

Consult current customer research and its participant recruitment. The former to utilize findings and identify gaps in knowledge that are relevant for this project. The latter to design or reuse a participant recruitment strategy that targets the entire customer base.

During consumer research, both options of returning the drill through a retailer and postal service should be discussed to understand which one holds a preference and why.

A comprehensive review of the different post-return possibilities should be undertaken in the future, considering both their economic and logistical implications (research concerning consumer acceptance of refurbished products, refurbishments expenses, inventory management etc.)

2.1.3 The product

After defining the product category, a self-conducted analysis was performed to better understand the context of use. This analysis focused on evaluating the product itself, as well as the information and additional services provided (manual and Bosch app). The goal was to assess the current accessible information and services from a circular perspective, identifying potential touchpoints, barriers, and opportunities for developing the return solution proposed in this thesis.
The analysis was conducted by a single evaluator and involved desktop research, as well as meetings with relevant Bosch units.

The cordless drill:
All the cordless drill models are considered for the return solution, meaning that both the heavy-duty models that can drill in concrete and light models that are suited for wood, plastic, and plaster are considered.

The drills' ACCU voltage and thereby battery packs also differ. The following battery voltages are available: 3.6V, 12V and 18V. The majority of these ACCU's are removable except for the lighter models (IXO, Pushdrive etc.) and the Easydrill 12. The latter could complicate the return solution if done by postal service since different regulations apply for removable and non-removable batteries and their packaging requirements.

Bosch app:
Bosch also provides a range of apps for their customers, one of these is specifically for the DIY tools called 'Bosch DIY'. On the app, different DIY tools can be registered, a variety of DIY projects are shown for inspiration and the customer service center can be contacted. You can also select your interests to receive suggestions for DIY projects and follow other users on the app to see their projects. Lastly, you can publish your own projects as well.

To be able to register your tool, publish your products and follow other users, the customer first needs to register for a Bosch account. Since the app would be an interesting touchpoint opportunity, it would be valuable to explore during the customer interviews:
1. How many customers know about the app.
2. How they know about it.
3. How many customers use the app.

Name plate:
Every DIY tool has a name plate on the drill (see image 1: The nameplate). With this name plate, the drill can easily be identified. On the app, the user can either scan the name plate or type in the serial number for registering the tool. A tool can also be registered by entering the serial number on the Bosch website, this however needs to be done manually since scanning is only possible on the app. By registering the tool within 4 weeks after its purchase, the warranty of the tool gets prolonged from 2 to 3 years.

The registration of tools allows Bosch to know which tools are in usage (not in the warehouse of a retailer e.g.) and when the usage started. The obtained data can give Bosch insights into sales that are regulated by a third party.

Retrieving information about when a tool is discarded/ no longer working etc., could also be useful to fill knowledge gaps that are currently present in reverse logistics processes (see '3.2 Reverse logistics'). Encouraging this option to scan the drill upon purchase could thus be an interesting option to explore for the return service.

Manual:
A manual is provided by Bosch both in an online and physical version. On the manual, instructions about the transport of the drill are mentioned followingly: 'When shipping by third parties (e.g.: by air transport or forwarding agency), special requirements on packaging and labelling must be observed. For preparation of the item being shipped, consulting an expert for hazardous material is required.' (Easydrill 12) This indicates that for doing a Bosch return, an expert should be consulted to fulfill the packaging requirements.
The absence of direct information and the mentioning of an additional task can be a barrier for customers to return their product in a legal way. Although not mentioned in the manual, the Bosch website does give more detailed instructions concerning returns. However, for the return steps to 'retour' a product after purchase, there is no mentioning of the needed packaging requirements on the website either. This could prompt users to consult the manual where they are then redirected to a third party. Currently

accessing information about the different return steps and the drills' necessary packaging for the return can therefore be time-consuming. The information regarding the returns policy and procedures as outlined on the Bosch website will be further be discussed in '2.1.4 Current return and discard model'.
The product manual also mentions the availability of spare parts and explosion drawings that can be accessed through the Bosch website, where this feature is also prominently displayed . Promoting this service to the user upon purchase for example could be interesting from a product retention and thus circular perspective. Bosch however does recommend that the installation of spare parts should be performed by a qualified expert in the respective field. This is because Bosch does not endorse or promote home repairs due to safety considerations (OSU, 2023).

Image 1: The nameplate.

Image 2: The Bosch DIY app.

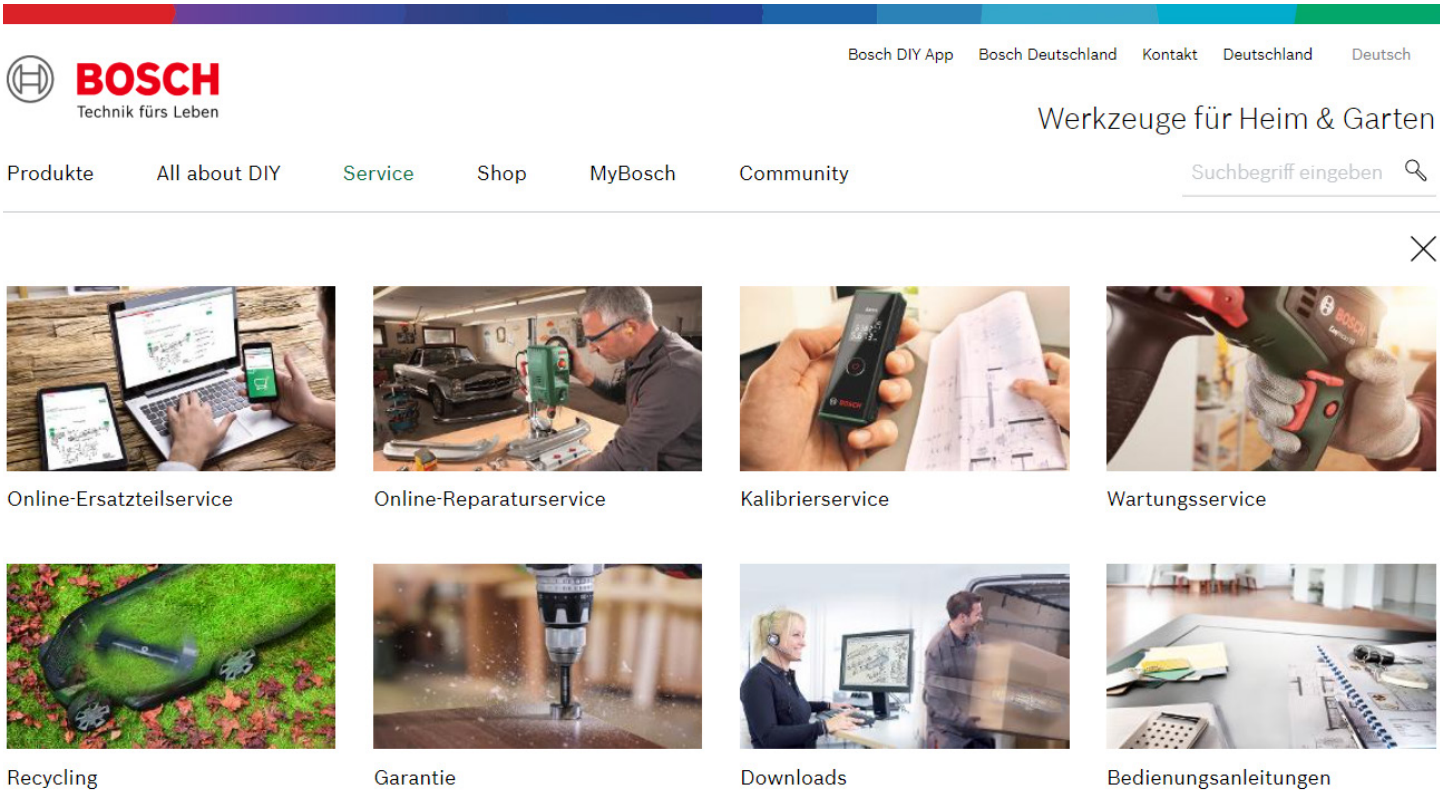


Image 3: Screenshot of spare part service (Online-Ersatzteilservice) option on Bosch website.

Conclusion
In conclusion, clear packaging regulations are necessary for cordless drills to ensure a hassle-free return process and avoid negative customer experiences. However, due to the diversity of cordless drill models on the market, specific packaging regulations may vary, making it essential to define these regulations and develop a legal return solution that facilitates a positive customer experience.
Moreover, the following barriers and opportunities were found:

POTENTIAL BARRIERS

The absence of direct information concerning packaging requirements in the manual can be a barrier for consumers to return the drill (in a legal way). Although the manual might not be the most commonly used source of information, it might be consulted when consumers are looking for offline or additional information.

The absence of a scanning option outside of the Bosch app may pose a barrier for consumers wishing to register their tools and receive extended warranty.

POTENTIAL OPPORTUNITIES

The manual can be a touchpoint for consumers, therefore providing direct and easy access to the necessary return information (or an information channel that doesn't require a third party), could improve the consumer experience of the return.

The Bosch app can be an interesting touchpoint to explore for promoting the return service. Conducting customer research to assess awareness, acquisition, and usage of the app would therefore provide valuable insights.

Streamlining the scanning process could be a first step in encouraging customers to register their tools which in turn could be interesting to obtain usage data. Usage data could optimize reverse logistics processes of returns by providing more information on the product lifetime for example (when did usage start). From a durability perspective, it would also be beneficial to encourage users to extend their warranty by streamlining the scanning process.

Image 4: Drills with following voltages (left to right): 3.6V, 12V, 18V.

2.1.4 Current return and discard model / logistics

In this section, an individual evaluation is conducted to assess the current processes and communication approaches involved in returning products to Bosch and discarding them. The evaluation includes an examination of the returns for repair, product exchange/retour, and end-of-use (EOU) scenarios as presented on the Bosch website and aims to identify the current status quo of returns and discards. Both the return and discard scenario are considered as the discard process needs to be modified into a return process. This understanding of the existing practices serves as a foundation for building upon current systems and collaborations in the development of the return service proposed in this thesis.

Furthermore, the evaluation explores the usability of the current return options by analyzing the clarity of information and ease of navigation. This assessment helps uncover opportunities for enhancing the return experience. The following research questions guide this evaluation:

1. **How are products currently returned to Bosch?**
2. **How are products currently discarded?**

It is important to acknowledge that the evaluation is based on an analysis of how the information is presented and its potential impact on the user experience and behavior. Assumptions and speculations are made considering that the clarity and usability of the presented information can influence users' perception and their willingness to engage in the desired behavior. For instance, unclear or difficult-to-navigate information might discourage users from proceeding with the desired action.

Additionally, it should be noted that the evaluation was conducted by a single evaluator, which may have limitations in capturing all points of improvement or barriers.

Returns for repair

This is a return executed by the consumer when encountering a functional problem with their tool. However, consumers are also advised to use this option when wanting to return their EOU product (see heading 'returns for when the product reaches its EOU'). Repairs can be done within the warranty period or outside of the warranty period.

Among the available return options, the option to repair the product is prominently displayed on the Bosch website under the label 'Bosch Online-Reparaturservice'. Through providing a step plan (see Image 5) and showing the key points of the service, the consumer gets informed on what to do and the advantages of the service. A video at the end of the webpage also explains the consumer the step plan in a more visual and detailed way. The consumer then needs to fill in the repair form (see Image 6). This form is presented in a less visual way with the packaging requirements for the lithium-ion batteries shown at the end. Here, the consumer can download a document on how to package the lithium-ion batteries. The information in this document is also given in plain text and the consumer needs to figure out which of the two labels they need to get based on their return case.

The absence of a general overview for the packaging requirements, the need for customers to determine the appropriate label, and the uneven distribution of text and visuals in the repair form and dangerous goods document may have a negative impact on the overall customer experience. Although the different return steps of the step plan (Image 5) could be used, the previous points could still be enhanced for the return solution developed in this thesis. Apart from the EOU return service, improving the customer experience for repair could also be beneficial to achieve circular goals.

The return process itself happens through DHL or GLS and the consumer can choose to either schedule a pickup or deliver the package to a designated DHL or GLS point. If within warranty, the consumer needs to take a photo of their receipt and upload it. Through email contact, the consumer is kept up to date about the status of the repair and when the repair will be delivered. The communication approach, variety of return options and carrier collaborations observed in this return process could be utilized in the return service proposed in this thesis.

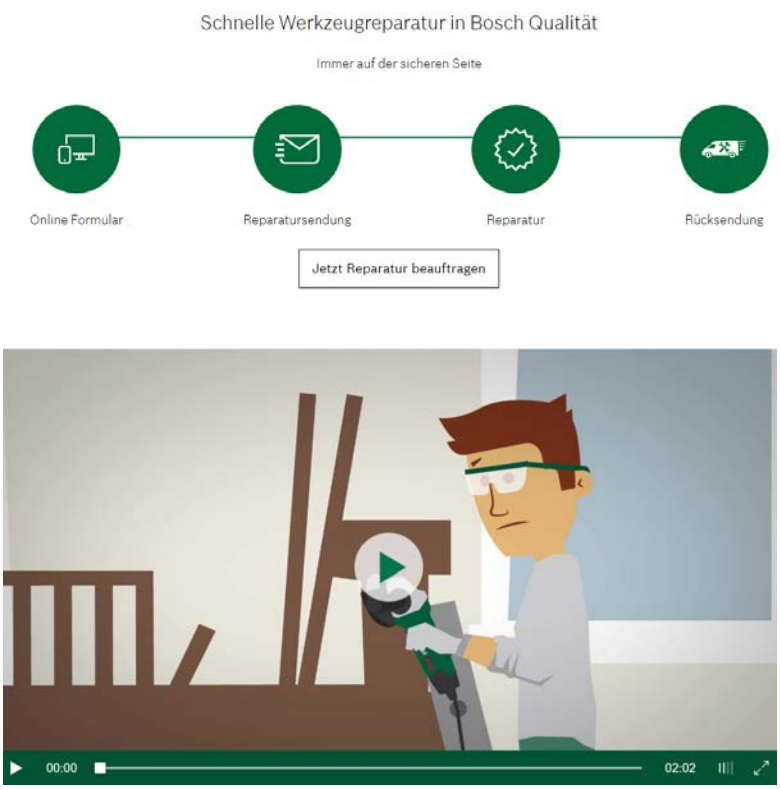


Image 5: Step plan (above) and video of steps (below).

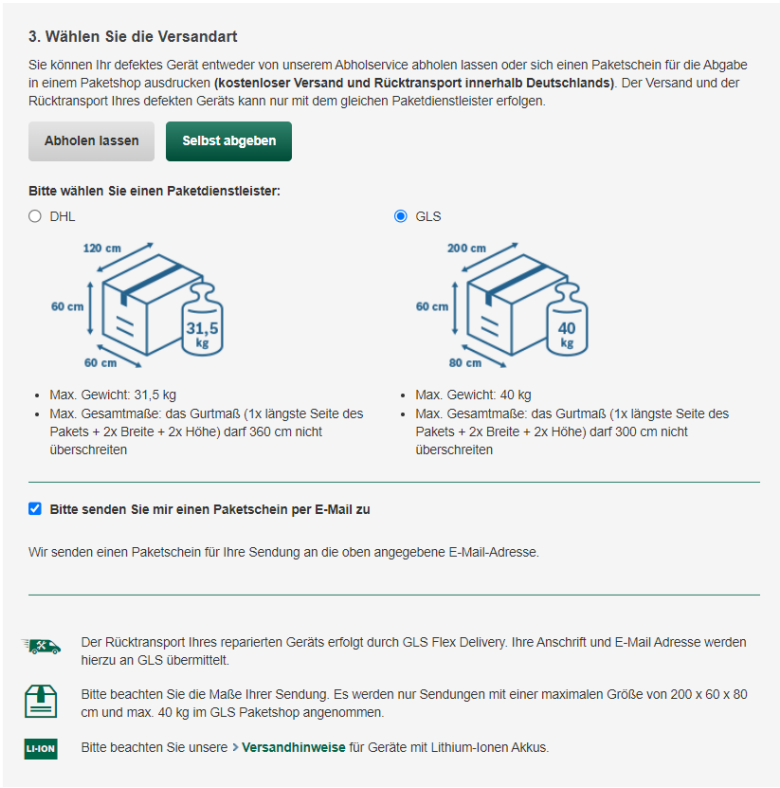


Image 6: Step three of the repair form

Returns for product exchange/ retour

This is a return initiated by the consumer when there is a dissatisfaction with the product. Here, the consumer would like to exchange their product for another one or have their money back. The following return process can only be initiated when the purchase was made on the Bosch website. Consumers who have acquired products from other sources are directed to return them to the respective dealer.

The Bosch website places the option to initiate product returns in a less prominent location towards the end of the page (refer to Image 7), and the instructions for returning are described in plain text without visual aids, potentially creating a barrier or a less enjoyable customer experience. Although the text provides information on how to package hazardous goods, it does not specify which hazardous goods label should be used. After following the instructions provided, customers are redirected to a DHL website where they can request a DHL shipping label. On the DHL website the consumer is given the option to print the label themselves or let DHL print it out by using a QR code. This redirection was not present for 'returns for repair'. With returns for repair, the label was sent by mail to the consumer without any direct interference of DHL.

Unlike the previous return option, the return for product exchange can only be initiated through DHL, which requires the customer to deliver the package to a designated DHL point without the option of a pickup service . Although the solution gives less flexibility in terms of the pick-up, the consumer is given a choice to use a QR code or print the label themselves. Redirecting the consumer through DHL could thereby potentially be interesting for the consumer but also for Bosch to reduce the company's required actions to provide the return service. Next to this, return through retailer is also possible when the product is purchased at the retailer. Exploring if this is also the case for EOU would be interesting for this thesis.

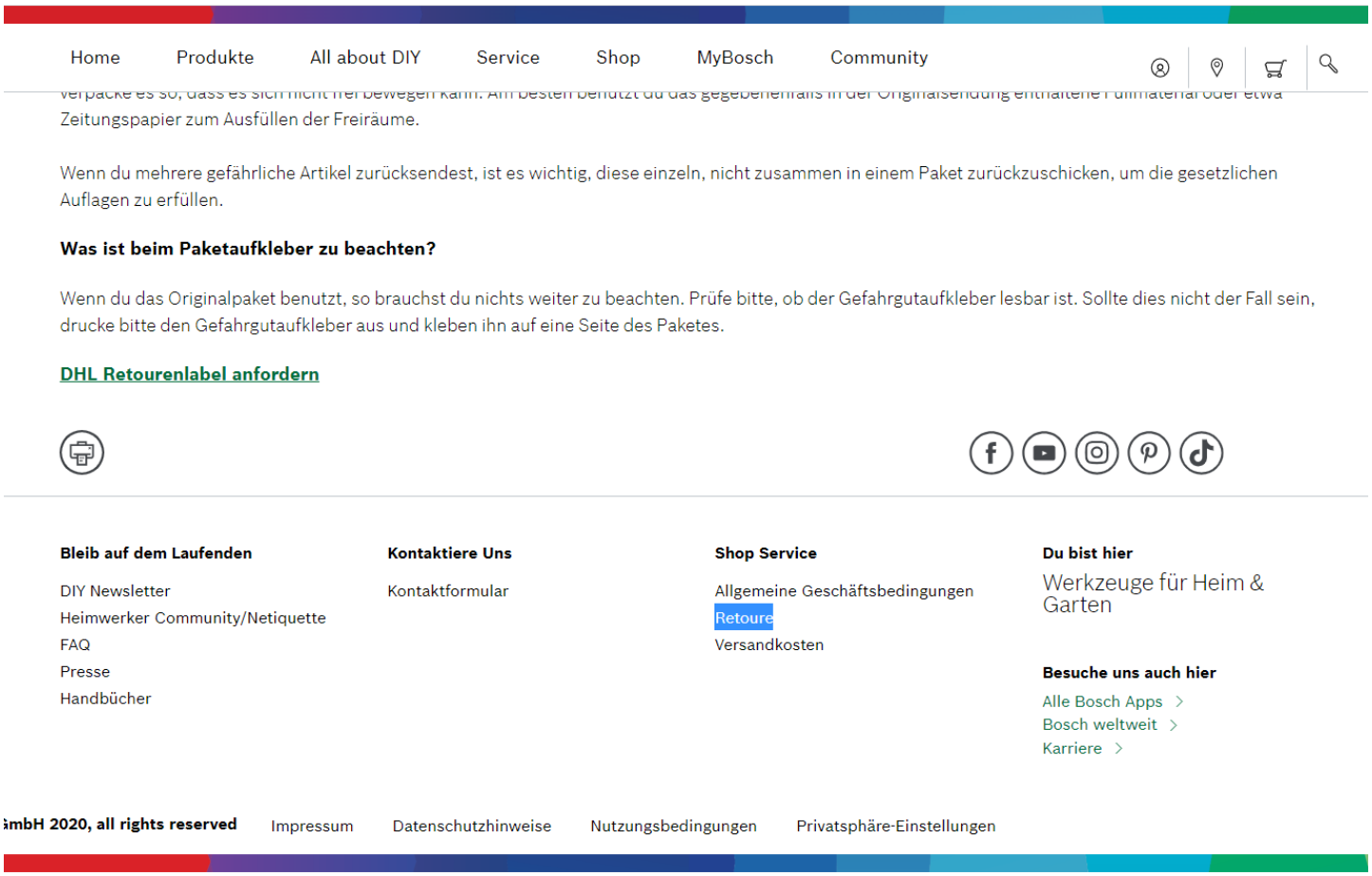


Image 7: Retour option on Bosch website.

Returns for when the product reaches its EOU (end of use)

The end-of-usage return option is intended for products that have reached the end of their usage. However, since it is presented as a possibility within a FAQ list rather than a dedicated return option, it was not initially considered as a comprehensive "end of usage return solution" at the outset of this thesis. The subsequent section describes the return steps for the end-of-usage return in detail.

On the Bosch website, a recycling service page can be found. Here Bosch recommends users to bring their tool back to public waste disposal providers and mentions a collaboration with the GRS Batteries Foundation for its battery return system. There is also an option to return the EOU tool by postal service; however, its visibility is relatively low as it is mentioned as an answer to a frequently asked question (FAQ) located at the bottom of the page (see image 8). If the user wishes to return their EOU device to Bosch, they must complete the repair form and indicate in the form's remarks that it is an EOU instance. The manual doesn't promote this return option either and discard is shortly addressed by stating that 'Power tools, rechargeable batteries, accessories and packaging should be sorted for environmental-friendly recycling.'

To make the end-of-use (EOU) return option more complete and independent, it is important to make it more visible and reduce the prominence of alternative methods. By creating a smooth and straightforward process that doesn't involve redirecting users to other return options, the EOU option can be a more comprehensive and effective solution on its own. Next to this, it would be interesting to clarify discard and return possibilities in the manual where this thesis' return service is mentioned.

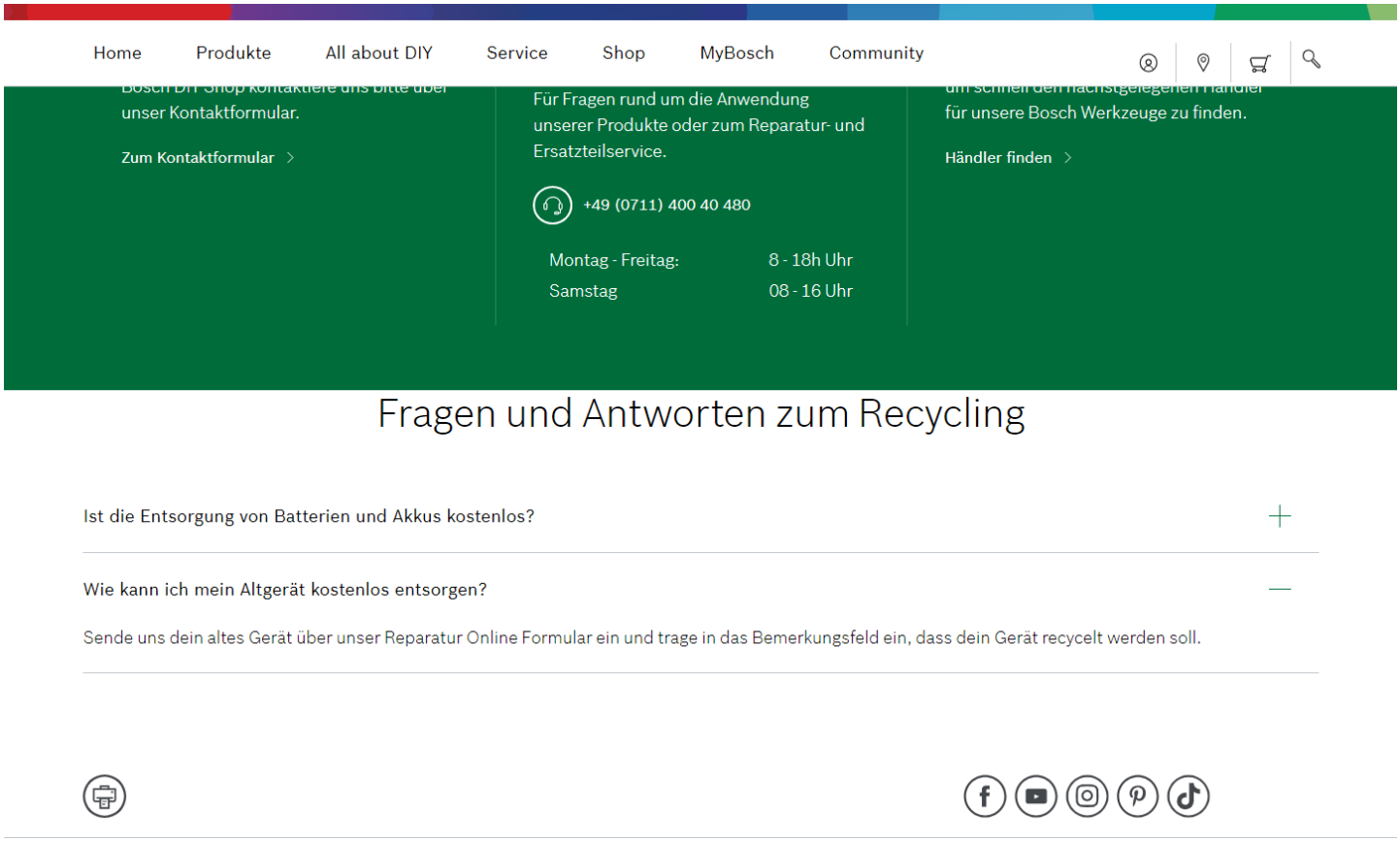


Image 8: Questions and answers concerning Recycling showing the return option for EOU devices.

Maintenance service

Although not addressed separately, Bosch also offers a maintenance option. Here, no price indication is given. For further information about the maintenance service, there is made a reference to a service hotline. The return has the same steps as the EOU return where the consumer fills in the repair form and indicates in the remark that the return is for maintenance.

Conclusion

After conducting an individual analysis of the current return processes implemented by Bosch, it was found that cordless drills can currently be returned for three different purposes, each communicated differently. Among these options, the repair option is the most prominent, uses the most visual aids and offers the most flexibility with a pick-up option and two possible carriers to choose from. However, the information for the return steps is not consolidated onto a single, easy-to-navigate page, which may be inconvenient for the customer. The options to return drills for retour and EOU (end of use) are less visible, and the instructions are given in a less visual way. Next to this, the options are located on a less prominent place on the website. This is mostly of importance for the EOU option, where the current presentation is likely to affect the consumer's adoption of the service.

Regarding the drill's disposal, the information provided by Bosch suggests that public waste disposal providers are the primary means of discarding the bare tool and battery. As such, it is likely that customers currently dispose of these components in public waste disposal sites. This, however, should be checked during consumer research to be aware of the scenario that needs to be altered.

In summary, the examination of the current return and discard processes at Bosch has highlighted the following opportunities and actionable steps:

POTENTIAL OPPORTUNITIES

Providing visual aids for the various return steps on the website along with instructions on packaging adaptations required for Lithium-ion batteries could significantly enhance the customer experience during the return process.

Promote the EOU return through the manual.

Showing the EOU return option on a more prominent place on the Bosch website.

Exploring the potential of collaborating with GLS and DHL for developing an EOU return service.

ACTIONABLE STEPS

Given the current practice of accepting product retours in physical stores, it would be valuable to examine the possibility of extending this option for EOU returns.

Investigate how consumers currently discard off their drill.

It is important to consider these opportunities to optimize the front-end logistical processes of the return solution and improve the overall customer experience. Finally, while the pick-up option may be convenient for customers, it may not be the most sustainable solution.

2.2 Sustainability

2.2.1 Introduction

The objective of this section is to explore how the final return service can align with the principles of the circular economy.

To accomplish this, two key resources were consulted: the 9R framework, which provides guidance on implementing circular economy practices, and the European Circular Economy Action Plan, which outlines the government's position on the circular economy and its implementation. Considering the significant impact of European regulations on the strategy development of the Operational Sustainability Unit (Bosch, 2023), examining these regulations was valuable in understanding Bosch's objectives and aligning them with the circular goal of the returns. However, it is worth noting that the most comprehensive understanding of Bosch's goals was achieved through direct discussions with Bosch employees.

This section will provide a discussion of both the 9R framework and the European Circular Economy Action Plan, with a focus on identifying the aspects that can be incorporated into the return solution.

2.2.2 European Green Deal

One of the agenda points of the European Green Deal is the Circular Economy Action Plan that aims to 'provide longer lasting products that can be repaired, recycled and re-used' (European Commission, n.d.). The Circular Economy Action Plan aims to address the following points (European Commission, 2020a; European Commission, 2020b):

Promote the design of products that are environmentally friendly:
Here products that they are designed for energy efficiency, durability, repairability, upgradability, maintenance, reuse and recycling are considered environmentally friendly.

Empower consumers:
The Commission seeks to give consumers access to reliable information about the durability and repairability of products, so that they can make sustainable choices. Consumers would also have the "Right to Repair," entailing access to repair services, spare parts, and repair manuals. For ICT and electronics, the right would also encompass the option to upgrade services.

Focus on sectors that use the most resources and where the potential for circularity is high.
For the sectors that are relevant for this thesis, the EU aims to launch the following actions.

- Electronics and ICT:
1. 'Circular Electronics Initiative': Improve collection and treatment of waste batteries and extend product lifetimes.
2. Regulatory framework for boosting the sustainability of batteries.

- Packaging (European Commission, 2020c):
1. Reduce the complexity of packaging materials.
2. Reduce (over)packaging.
3. Ease the reuse and recyclability of packaging.

Next to this, the European Green Deal also introduced the concept of a Digital Product Passport (DPP). This is a tool to provide consumers with more information about a product throughout its entire life cycle. This standardized format collects and shares data about the product's design, materials, production, and more (see image 9). The DPP would be accessible through a digital data carrier and would collect product information at each step of the value chain. For digital carrier options, an assessment of the different possibilities had been made by the Boston Consulting Group (see Appendix B). From this the QR code seemed the best option when also considering the cost of implementation (Boston Consulting Group & World Business Council For Sustainable Development, 2023).

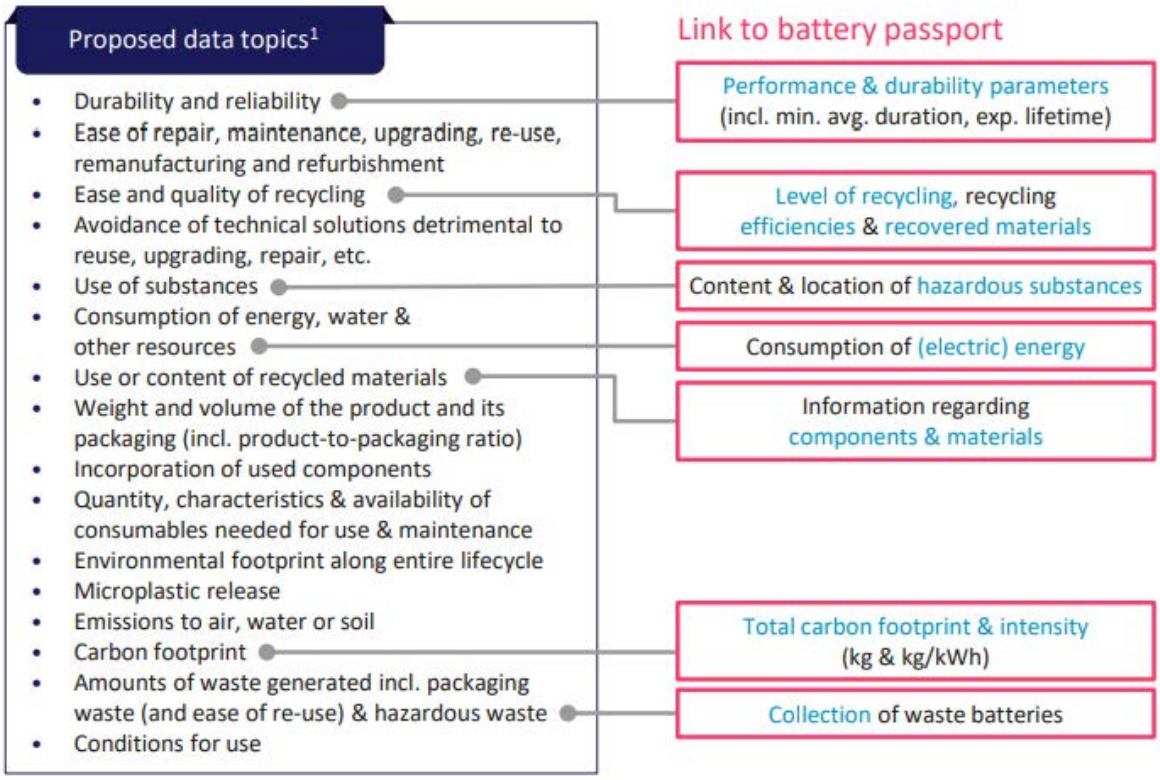


Image 9: : Relevant data topics for the DPP proposed by European Commission (Boston Consulting Group & World Business Council For Sustainable Development, 2023).

From the Circular Economy Plan, it can be concluded that next to reuse, repair and recycling, product retention strategies such as upgradability or maintenance will also be encouraged increasingly by regulations. With the current status quo of "durable services" provided by Bosch which are return services to repair, maintain or recycle the product, repair and returning the product EOU would be the most feasible to implement short-term.
Next to this, the packaging of materials will also be tackled by EU regulations. Although this thesis does not tackle packaging design, these future changes should be kept in mind.
Lastly, the DPP offers an interesting opportunity in terms of data collection. If the ease of re-use, repair etc. would be assessed as suggested by the DPP, Bosch would also have a better cost estimate of these processes, simplifying post-return decision making. On the other hand, would capturing data related to product repair, maintenance etc. also help in determining the ease of refurbishment through having more awareness of the product its state. To link data with a specific product, the scanning feature provided by the Digital Product Passport (DPP) could serve as a means for this. The European Commission also assessed different data carriers with the QR code resulting in the best option based on its cost, ease and speed of implementation, data storage feature, durability and user-friendliness. The NFC would also be an interesting data carrier due to its remained functionality when scratches occur. However, 'over 10 years' as a lifespan for the NFC tag might still not be enough for drills.

2.2.3 9R Framework (Potting et al., 2017)

The 9R Framework is a framework that encompasses different circularity strategies. The higher-up in the list, the more the primary function of the product is maintained, and the lesser (additional) resources are used. Meaning that the strategy is more circular higher up in the list. This framework suggests that repairability is an important circular economy strategy, with repair being positioned before refurbishment, remanufacturing, repurposing, or recycling. To align with Bosch's mission to be circular, the repairability of the drill would be an interesting option to promote upon requesting the drill's return.

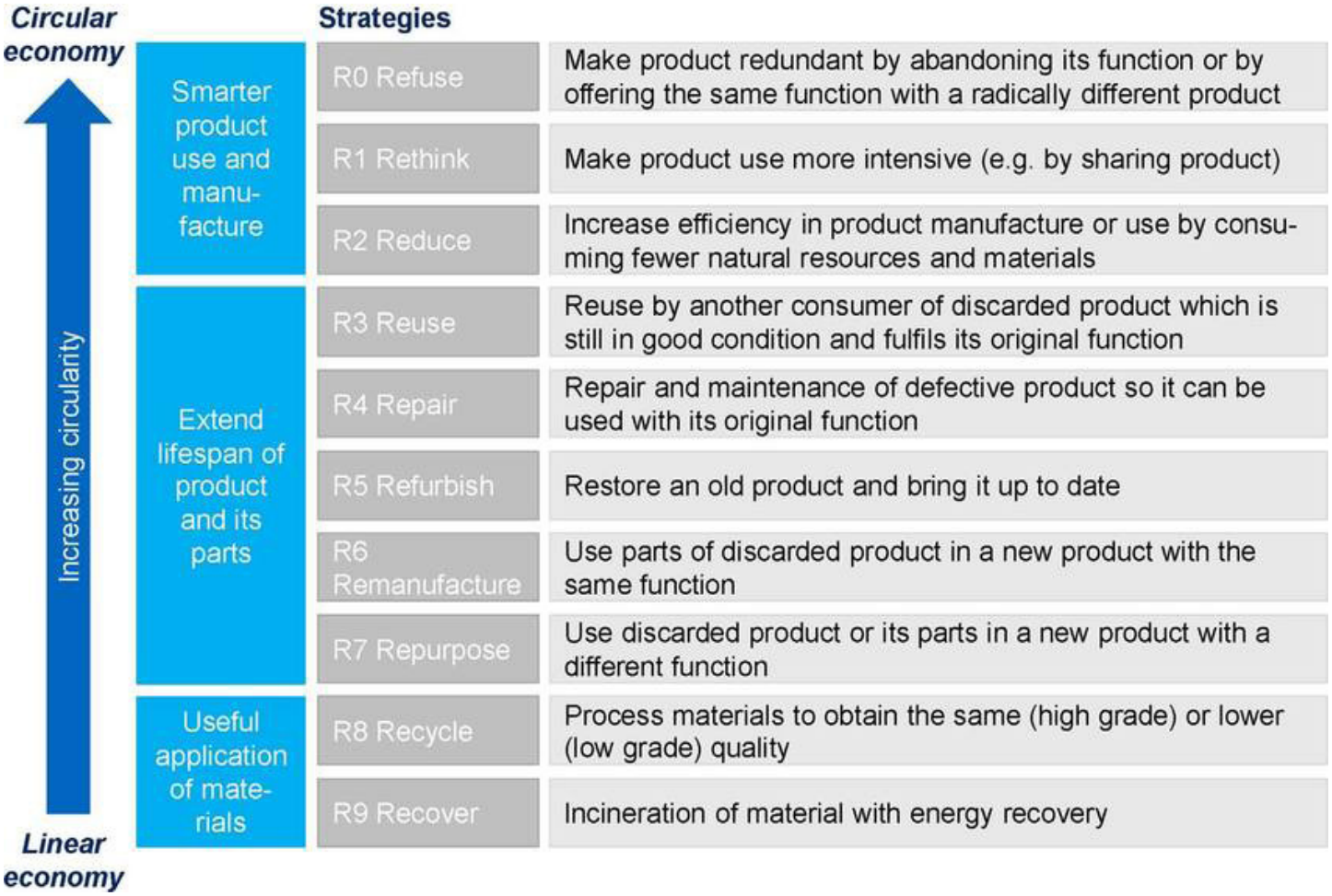


Image 10: :9R strategy for a circular economy (image from Potting et al., 2017).

2.2.4 Conclusion

By looking at the European Green Deal and its Circular Economy Action Plan, it could be concluded that repairability will play a major role for companies in the upcoming years as the European Commission aims to provide consumers with a 'Right to repair'. Next to this, maintenance and upgradability will also be important services that are likely going to be encouraged by the European Commission. Therefore, encouraging and offering return options to repair, maintain or upgrade the drill rather than returning the drill EOU would be an interesting avenue to explore. This, not only to align the service with the European Commission but also Bosch's own circular objectives. With the current status quo of the mentioned services, promoting repair or EOU return would be the most feasible short-term.

To empower consumers and promote sustainable choices, the Commission aims to introduce the Digital Product Passport (DPP), which would provide information on the product's materials, production, repairability etc. Consumers would be able to scan the DPP to access this information and make informed decisions. Furthermore, the DPP would also provide information on the ease of refurbishment and remanufacturing processes (see Image 9), making it beneficial for Bosch to start assessing and rating their products on these aspects. By doing so, reverse logistics decision-making could be simplified by providing (more) predictable costs for refurbishing or remanufacturing the different drill types. Obtaining data concerning the drill's condition when returning it for repair and potentially maintenance could in turn offer valuable insights into its ease of refurbishment for example. From the previous findings, having a way to collect data concerning the product's condition through its lifecycle would be beneficial for the post-return decision-making of the products and thereby also potentially cut costs of the product evaluation upon its arrival. Developing a centralized return service that facilitates such data collection through the same data carrier could therefore

be very attractive for Bosch. From the analysis of the BSC (Boston Consulting Group), the QR code seems the most promising data carrier out of its suggested options.
For the return solution to align with circular economy principles and the European Commission's objectives, the following opportunities can be concluded:

POTENTIAL OPPORTUNITIES

Assessing the drills' ease of refurbishment and remanufacturing once the return service is established can prepare for the necessary data requirements of the Digital Product Passport (DPP) and simplify decision-making for post-return processes by easing the cost estimation.

Obtain data of the time and condition of the product upon its returns throughout its life cycle could help with assessing the ease of refurbishment, parts harvesting etc.

Offering options to repair, maintain or upgrade the drill rather than returning the drill.

The QR code can be explored as the data carrier and perhaps also as a starting point to initiate a return.

2.3 Legal regulations

2.3.1 Introduction

Through conducting research on product return regulations and consulting the OSU and legal advisers, additional regulations were identified beyond the scope of the European Green Deal. These are first discussed in '2.3.2 The company' followed up by the implications of the European Green Deal on legal requirements. The latter can be read in '2.3.3 The European Green Deal's implication'.

2.3.2 The company

Based on conversations with the legal department, three key considerations were identified :

Legal ownership
According to legal regulations, the product owner has the right to decide what to do with their product. If the owner labels the product as waste, Bosch is only allowed to dispose or recycle it. However, if the product is not labeled as such or the product is bought back based on its residual value (therefore implying that the product is not waste), other post-return processes are then possible that enable a second life.

Packaging
As mentioned previously, clarification on packaging was provided upon requesting a return for repair through a clickable link. The link then lead to a document where information on hazardous goods labels was provided. The consumer however still needed to determine which hazardous good label was appropriate for their return case. Clarifying these requirements might affect the service in terms of providing

information to the consumers but potentially also the packaging itself if desired by the consumer. By ensuring users have access to the correct packaging requirements, the return process can be streamlined and efficient, potentially affecting the consumer experience positively.

Battery return labels vary based on the battery's Watt-hours and whether the battery is returned with the device or not. Given that all cordless drills have a Watt-hour rating of ≤100Wh, there are only two viable dangerous goods labels to choose from. It is important to adhere to these guidelines to ensure that the battery return process is both safe and efficient (see image 11). Next to this, the battery and device should always be separated if possible, and the batteries must be fully enclosed in inner packaging before being placed in a sturdy and rigid outer packaging (DHL, 2022; Bosch GmbH, n.d.).

EOU returns

Under the provisions of the Electrical and Electronic Equipment Act (Bundesministerium der Justiz, n.d.), electronics distributors with a sales area of 400 square meters or more are required to accept electronics, not exceeding 25cm in any external dimension, upon the consumer's request. Among the cordless DIY tools, only one drill exceeds the 25 cm length limit, measuring 27cm. However, it is unlikely that the difference of 2cm in length will be strictly enforced or noticed during the return process. Consequently, it is highly likely that big retail stores will accept drill returns, making this a straightforward option that does not require significant intervention from Bosch. Nevertheless, to ensure the separate collection of these Bosch drills from the other collected electronic waste in-store, an arrangement or agreement should be established between Bosch and the retailers.

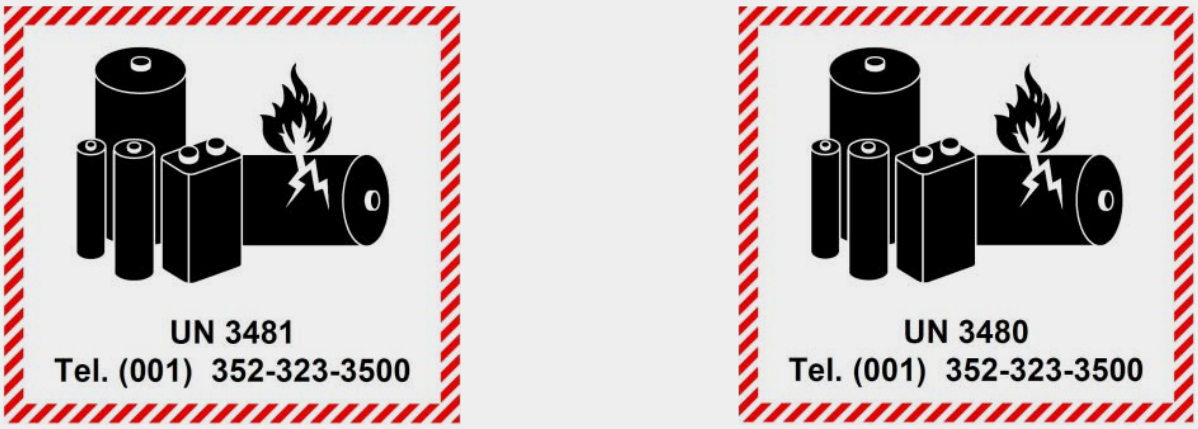


Image 11: :Dangerous good label for batteries without device (Left) and with device (Right).

2.3.3 The European Green Deal's implication on legal requirements

This section will shed light on the timeline of the circular economy regulations of the EU that were outlined in the previous section.
The development of the Ecodesign for Sustainable Products Regulation (ESPR) aims to promote the creation of more circular products by introducing minimum ecodesign and information requirements for most types of physical products sold in the EU market (European Commission, 2022). Although specific regulations are yet to be established, their objectives have been defined (see section 2.2.2). To attain the Commission's goal of reaching 132 million tons of oil equivalent in primary energy savings by 2030 through the implementation of the sustainable products framework (European Commission, 2022), timely clarification of these regulations is anticipated.
According to a report by the Boston Consulting Group and the World Business Council for Sustainable Development, the first implementation of the Design for Product Lifetime Performance (DPP) will target batteries and is expected to be implemented by 2026-2027. This report was published in 2023.
Lastly, the European Commission would like to ensure that 'all packaging on the EU market is reusable or recyclable in an economically viable way by 2030' (European Commission, 2020c).

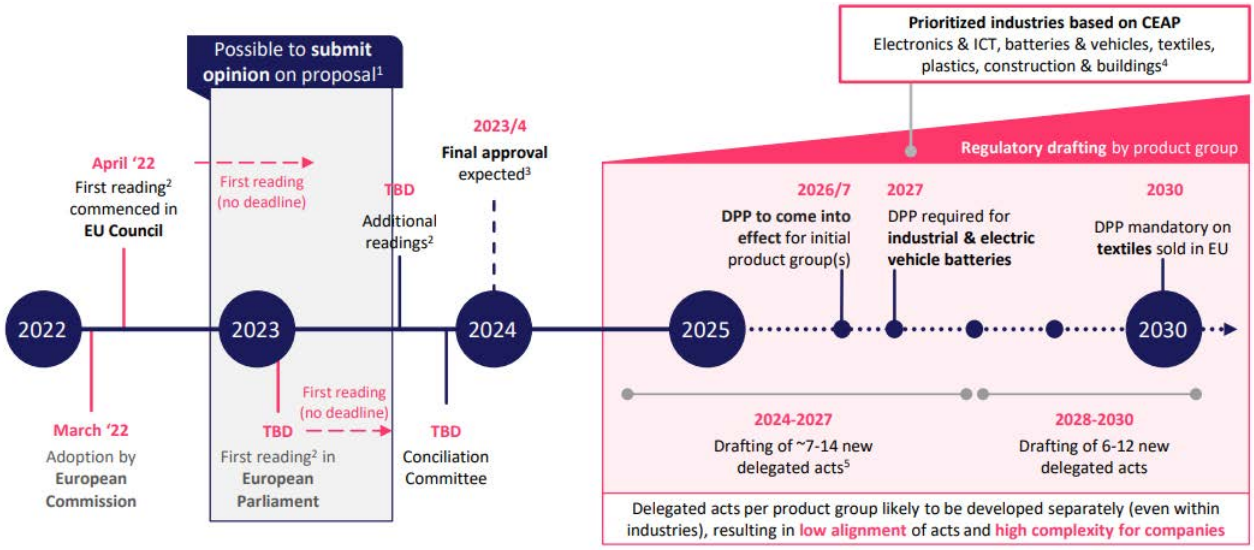


Image 12: :Timeline of the EU Digital Product Passport (Boston Consulting Group, 2023).

2.3.4 Conclusion

During the meetings with the OSU and legal advisers that I reached out to, it was concluded that for the drill to not be considered as waste, Bosch would need to repurchase it at its residual value. Additionally, the legal regulations were clarified regarding the packaging of batteries for the return service. Lastly, Bosch could promote the EOU electronics return option among electronics retailers with a sales area larger than 400 square meters, as they are obligated to accept electronics smaller than 25 cm. Once the eligible retailers are identified, Bosch can collaborate with them to facilitate this return option. However, in case smaller retailers would be part of the return service, arrangements would need to be made to accommodate the return there as well. In the case of in-store returns, it would be crucial to establish an arrangement that ensures the separate collection of Bosch drills from general electronics waste within the store. Based on the findings, the following design requirements for the return service were identified:

DESIGN REQUIREMENTS

4.

The return service should allow for the repurchase of the returned good based on its residual value.

5.

The return service should provide adequate labels for the packaging as outlined in '2.3.2 The company' to comply with the legal regulations.

Looking at the timeline and objectives of the Ecodesign for Sustainable Products Regulation (ESPR), it is expected that regulations will be clarified in the upcoming years. As the European Commission is encouraging companies to clarify their products' value chains and collect data, including for electronics and ICT, it would be advantageous for Bosch to take a proactive approach to these issues, not only to comply with future legal regulations but also to make post-return decisions more easily and achieve circular economy goals.

2.4 Conclusion

Upon examining the company's internal goals regarding the return service, it has been determined that the entire customer base must be targeted, and the goal should be to bring back as many EOU drills as possible to Bosch. For the EOU return service its feasibility, it would be interesting to build on current existing solutions such as postal service and the returns done in current stores. Because of this, these two avenues will be explored in this thesis.

Through inspecting the current product and the services provided, an interesting touchpoint opportunity was identified: the Bosch app. However, consumer research is needed to determine the app's familiarity and usage among customers. The current return services offered by Bosch can be improved by implementing a more centralized system that clearly showcases the different return possibilities, and by providing greater clarity on how the return process should be handled by the user. The webpage showcasing the return steps lacks direct information on how to handle the (drill) batteries with the user having to go to another webpage to access this information. Next to this, not much visual cues are given with the user having to read through blocks of text to inform themselves on how to handle the return. Additionally, carriers and their option to drop-off or pick-up could be used for the EOU returns.

In terms of European Commission regulations, it is important to note that they are heading towards promoting more repairability, maintenance, and upgradability, making it recommended to offer and promote such services alongside the return of an EOU drill. However, due to the current state of the maintenance service offered and the difficulty to upgrade the drills due to their current design, repair would be the most feasible option to also promote and offer through the return service.

Additionally, it is important to consider the Digital Product Passport as it would provide information on the product's durability in terms of repairability and remanufacturing. Collecting data on the value chain and the ease of repair for each drill (category) would enable Bosch to take proactive steps to meet the upcoming requirements. Since the DPP will be accessible through a digital data carrier, it could potentially be used in combination with the nameplate on the drill to make the latter more accessible. This could increase tool registration at the start of usage which would provide additional interesting data. Lastly, to enable post-return processes such as refurbishment and reuse, it would be necessary for Bosch to buy back the cordless drills based on their residual value.
The findings have been categorized into design requirements, design suggestions, actionable steps for during the project and suggested actions for Bosch after the end of the project.

DESIGN REQUIREMENTS

1. *Design requirement 1 and 2 were combined into the following:*
The return process should safeguard the product's condition and prevent any degradation during the return journey. This necessitates the provision of explicit return instructions, adequate packaging protection, and the promotion of safe handling.

2. **The return solution should be designed to appeal to the entire DIY customer base to ensure economic viability.**

3. **The return process should facilitate the repurchase of returned goods based on their residual value to support non-waste post-return processes.**

4. **The return service should provide adequate labels and multiple packages (if necessary) as outlined in '2.3.2' The company' to comply with the law.**

DESIGN SUGGESTIONS

Provide easily accessible and concise information regarding packaging requirements for return without relying on third-party involvement or redirecting to other pages.

Enhance the clarity and intuitiveness of the return steps by incorporating visual aids.

Provide needed labeling to users based on their type of return, eliminating the need for them to search through text to identify the correct label.

Ensure the visibility and include the mention of the return service in relevant touchpoints, such as the product manual and app.

Explore potential collaborations with established logistics partners, such as DHL and GHLS, to enhance the efficiency and feasibility of the EOU (end-of-use) return service.

Consider expanding the return service to include additional types of returns using the same data carrier, enabling the collection of valuable usage data and streamlining post-return processes.

ACTIONABLE STEPS - DURING PROJECT

Leveraging past participant research and recruitment strategies for DIY consumers.

Investigate customer preferences: In-store vs. postal service returns.

Gather information from participants regarding their awareness and usage of the Bosch app, including how they became aware of it and their frequency of usage.

Investigate current disposal practices of Bosch customers for their drills, identifying both positive and negative aspects of the current approach.

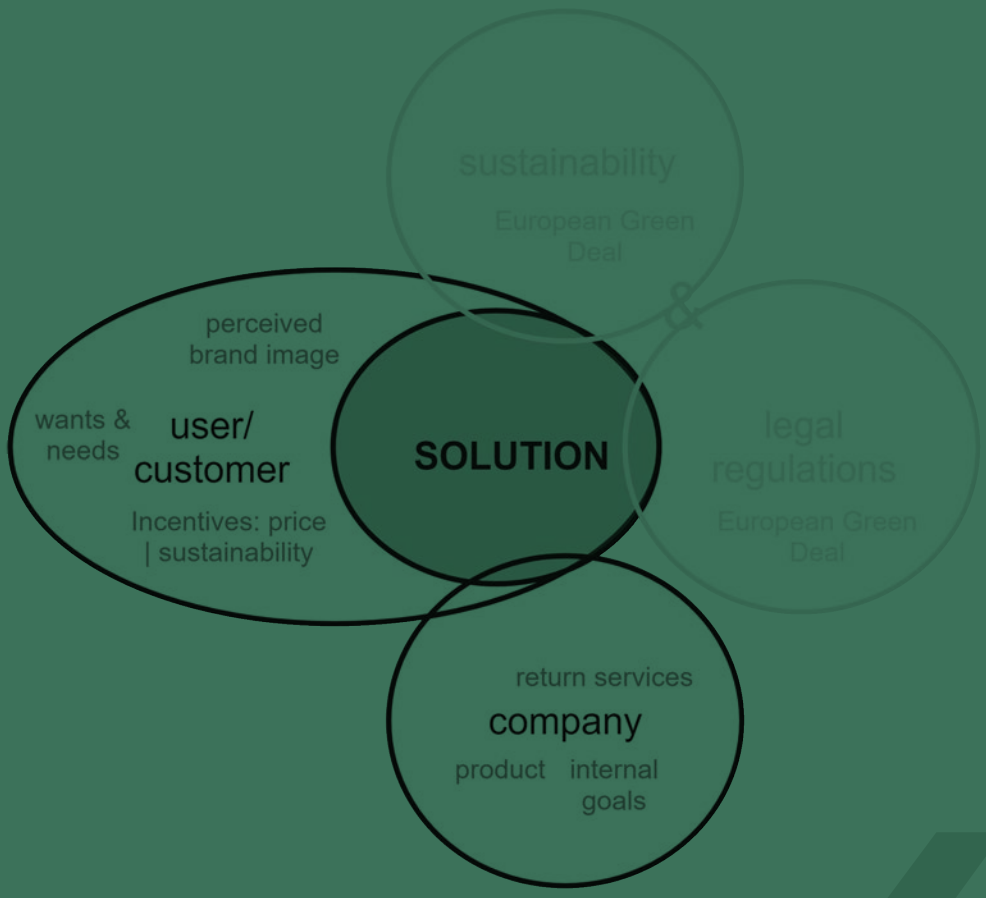
SUGGESTED ACTIONS - POST PROJECT

Comprehensive review of post-return possibilities: Economic and logistical implications.

Assessing refurbishment and manufacturing ease for informed post-return decisions and regulatory compliance.

Advancing circular goals and ease repairs orthrough improved maintenance options and design for upgradability.

Streamline the tool registration process at the beginning of usage to facilitate data collection and support informed decision-making for post-return processes.



3. Literature review

3.1 Behavioral models
3.2 Reverse logistics
3.3 Conclusion

During this literature review, different behavior models and their applicability to the thesis topic, as well as research about product returns and 'reverse logistics' will be discussed. The former will create a better understanding on how to increase the consumer's involvement (consumer bubble) and the latter concerning (reverse) logistics (company bubble).

By looking at the different behavior models that have been proposed in the literature, we can identify the key factors that influence (consumer) behavior. These models are based on different theoretical frameworks, and each has its own strengths and weaknesses. Through a critical evaluation of the models, we aim to identify the most suitable behavior model for further ideation and concept evaluation in the context of this thesis. In addition to behavior models, research on reverse logistics have been reviewed.

Through identifying research gaps and key findings, important factors to consider as well as the direction of future research can be determined.
To achieve these objectives, we will begin by discussing the behavior models that have been discussed in the sustainable consumer behavior course given by the Tu Delft and different frameworks that have been found through research. We will then move on to a discussion of research on reverse logistics. Finally, we will synthesize the key findings from these different strands of research and discuss their implications for this project.

3.1 Behavioral models

For selecting the behavior models, the course Sustainable Consumer Behavior had been consulted. Models aiming to trigger behavior change that suited the context of a product return were selected. This resulted in two possible behavior models. Next to this, research concerning behavior change had been consulted ranging from product retention strategies to design research for altering a current divestment experience (Poppelaars, 2014). These will be discussed below concluding in a behavior model and underlying theories/frameworks that best suit the further development of this thesis.

Fogg's Behavioral Model (Fogg, 2009)
This model is a quite general behavioral model that identifies three influencing key factors for behavior: motivation, ability, and triggers. It states that for a behavior to occur, motivation, ability and triggers must be present at the same time. Triggers specifically should be given when the behavior can be initiated or executed (See Fig 9). When motivation and ability is high enough with the presence of triggers, the action line is reached, and the person will act on the behavior. By analyzing these factors, there can be better understood why consumers choose to return products or not. However, it is important to note that the model does not consider habits and other factors that could influence consumer behavior.

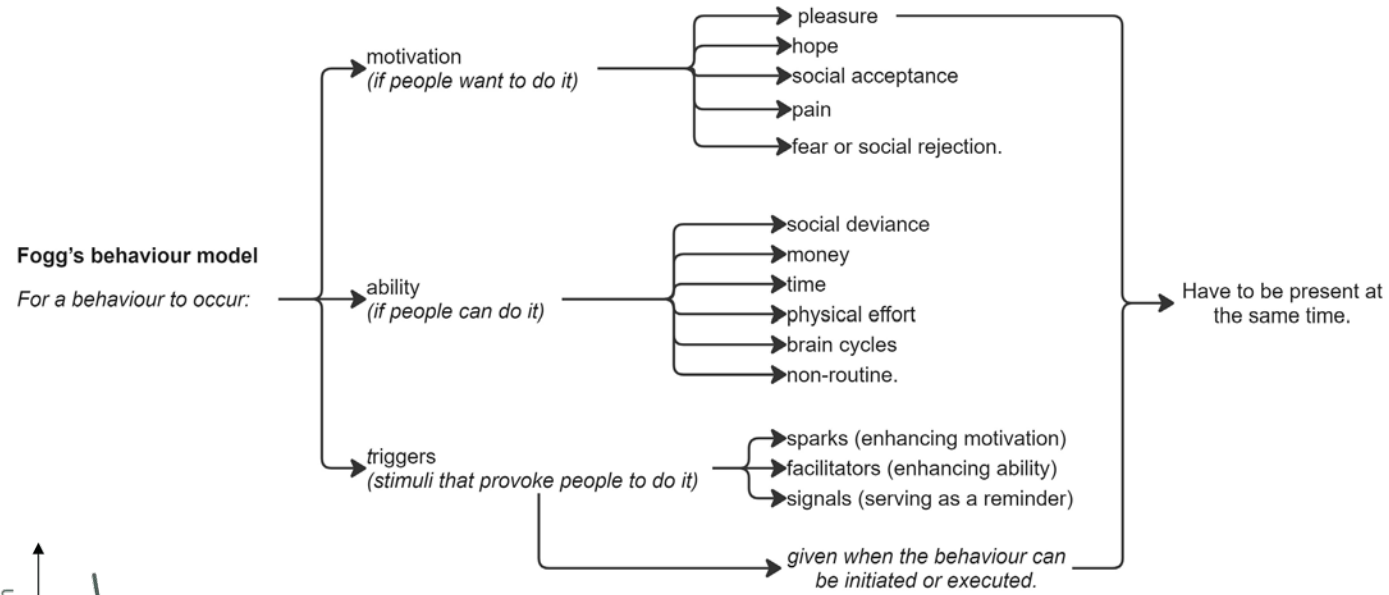


Figure 8 : Fogg's Behavioral model (figure made by me).

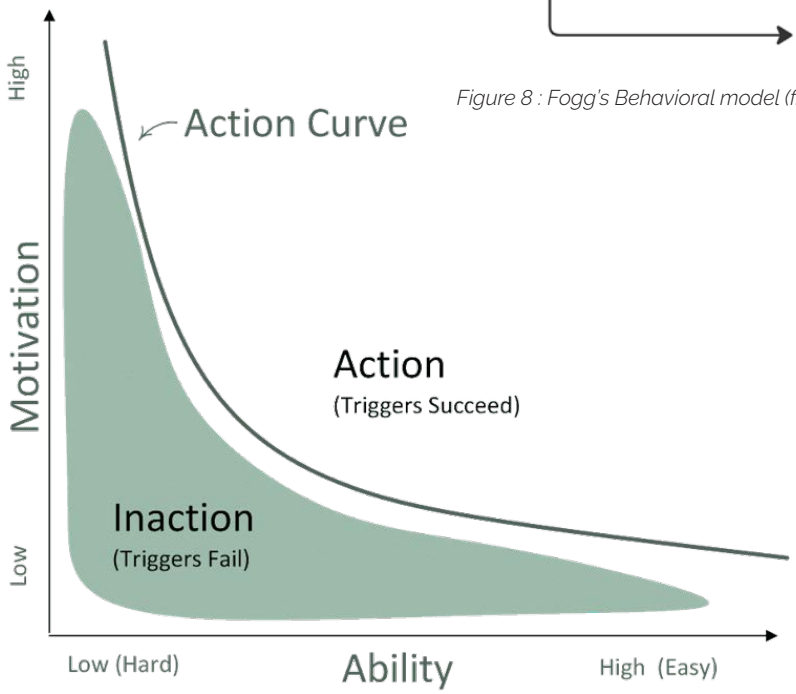


Figure 9 : Fogg Behavioral Model (Kjer, 2019).

Theory of Planned Behavior (Ajzen, 1991)
This model suggests that attitudes, subjective norms, and perceived behavioral control all influence behavior. For example, if a consumer has a positive attitude towards recycling, perceives social pressure to recycle, and believes they have the necessary resources and skills to recycle, they are more likely to engage in recycling behaviors. This model can be useful in understanding how social influences and personal beliefs shape consumer behavior towards returns. However, the Theory of Planned Behavior does not fully account for the intention-behavior gap and the external factors that may impede actual behavior even when intention is present. Next to this, it considers personal beliefs and the beliefs of others, which are less tangible components for the design of a return service blueprint. For these reasons, the model might not be the most suitable for this thesis.

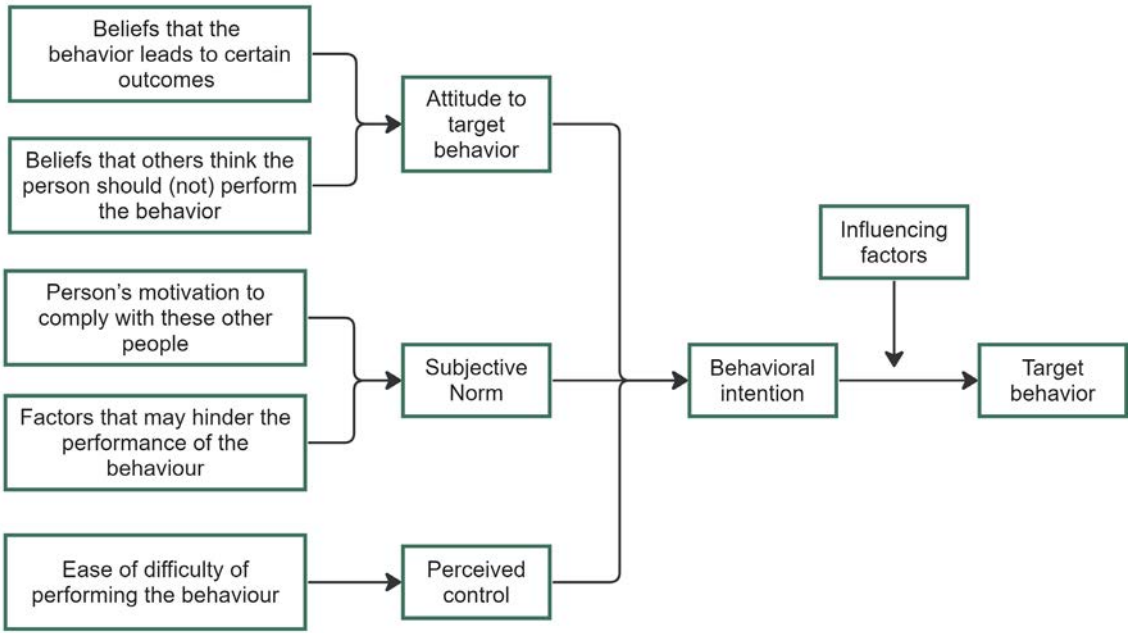


Figure 10 : Theory of Planned Behaviour (figure made by me).

The Behavioural Problem Solution Matrix (Cash et al., 2020)
The BPS Matrix is a behavioral change framework constructed through examining existing behavioral theories and models and the analysis of 218 behavioral design interventions. The framework considers two factors in identifying solutions to a given problem: change demand and behavioral constraint. Change demand refers to the degree of change that is required of the individual, while behavioral constraint pertains to the level of difficulty associated with a planned intervention. Depending on the degree of change demand and behavioral constraint, the problem can be assigned to one of the four quadrants of the framework. For each quadrant, the framework can provide tailored solutions to promote behavior change.
When assigning Bosch's position on the quadrant, both the change demand and behavioral constraint are high. The top five solution principles identified for this quadrant include providing feedback to users, enhancing commitment through motivation or guilt, providing guidance on operational and psychological knowledge to perform desired behavior, highlighting social norms through examples, and presenting information figuratively. What is interesting is that according to this framework, triggers are not very effective (see image 11).
When coupling it back to Fogg's behavioral model, the offered solutions mainly focus on enhancing the motivation and ability (see Image 12). Although this can provide a basis for further ideation, further research needs to be conducted on the actual motivational factors in the context of a drill return. The same goes for the factors that influence ability in this specific scenario.

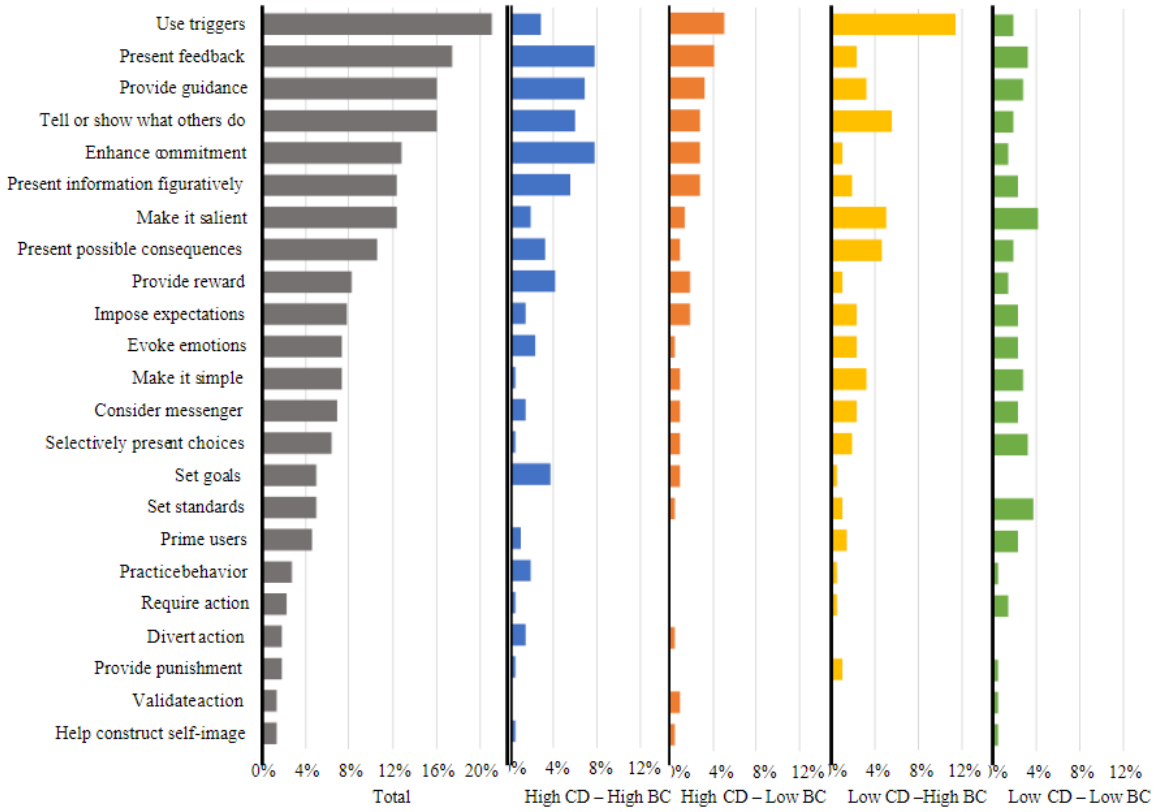


Figure 4. Solution data for each quadrant of the problem feature framework:
Change Demand (CD) verses Behavioural Constraint (BC).

Figure 11 : Figure showing the solution data for each quadrant of the BPS Matrix (Cash et al., 2020)..

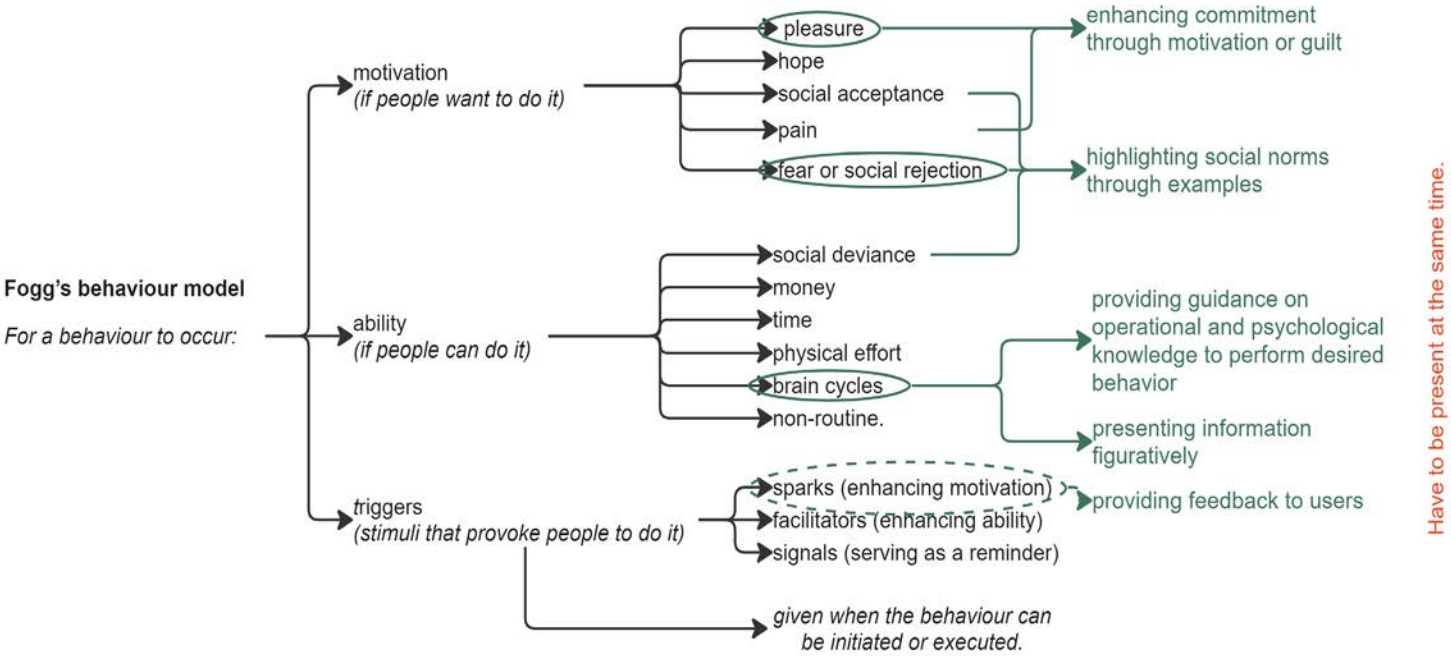


Figure 12 : Coupling the suggested solutions of the 'High CD – High BD' quadrant back to Fogg's Behavioral model.

Conceptual model of divestment (Poppelaars, 2014)

The dissertation by Flora Poppelaars examines various behavioral models, with the aim of identifying a model that is suitable for both access-based consumption and ownership-based consumption, the latter in relation to the divestment of mobile devices. However, most of the selected behavioral models take an integral view of the consumer journey and do not provide detailed information on factors related to divestment. Nevertheless, the study offers an interesting conceptual framework of divestment, which includes design interventions to ensure a smooth divestment process.

It should be noted that since the study focuses on mobile phones, some design interventions, such as those related to the relationship between the user and the device, may not be as applicable to the context of drills. Nonetheless, the proposed framework outlines the different divestment stages, which can be used during consumer research to understand when design interventions are necessary in the context of cordless drills (see Figure 13).

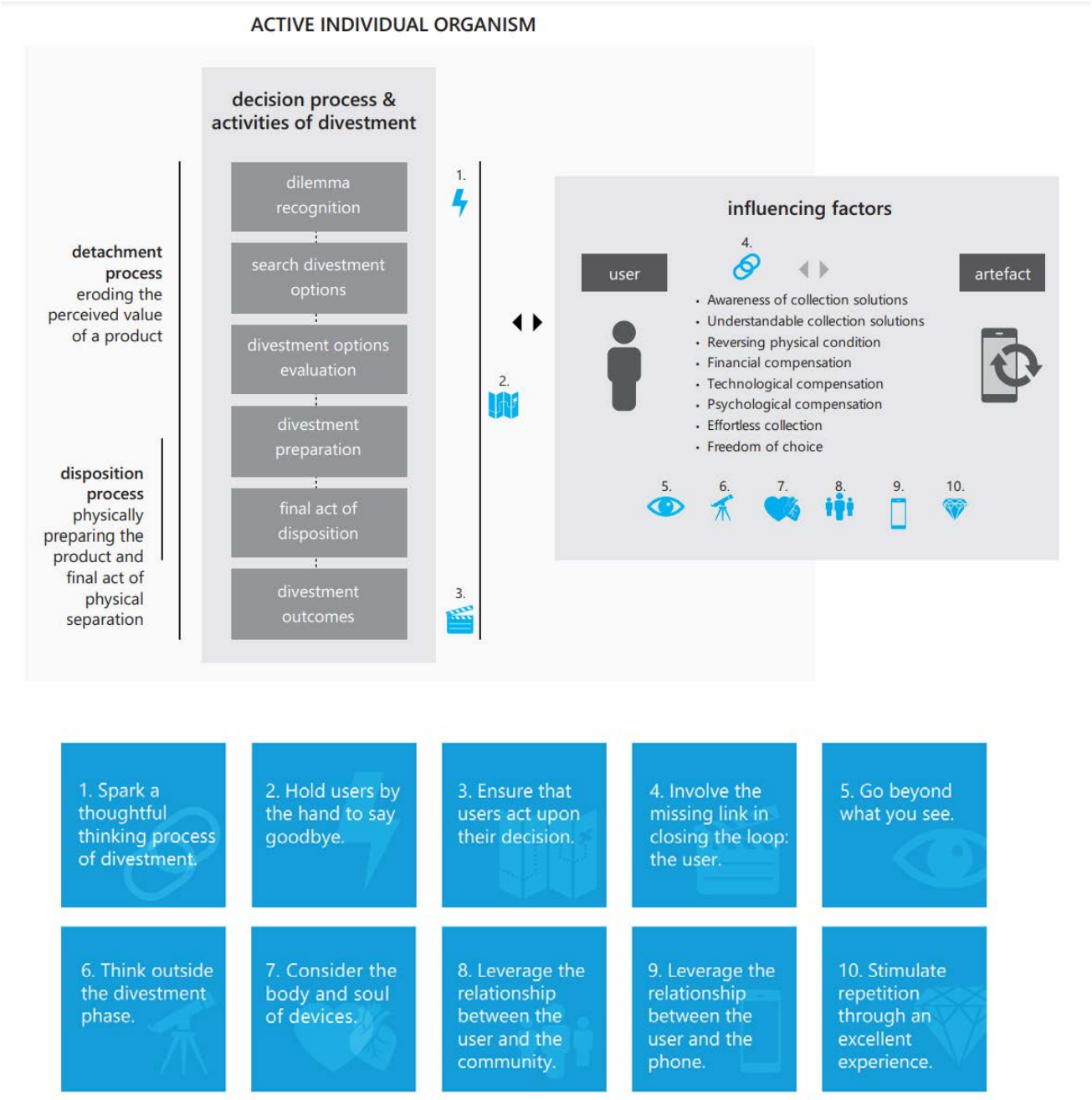


Figure 13 : Conceptual model of divestment and the position of the design principles (Poppelaars, 2014).

3.2 Reverse logistics

A review of literature using the keywords “reverse logistics,” “product returns,” and “end of life return” was conducted on ScienceDirect. The majority of the studies examined the technical and managerial aspects of returns, with little emphasis on the consumer perspective. The abstracts of the studies were evaluated to assess their relevance to developing a return solution for a cordless drill. Three papers were selected, and their findings are briefly discussed below. The studies underscore the obstacles that arise in reverse logistics, such as managing the quantity, timing, and quality of returned products.

A model for managing returns in a circular economy context: A case study from the Indian electronics industry (Choudhary et al., 2022)

Choudhary and colleagues (2022) proposed a recovery-decision framework to manage product returns within a circular economy context, which is illustrated in the accompanying diagram (Fig 14). This framework can assist in recognizing the critical factors that influence the recovery strategy of the product post-return. Nevertheless, the significance of each factor may vary based on the industry type and other relevant factors. The framework identifies six key factors that affect the recovery process:

- Product recovery value: the residual value retained by the product when it enters the recovery system.
- Marginal value of time: The rate of loss in the value of product returns from the instant they are returned until the recovery process is complete.
- Processed quality: the quality of the reprocessed returns after their value has been recovered through various recovery options.
- Novel resources requisite: the amount of virgin resources expected to be consumed during the reprocessing of returned product.
- Environmental aspect: the consequences of the recovery options in terms of their ecological effect.
- Market scenario: Demand for the secondary products reprocessed through different recovery options. This criterion considers customer’s willing-ness to purchase the secondary product and profit.

Product recovery value is a relevant factor to take into consideration for the development of a return solution. Knowledge of the quality of returned goods can accelerate decision-making and reduce the marginal value of time. Therefore, monitoring product quality or allowing consumers to assess it could facilitate post-return processes. However, the study does not address the social impact of recovery strategies or risk considerations in recovery decision-making, which should be considered when evaluating its validity.

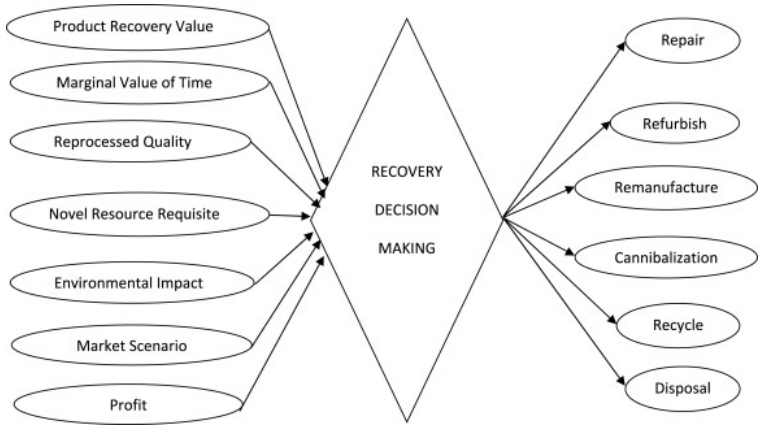


Figure 14 : Recovery decision-making framework (Choudhary et al., 2022)

Barriers to product returns and recovery management in a developing country: investigation using multiple methods (Shaharudin et al., 2015)

The paper conducts a review of 38 articles to identify barriers to product returns and recovery management, which are subsequently classified into internal and external categories. Since the identified barriers are from articles related to product returns and recovery management, the identified barriers could be applicable to other contexts as well. From the list of 23 identified barriers, relevant barriers that could be addressed or need to be addressed for the development of a return solution were grouped together and presented in the following image.

I) Internal barriers

(14) *Risk (RI)*: This is due to the risk of losing market share as green practices affect a firm's image. For example, customers may perceive that a firm's products are of lower quality or standards if it reuses recovered parts (Kumar and Malegeant, 2006).

(15) *Infrastructure (IF)*: The absence of infrastructure to support the development of green practices, such as the lack of space and equipment adds to this barrier (Thiruchelvam et al., 2003).

II) External barriers

(3) *Regulations (RG)*: These barriers are due to unclear government regulations and policies, which make it difficult for firms to decide on appropriate strategies (Liu, 2012).

(5) *Uncertainty of returned products (UP)*: This impediment in the green practices of reverse logistics includes the uncertainty in the product recovery and replacement process, such as quantity, timing, and quality of returns. It also includes uncertainty in the collection process of used products and packaging (Jayaraman and Luo, 2007).

Figure 15 :Group of selected barriers (Shaharudin et al., 2015).

For the back-end of the solution, lack of proper infrastructure (see “Internal barriers” no. (15)) could be a challenge as well as the uncertainty of returned products (see “External barriers” no. (5)). This encompasses their quantity, timing of arrival, their quality, the collection processes and packaging as mentioned in Fig 15. Regulations (3) and risk (14) also play an important role for the acceptance of the return solution. As mentioned in section 2.3, European regulations are currently expected to be defined in the near future but general guidelines have already been given. Through meetings with the legal department of Bosch, certain regulatory requirements were defined that complicated post-return options forming an external barrier as mentioned in (3). Following up with these regulations (both on a national and European level) would not only be necessary to ensure compliance with the law but could potentially also simplify the (post-)return service. Additionally, it is important to assess consumer perception and their willingness to purchase refurbished products or products that contain salvaged parts as mentioned in (14). This topic was also discussed in a previous paper by Choudhary et al. (2022).

Reverse logistics: Understanding end-of-life product management (Wilson & Goffnett, 2021)

This article outlines different decision categories required in reverse logistics at the strategic, tactical, and operational levels (see Figure 16). Mostly the collection phase is of interest for this thesis, the article also highlights the 'variability of products received', which can impact warehousing and related tasks, consistent with Choudhary et al.'s (2022) findings. Furthermore, the article highlights the potential benefits of using artificial intelligence to forecast product return volumes, sort mixed materials, and evaluate product conditions.

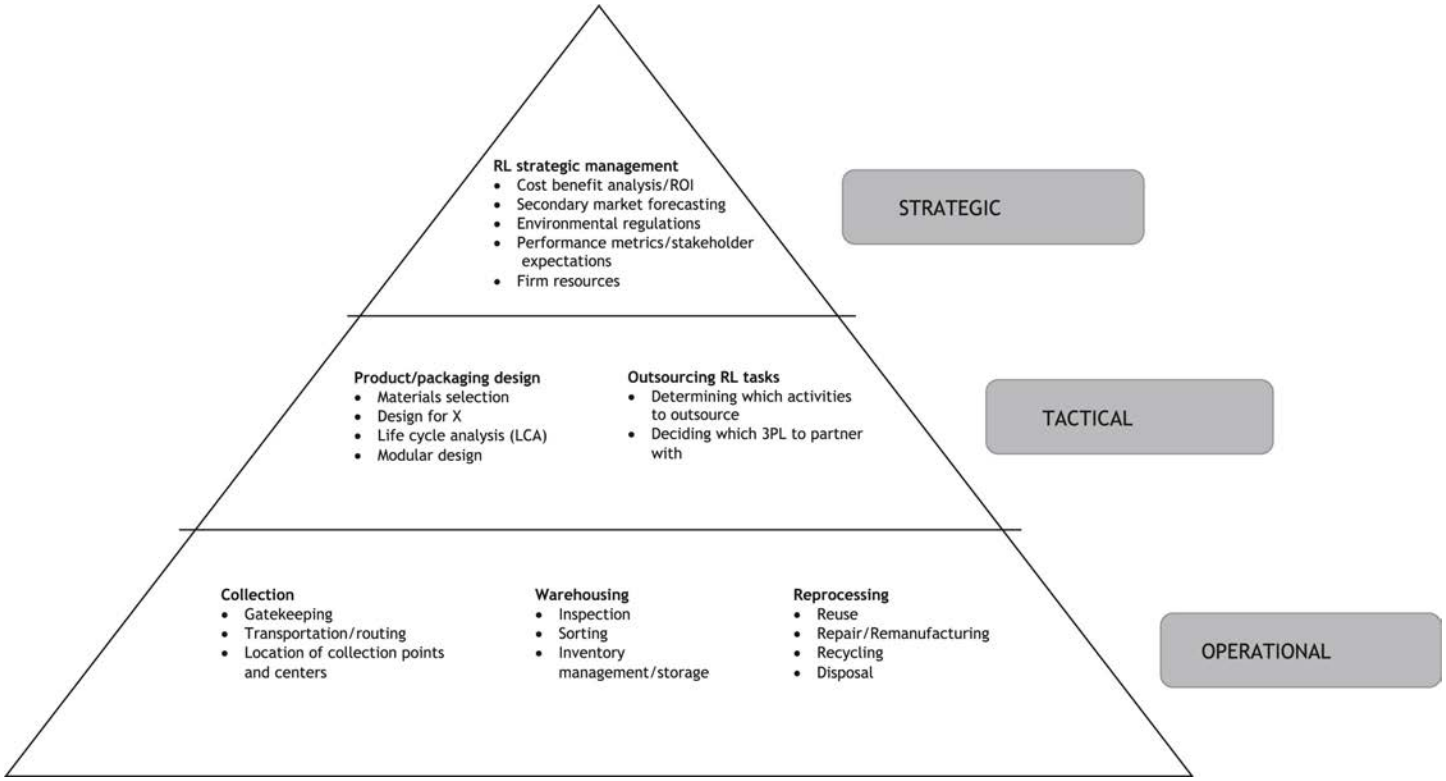


Figure 16 : Common decision categories in reverse logistics (Wilson & Goffnett, 2021)

3.3 Conclusion

Different behavioral models were explored through existing research, of which the theory of Planned Behavior and Fogg Behavioral Model were discussed in the literature review. Through Flora Poppelaar's dissertation (Poppelaars, 2014) and the article by Cash et al. (2020) concerning the BPC matrix, interesting frameworks regarding the divestment process and behavioral change in a design context were found.

While the Theory of Planned Behavior examines the attitudes, beliefs, and social norms that shape behavior al intention, the Fogg Behavior Model focuses on identifying the factors that drive behavior change. The latter has more tangible components that can be influenced more easily through a service blueprint. Based on this review, the Fogg model offers a promising framework for designing solutions to encourage divestment and returns of cordless drills.

To complement the Fogg model, the BPS matrix can offer insight into possible solutions. When positioning the return solution for cordless drills on the matrix, solutions focusing on shame or

pleasure together with social pressure and guiding the user were suggested. However, these possible solutions would still need to be validated through consumer research. During consumer research, barriers that inhibit a feeling of ability and possible incentives as motivators should be explored. To overcome the limitation of the absence of habits in the Fogg model, the reason behind the behavior should be specifically asked about to take this constraint into account.

Flora Poppelaars' dissertation presents a divestment framework accompanied by design guidelines and influential factors for divestment. By examining the various divestment stages through consumer research, we can gain a better understanding of how to implement the design guidelines effectively. Additionally, exploring users' decision-making process when selecting a specific divestment option can provide valuable insights into their needs related to drill divestment. This approach allows us to identify the relevant influential factors that should be taken into consideration.

Regarding reverse logistics research, not much has been published about the user side. However, studies suggest that reversed logistical processes may encounter obstacles such as uncertainty regarding the quantity, timing of arrival, and quality of returned products (Shaharudin et al., 2015). As noted by Choudhary et al. (2022), these factors are also critical considerations in the decision-making process related to product recovery. Therefore, exploring solutions that address these challenges in reverse logistics would be beneficial to mitigate the negative impact of these roadblocks. This could be done through letting the consumer assess the product quality pre-return and/or, as suggested by literature, using artificial intelligence to forecast product return volumes and evaluate product conditions (Wilson & Goffnett, 2021). To accurately forecast product returns, it would however be essential to gather data regarding the initiation of product usage and/or the product's condition.

Since the degree of circularity achievable in the post-return process is heavily reliant on the quality of the returned product (Choudhary et al., 2022), it is imperative to preserve the quality of the returned goods by handling them in the safest possible manner as was suggested in the previous chapter. Lastly, it is crucial to further investigate the consumer's role in a return service given the limited research in this area. This results in the following key points:

DESIGN SUGGESTIONS

Implementing a data collection system to gather information about the drill's condition over its lifetime and/or before return ("product recovery value" of Choudhary et Al. (2022)). This could be achieved in the following ways:

1. Allowing consumers to monitor the product quality before the drill's return and/or during its use.
2. Collect usage data by capturing the initiation of drill usage and assessing its condition upon the drill's returns (repair, maintenance etc.).
3. Incorporating a smart drill design that enables automatic data collection on its condition throughout its lifetime and/or informs users on issues. However, this is not an idea that would be compatible with the current drill design and the durability of such a smart system would also need to be assessed

By adopting data collection measures, post-return decision-making can be streamlined and potentially be automated based on the collected data concerning the drill's condition. Additionally, automating the decision making and drill evaluation has the potential to reduce the costs associated with post-return processes.

Use AI to forecast product return volumes, sort mixed materials and evaluate the product's condition (Wilson & Goffnett, 2021).

ACTIONABLE STEPS - DURING PROJECT

Conduct consumer interviews to determine the position of consumers on the motivation-ability graph, as proposed by Fogg (2009).

Conduct consumer interviews to explore their experiences and decision-making process related to the divestment stages. This will provide insights into consumer needs and preferences, guiding the implementation of Poppelaar's design interventions.

Investigate current disposal practices of Bosch customers for their drills, identifying both positive and negative aspects of the current approach.

SUGGESTED ACTIONS - POST PROJECT

Assess other factors that are important for post-return processes:

1. Processed quality: What level of drill quality can be attained considering various drill condition scenarios?
2. Novel resources requisite: How many virgin/recycled materials should be integrated? Also: What would be the cost to bring the drill to such a processed quality?
3. Environmental aspect: How environmentally friendly are these post-return processes?
4. Market scenario: What would be the consumer's acceptance towards refurbished products (brand perception/ how much would they be willing to pay for a refurbished product etc.)

Lastly, marginal value of time is not of importance in the current context of drill returns.

Infrastructure: assess possible post-return infrastructures and its costs.

Following up with regulations on both a national and European level.

4. First ideation

Several brainstorming sessions were conducted to facilitate the initial ideation phase. The initial session involved a Bosch employee, followed by an individual session as well as one involving a group of Tu Delft students. As a result of these brainstorming sessions, various conceptual ideas emerged, which will be subsequently presented and subjected to evaluation.

4.1 Method

Using mainly the Fogg's behavioral model, information regarding the different customer segments of the DIY tools was used as a starting point for ideating about the consumer's possible motivators, triggers, and barriers towards returns. The characteristics of these market segments is not disclosed for NDA reasons.

Later, two collective brainstorm sessions were conducted. The first one being with a Bosch employee and a later one with four design students. During these brainstorm sessions, the Fogg's behavioral model and the different (slightly altered) target groups were used as inspiration. Participants brainstormed about motivators and factors influencing the target groups' ability. Triggers were not specifically focused on since they either enhance ability (facilitators) or motivation (sparks) or are used as a reminder (signals) and then greatly depend on user touchpoints. By using 'rolestorming' and 'bad idea brainstorm' as brainstorm methods, creative outcomes were encouraged. Bad idea brainstorm allows participants to break the ice by encouraging 'stupid ideas'. As a second part of the brainstorm, these ideas are altered and made into 'good ones' (Ruijter, 2021). Rolestorming is a brainstorm technique that allows for a playful idea generation. By playing a character, innovative ideas get the chance to surface while keeping the brainstorm fun and low-key (Rudy, 2021).

Similar ideas from the individual and collective brainstorm sessions were grouped into the following categories:

- In-store experience
- Gamification
- Sustainability program

The three ideas were assessed on the ease of execution (with Bosch behavioral model and the brainstorming as basis) and the previously identified design opportunities and requirements.

Image 13: Collective brainstorm session.

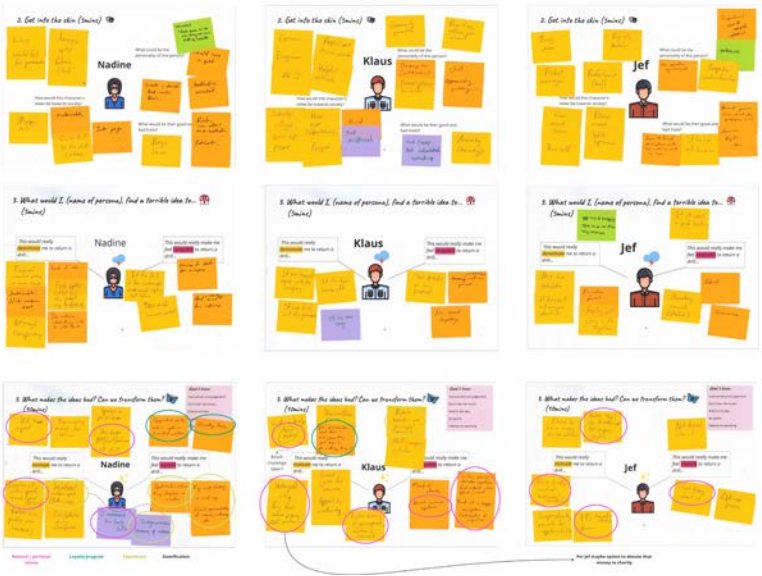


Image 14: : The collective brainstorm results (see appendix C for full view).

4.2 Brainstorming results

Based on the individual and collective brainstorm, the following motivators, capability factors, and triggers could be determined.

4.2.1 Motivation cluster

Possible motivators were clustered according to the three groups presented by Fogg (2009): pleasure/ pain, hope/fear and acceptance/ rejection. Out of these, three ideas were generated. These are presented by the three different colors. While gamification focuses on a fun experience by gamifying the return, the in-store experience focuses on a more professional setting where the customer can get advice and buy a new drill. Lastly, the sustainability program focuses on a reward system where there is an emphasis on contributing to a sustainable goal.

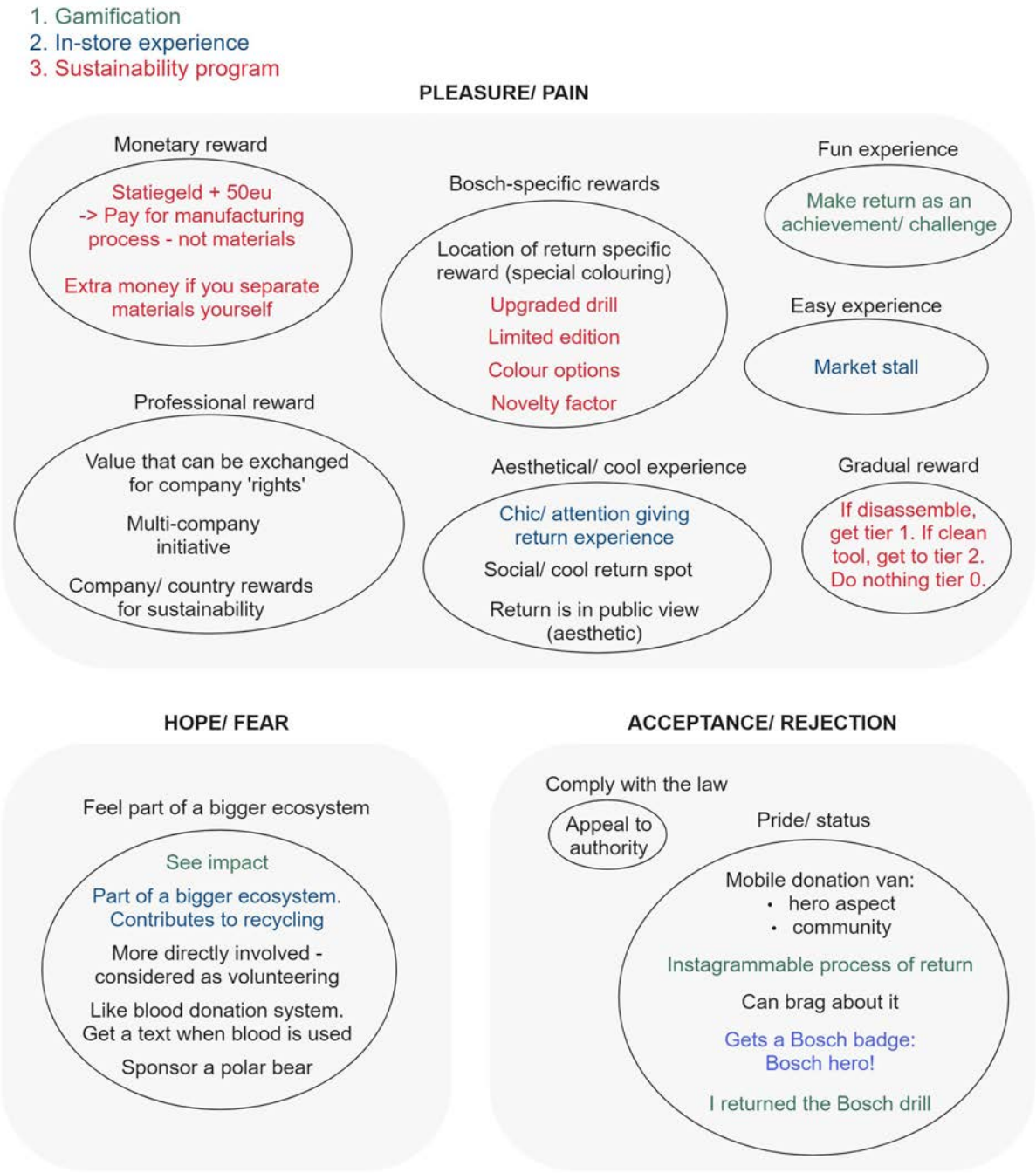


Fig 17: Motivation clusters

4.2.2 Capability cluster

The brainstorm results concerning capability were divided over the 'six factors of simplicity' from Fogg's behavioral model (2009): brain cycles, physical effort, time, social deviance, non-routine, and money. From this, there could be concluded that mostly factors related to the amount of brain cycles, the physical effort and time needed for the return, were generated. However, all six factors are valid for creating a return experience where the consumer feels capable. One factor that cannot be altered however, is the fact that returning a drill is not a routine behavior.

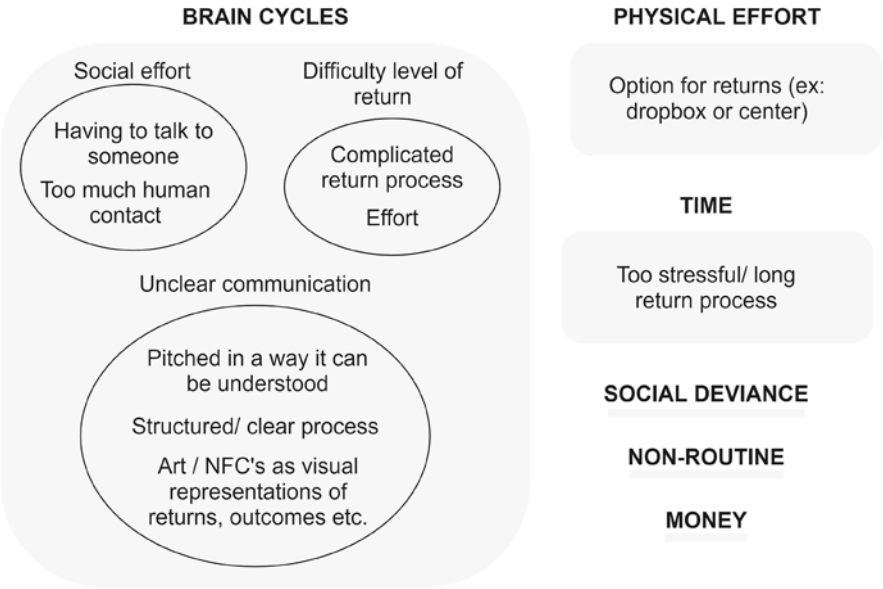


Fig 18: Capability clusters

This results in the following points that were used to evaluate the generated ideas.

Brain cycles
- Consumers might not enjoy social effort paired with having to do a return.
- The return should be the least complicated possible and require the least effort possible.
- The return should be communicated in a structured way, potentially with visuals. This is also in accordance with one of the suggested solution principles of the BPC matrix (present information figuratively).

Physical effort
- The return requires little physical effort.

Time
- The return should take the least amount of time possible.

Flexibility (time, physical effort)
- There should be a variety of return possibilities to offer the consumer more flexibility in terms of physical effort, time and resources needed for the return.

Lastly, there could be stated that:

Social deviance
- The return should not require socially deviant behavior. This can also mean that by showing exemplary behavior, consumers can be motivated to return the drill. (acceptance/ rejection group from Fogg's behavioral model).

Money
- The return should not require any payment. In contrast, monetary rewards could be used as a motivator as well.

4.2.3 Triggers

As mentioned previously, triggers can either enhance ability or motivation or can be used as reminders. Fogg states that when motivation is high but ability low, triggers facilitating the behavior should be used. For this, Fogg gives examples as 'saying something can be done in "one click" or offering an option to upload you address book on social networking sites'. When motivation is low but ability high, triggers with a motivational element should be used. This can for example be a text that highlights the social acceptance of participating in a specific behavior or a video concerning the positive/ hopeful outcomes for the planet when having a climate positive attitude. When both ability and motivation is high, reminders should be used (Fogg, 2009).
During the customer interviews, customers will be guided through the standard return steps for both postal service and in-store returns. Additionally, guidance will be provided for the three different return ideas that have been generated and feedback on the concept ideas will be asked from them. This process aims to understand customers' motivation and ability levels for the various return options and overall return steps and thereby find adequate triggers. Lastly, particpants will be questioned about the entire consumption cycle to identify touchpoints for the triggers.

4.3 Preliminary ideas

Through connecting different motivational factors (see Fig 17), three different ideas were created that are discussed followingly. Here, possible ways to motivate the consumer were solely considered. Possible triggers to inform or remind the consumer of the return service were not considered since these would be identified during consumer research (chapter 5). These three ideas centered around possible motivators were assessed by the customer during the customer interviews to identify customer needs and wants.

In-store experience
For this return experience, the consumer would mostly be motivated by the professional environment where they can also get inspiration for new DIY ideas and get advice. Upon returning the drill, customers can look at the new models, ask Bosch professionals about their technical specifications and test the showroom models out. When the customer encountered a functional problem with their drill, advice can also be given on its repairability based on the problem description and initial look at the drill. This return experience would be in the form of a stall at the "baumartkten" currently selling Bosch drills (such as OBI). Here, house decoration ideas would also be showcased, and a DIY connoisseur would be available to give DIY tips and tops.

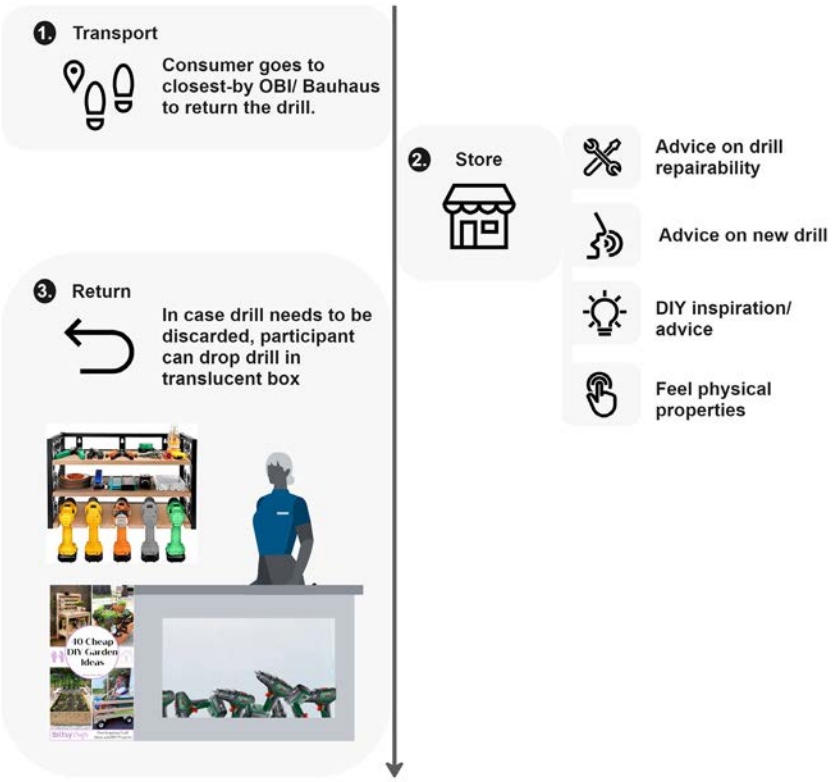


Fig 19: In-store experience

Gamification

Through the utilization of a QR code affixed to the drill, customers are presented with a choice among three distinct return options: the creative return option, which carries a familial tone and allows a creative outlet for the customers; the easy return option, wherein consumers abstain from participating in gamification; and the challenge option, where consumers engage in a problem-solving activity to facilitate the return process. The solution allows the customer to choose between getting the drill picked up or bringing the drill themselves to a postal point (see figure below).

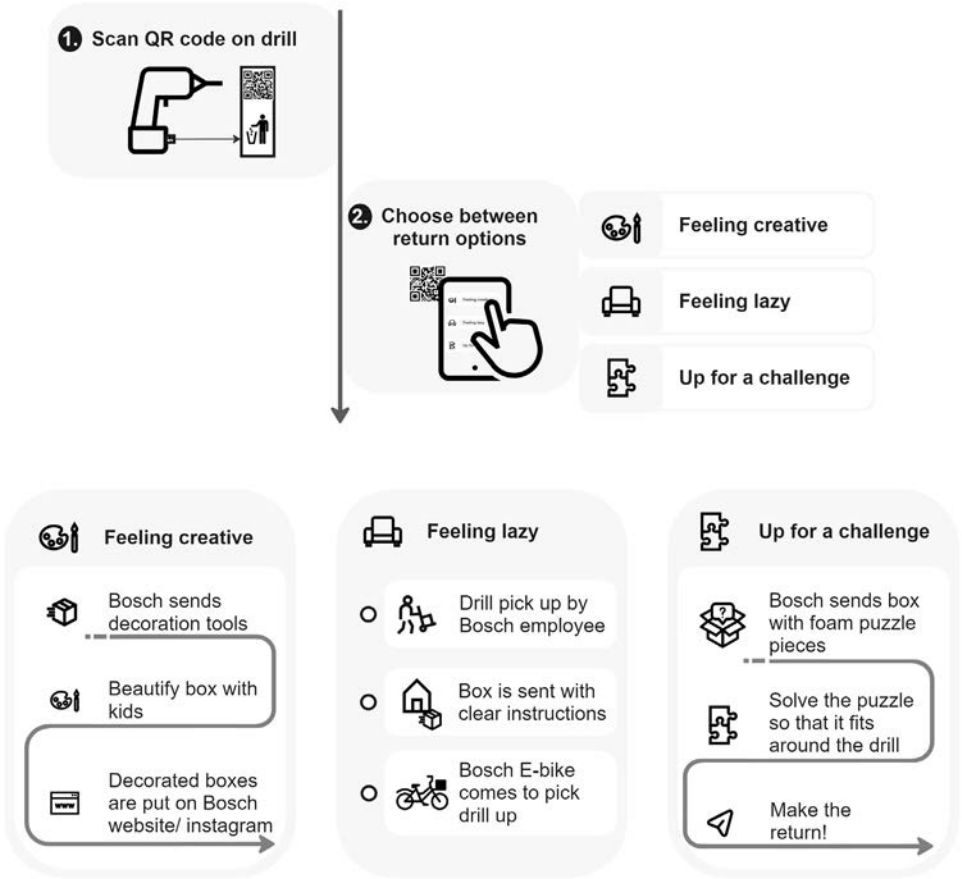


Fig 20: Gamification.

Image 15: Feeling creative concept idea: the winning box is placed on instagram.

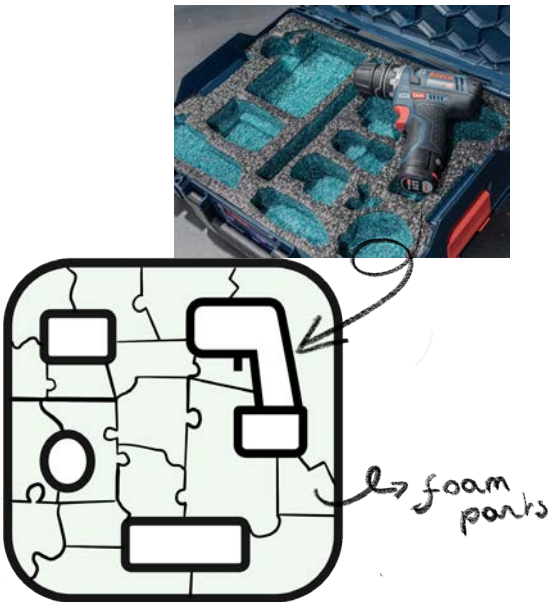


Image 16: Up for a challenge.

Sustainability program

With this concept idea, the customer gets their newly purchased drill, finds a notice in the package that explains the sustainability program and prompts customers to register by making a Bosch account or activating the sustainability program for that tool.

The program then allows Bosch to track the consumers' usage behaviour in terms of repair of the drill, maintenance of the drill etc. If consumers actively participate on the Bosch forum, repair their products through the website, and return end-of-use products, they can achieve a higher sustainability level. This higher level unlocks more rewards, as shown in the figure below. This way data can be obtained about the drill and customer's usage behaviour. Next to this, sustainability gets encouraged and becomes a central aspect of the customer's drill use. Through the program, the EOU return option can also be promoted. When the customers decides to return their drill EOU, they have to do it through postal service.

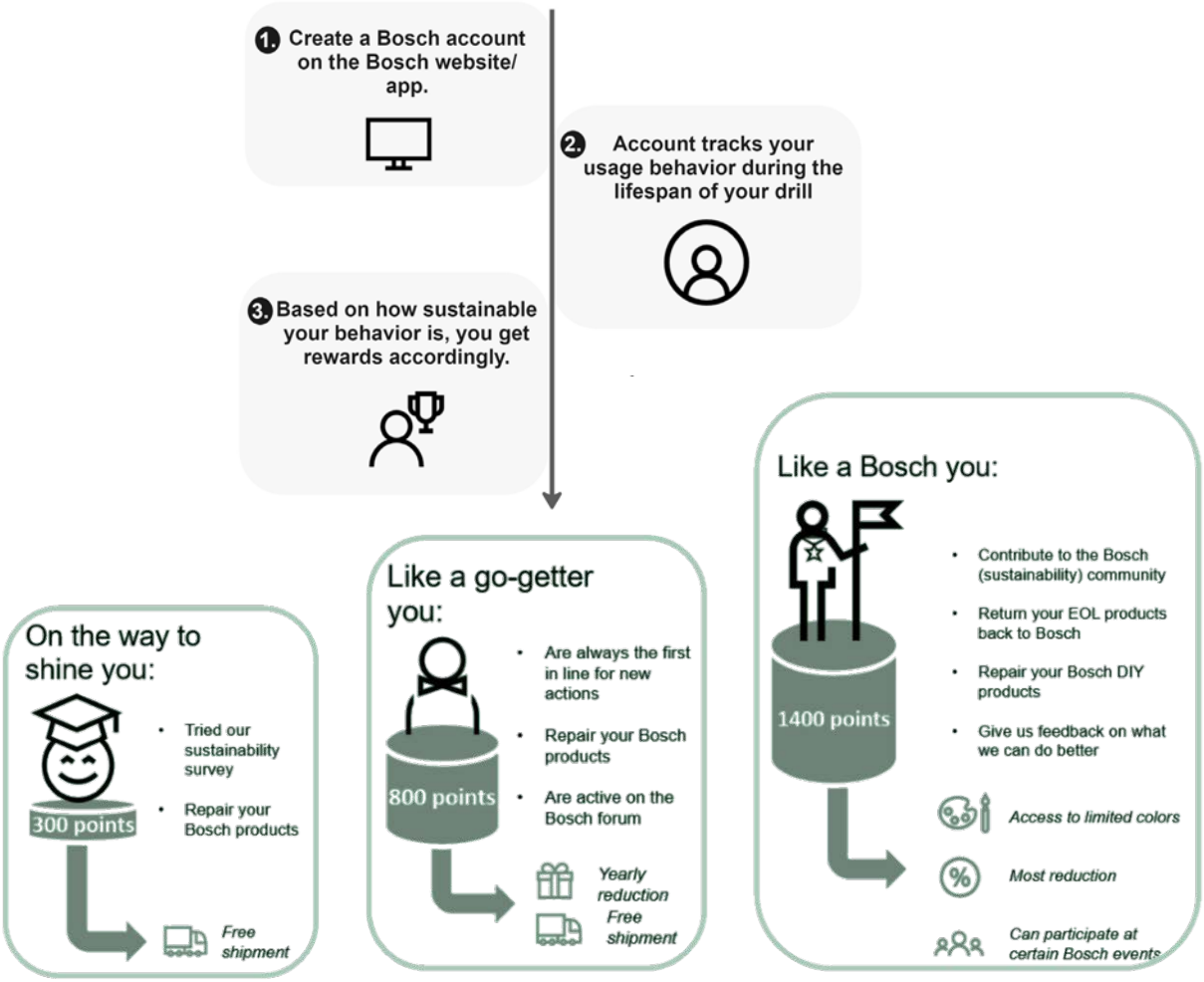


Fig 21: Sustainability program.

4.4 Evaluation

4.4.1 Assessment criteria

The various idea directions are evaluated based on the established design requirements and design suggestions obtained from the 'factors of influence' and 'literature research' chapters. Additionally, Fogg's 'six factors of simplicity' framework is employed as a foundation for defining the assessment criteria. The brainstorming outcomes (concerning ability) are also taken into consideration for this. As a result, the following criteria have been derived:

CRITERIA FROM THE DESIGN SUGGESTIONS AND REQUIREMENTS

General criteria:

1. The return service is durable (resource consumption, transport).
2. The return service allows for a safe return where the product's residual value can be maintained (packaging/ handling/ depositing).

Legal regulations:

3. The return solution integrates the repurchase of the returned goods based on their residual value easily.

European green deal and reverse logistics research (uncertainty of quantity, quality and arrival time):

4. The return solution collects data concerning the product's condition before its return or during the product's lifetime.

9R framework:

5. The return promotes or could integrate the promotion of other circular initiatives such as repair and maintenance.

Flora Poppelaars ' dissertation

Relevant design principles for the assessment of the concept ideas were selected and can be read next:

6. The return solution sparks a thoughtful divestment process at the start of the divestment decision process.
7. The return solution holds users by the hand to say goodbye.
   Flora Poppelaar taps into this design principle by saying that "The divestment experience should be intuitively guided in a supportive, simple, effortless and seamless manner". This is quite similar to Fogg's six factors of simplicity (brain cycles, time, social deviance, non-routine, money, physical effort).
8. The return solution ensures that users act upon their divestment decision by leaving as little time as possible between the divestment decision and action.
9. The return solution is an integral part of the consumption cycle.
10. The return solution allows for autonomy (control, self-expression) while also making use of existing communities.

CRITERIA FROM THE ABILITY ASPECT - FOGG BEHAVIORAL MODEL

Fogg's six factors of simplicity (only 5 of them can be influenced):

1. The return solution requires as little brain cycles as possible from the participants. (Brainstorm: Not complicated and steps don't require much effort.)
2. The return solution requires as little time as possible.
3. The return doesn't require socially deviant behaviour.
4. The return doesn't require financial resources.
5. The return requires little physical effort.

Brainstorm results

1. The return solution should provide flexibility in the extent of required socializing.
2. The return solution offers flexibility in terms of return options.
3. The return solution is provided in a simple and structured way with the help of visual aids.

4.4.2 Assessing the concept ideas

Assessment of the design suggestions and requirements

For the assessment of the design suggestions and requirements, the following Harris profile has been constructed. For more information on the assessment, please refer to appendix D. Since certain elements are not yet included in the concept ideas but have the potential to be included, a scale going from “currently part of the solution” to “very hard to integrate” has been chosen.

+ +	Currently part of the solution
+	Can easily be integrated
-	Difficult to integrate
- -	Very hard to integrate

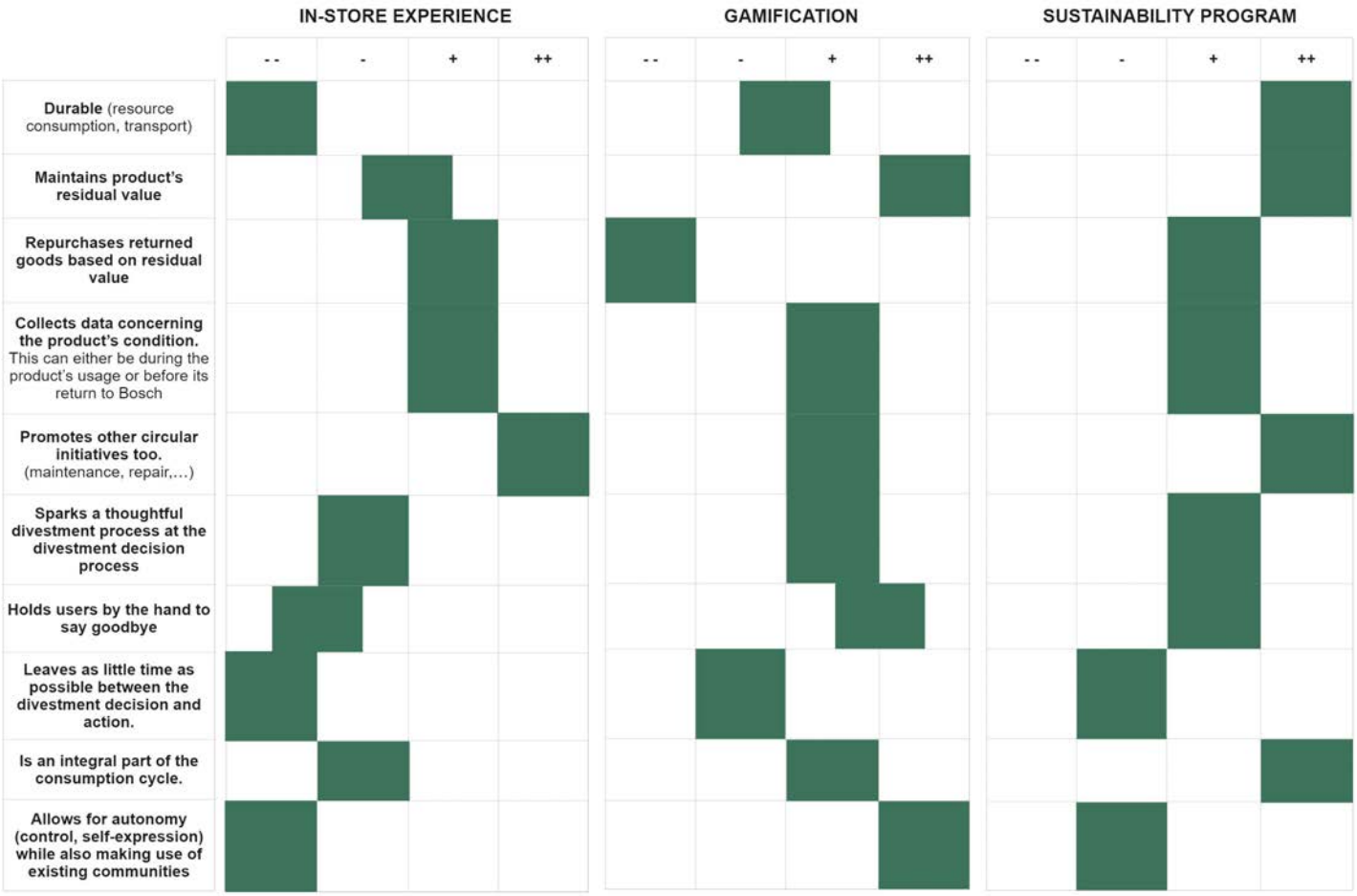


Fig 22: Harris profile design suggestions and requirements..

Assessment of the ability aspect

For assessing the ease (/ability) of the solution, the six factors of simplicity from Fogg’s behavioral model and the outcomes of the brainstorm were included. One assessment criterium was however left out, this being: ‘the return solution is provided in a simple and structured way with the help of visual aids’. This was not part of the assessment as it can be integrated in every concept idea. Since ability is less easy to change significantly in pre-defined scenarios such as an in-store return or a postal service return, a range from very accurate to totally not accurate has been used for this assessment. For more information on the assessment, please refer to appendix D.

+ +	Very accurate
+	Accurate
-	Not accurate
- -	Totally not accurate

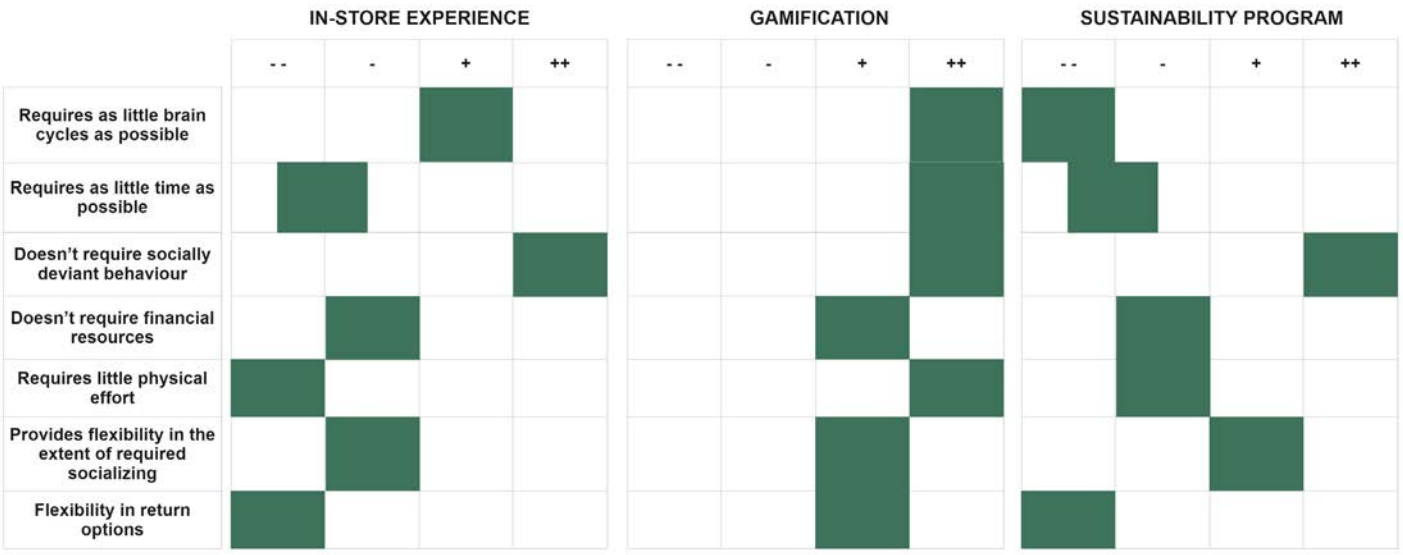


Fig 23: Harris profile ability aspect.

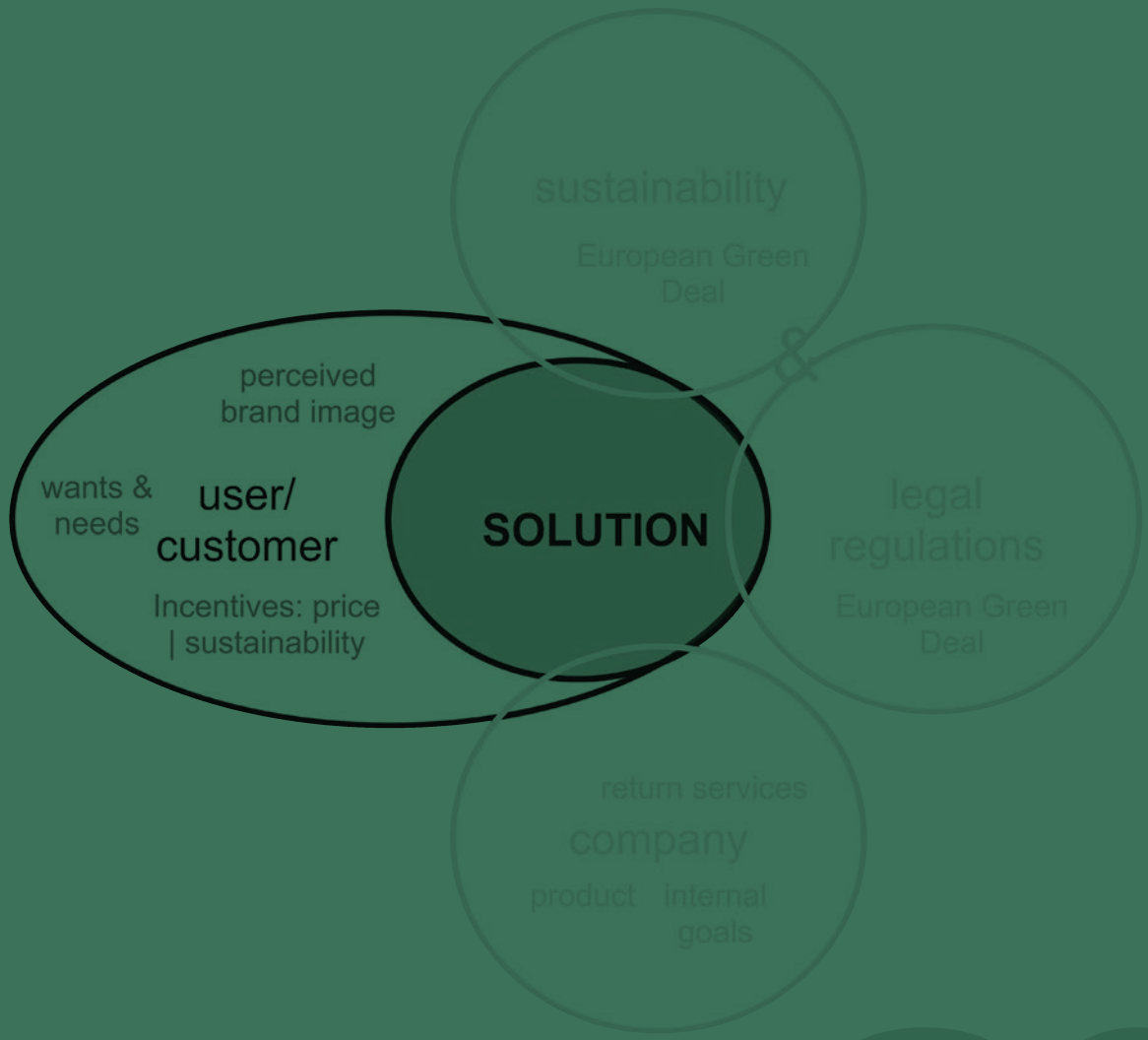
4.5 Conclusion

From the Harris profiles there can be concluded that the sustainability program and the gamification concept answer the design requirements and suggestions the best. The sustainability program integrates the collection of data and other sustainable initiatives well and the gamification concept has the potential to do so through the QR code. Next to this, both concepts can be an integral part of the consumption cycle, also integrating aspects such as repair, maintenance etc. This would make the usage of the QR code or website throughout consumption a more repeated step, lowering the change demand and therefore easing the action for customers (Cash et al., 2020). Through using this QR code or website, customers can be reminded of the EOU return.

When looking how the different concept ideas score on 'ability', gamification scores the highest due to its flexibility in return options. This is mainly due to the fact that the customer does not need to provide the packaging and doesn't need to displace themselves thanks to the pick-up option.

Overall, there can be concluded that the gamification concept comes out strongest when looking both at the design requirements and suggestions and the factors influencing ability. Some aspects such as the flexibility of the return solutions can however still be improved.

In the next chapter, there will be looked at the motivation of the customer concerning these three return formulas.



5. Customer research

5.1 Interview questions
5.2 Method
5.3 Results and implications
5.4 Conclusion
5.5 Limitations

Limited research exists on reverse logistics from the customer's perspective, specifically regarding cordless drills. Understanding the context of cordless drills is crucial as it affects reasons for disposal and potential incentives for returns. This thesis focuses on motivating customers to return their EOU cordless drills to Bosch, emphasizing the customer experience. Interviews with Bosch customers covered usage context, return experiences, drill discard process since this is the situation that needs to be altered, and assessment of previous conceptual ideas. These insights identified touchpoints, return pain points, and customer preferences, informing the conclusion's reflection on past research.

5.1 Interview questions

Context of use
- Who uses the drill? *(Possible incentive)*
- Who is responsible for the drill? *(Target group)*
- For what purpose is the drill used? *(Possible incentive)*
- Where does the customer draw its DIY ideas from? *(Touchpoint opportunity)*

The customer's past return experience
In this part of the interview, customers were asked about their past return experience while drawing inspiration from Fogg's behavioral model. By asking the participants about their best and worst return experiences, possible hassles, the ease of return and possible motivators, were addressed.

- What hassles has the customer experienced in the past while doing a return?
- What enjoyable experiences has the customer experienced in the past while doing a return?
- How did the customer find out in those cases how they needed to make a return? (Touchpoint opportunity)
- How does the participant feel about the different steps for doing a product return to Bosch?

The customer's discard process of a cordless drill
Using the different divestment stages provided by Poppelaars' dissertation (2014) and the psychological process of product replacement (van den Berge et al., 2021), the following points were clarified. The divestment stage to which the question is referring, is put in between brackets.

- When and why did the customer throw out a drill? *(Dilemma recognition and motivation)*
- Did the customer research different divestment options? *(Search divestment options)*
- Why did the customer choose this option of discard? *(Divestment option evaluation)*
- Were there enjoyable or annoying parts during the discard process? *(Final act of disposition)*
- Did the customer buy a new drill before, during or after they discarded their old one?
- How was the process regarding the purchase of a new drill?

The customer's wants and needs regarding returns
- What does the customer like about solution one? What else would they enjoy?
- What experience does the customer value in regard to buying a new drill and disposing of their old one? (solution two)
- What rewards does the customer like from solution three? What rewards would the customer like that are currently not offered in solution three?

5.2 Method

5.2.1 Participants

After discussion with Bosch, there had been decided to do the participant recruitment for the interviews with an agency named 'TestingTime'. For this, a screener was made. A screener is a tool that allows TestingTime to find the adequate participants for the research. For this thesis, the following criteria were chosen for participant recruitment:

Aged 18-75
No information was given about the target group's age, hence 18-75 seemed a representative age group for drill returns.

Living in Germany
Based on conversations with Bosch, Bosch indicated wanting to focus on the German market for the drill returns hence participants located in Germany were chosen.

English-speaking
The participants needed to be able to speak English since I couldn't speak German.

Current Bosch drill user
Since current drill usage was also questioned, participants who currently use a Bosch drill were selected. Reason for this was so they had a vivid memory of their drill usage.

Disposed of a drill in the last 5 years
Since drill discard is the scenario that needs to be altered, focus was put on retrieving participants who had discarded of a drill in the past 5 years. This timeframe was chosen to strike a balance between ensuring participants could recall their drill discarding experience and avoiding overly strict criteria.

Fits into Bosch Home&Garden market segments:
To represent the entire target group that could be doing the drill returns, three participants were chosen from each market segment of the Bosch Home&Garden line (GreenTools). As a basis for the screener, the available research from Bosch regarding the different customer segments was used. This resulted in 9 participants in total.

These were reformulated so that they would fit a screener test format in accordance to TestingTime's 'screener guide' (TestingTime – part of the Norstat Group, n.d.). The full screener can be found in Appendix E.

Out of the nine participants, three were selected to answer an additional screener question along with the standard set of questions. The purpose of this extra question was to ensure that these participants had firsthand experience with returning items to Bosch, rather than just being guided through the steps as part of the interview process. The aim was to gain insights into the practical aspects of returning items and to capture any potential practical issues or unforeseen steps that may arise during a real return experience. However, it was discovered during the interview that although these three participants initially claimed to have returned products to Bosch, their responses revealed that they had not actually done so.

Given how elaborate the requirements of the screener already were and the available time to find the participants, only three individuals were given this additional requirement. Ideally, participants who had both discarded of a drill and had returned (a drill) to Bosch in the past would've been part of the interview. However, since these would've been too many requirements for the available time, the previous approach was applied.

5.2.2 Interview

As mentioned in the introduction, the interview consisted of four major sections. During most of the interview, the participants were asked to use the Miro board. How the Miro board was used and the way the questions were asked will shortly be discussed followingly. The interview was semi-structured, meaning that the interview guide (see Appendix F) got followed most of the time but on certain points, additional questions got asked based on the participant's answer.

1. Context of use
During this part of the interview, the participants were asked to put the drill users on a layered circle that was visible on the Miro board (see Fig 24 where the participants their answers were also added). The users that most often use the drill, had to be placed closer to the center of the circle and vice versa. Next, the participants were asked who was responsible for the discard of the drill and why (see quotations placed next to Fig 24). The different information and inspiration channels the customer used during drill usage were also discussed, as well as the purpose of the drill usage. The latter to discover additional touchpoints during usage.

2. (Past) return experience
It was first clarified to the participant that 'return' means to 'bring back a purchased product either by bringing it to the store or sending it back by post' and that 'this is usually done when a product is defect, or when you end up not wanting the purchase.' The participant was then asked about a memorable return experience that they didn't enjoy and one that they did enjoy. Lastly, participants got asked how they knew about the return process in these two cases if they didn't address this yet.

To know the participants' opinion concerning returns to Bosch, the participants were walked through the different steps that were presented

on the Miro board (see figure 25). The additional option of an in-store return was however added. For the return through postal service, participants were guided through the 'return for repair' steps as presented earlier. Here, only the option to bring the package to a postal service point was presented however. 'Return for repair' got chosen since Bosch currently also refers to this option for EOU returns.

Participants were guided through the different return steps. At each step of the return, participants could choose the emotion that matched their feelings about a step. For this, an emotional face scale was used as it would become too elaborate to assess the intensity of the emotion as well (as is done with Likert scales or the PANAS method). This emotional face scale was 5 point scale ranging from very unhappy to very happy. Next to this, the participant could give additional information to why they were (not) pleased with a step.

To assist the participant with this, an overview of different emotions was presented. When the participant didn't voice additional information, open-ended questions about their happiness levels concerning the step were asked.

3. Past discard process

In the third part of the interview, customers were asked about their past drill discard through a set of questions. The goal of these questions was to understand the psychological process of product replacement as mentioned in the introduction. The reason of discard was also addressed during this part by mentioning the product's performance, the appearance of the product and the need for novelty/ new features (satiation) as possible reasons. The latter three reasons were selected for the interview since they seemed the most relevant for the discard of a drill. These were based on research conducted by van den Berge et al. (2021) and Magnier et al. (2022).

4. Wants and needs regarding returns

To interview the customers about their wants and needs regarding returns, the three solution ideas from the first iteration were presented to the participants. Here, participants could again make use of the smiley emoticons to rate the different features of each solution.

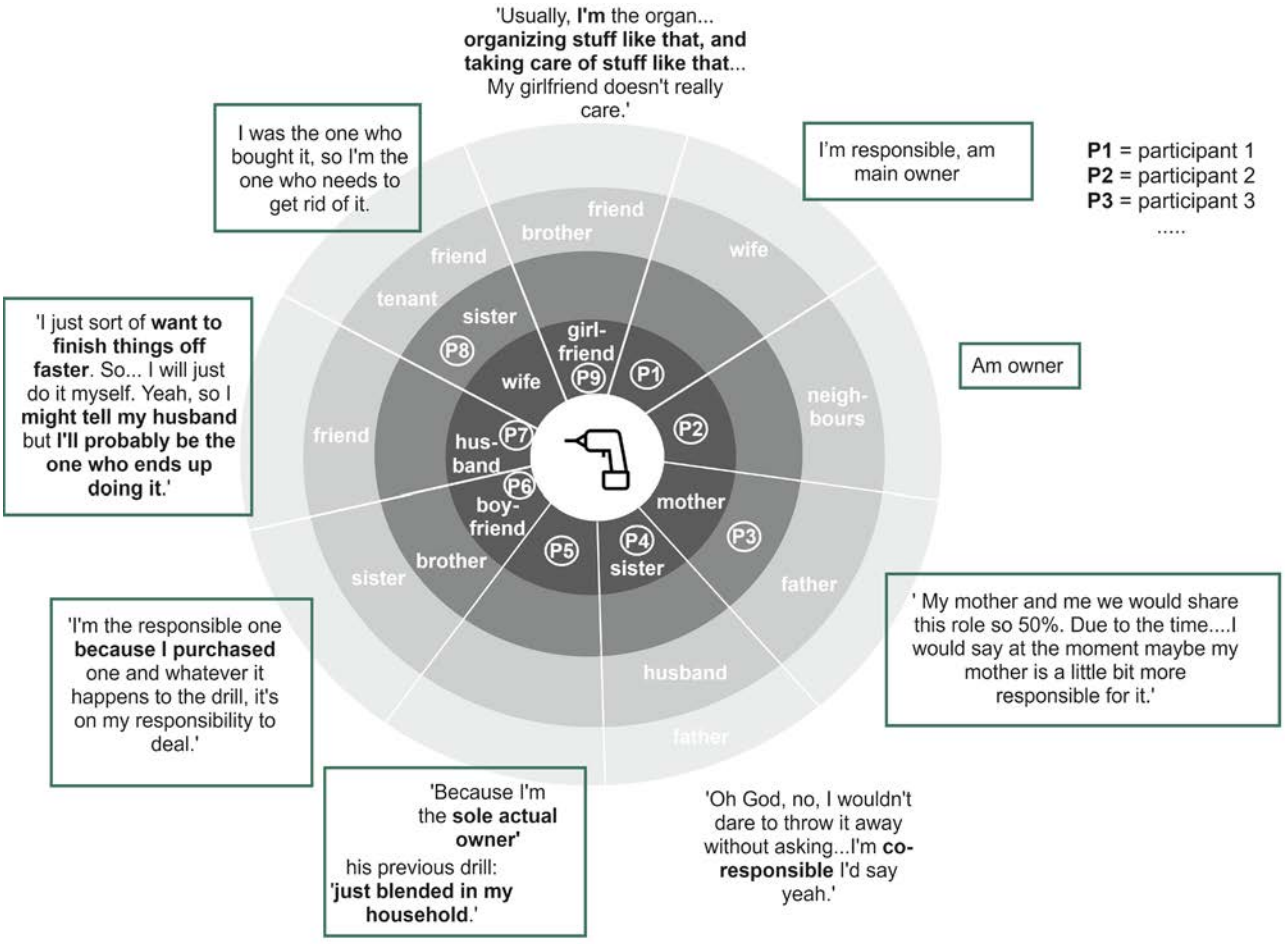


Fig 24: Layered circle used during interviews with the interview results. Squares around the text signify that the user considers themselves owners because they bought the drill.

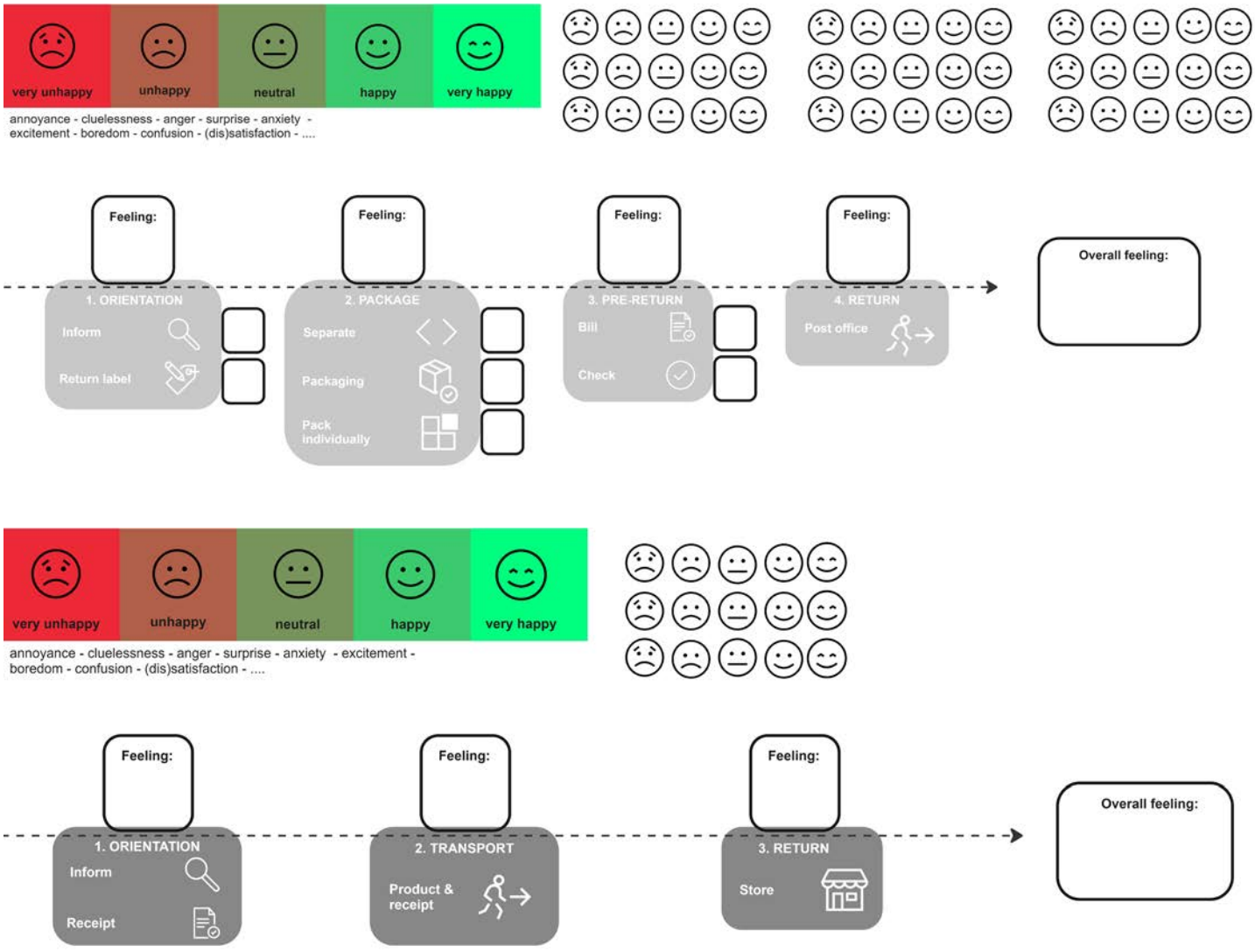


Fig 25: Different return steps. Upper image is for postal returns, lower image is for in-store returns.

5.2.3 Pilot test

Before the interviews took place, a pilot test was done where the Miro board interactions were integrated into the interview and an interview guide was used. During this test, the transcription software got tested and the duration of the interview together with the results were evaluated. After the interview, the visualizations of the different return steps got simplified. For a comprehensive examination of the image, reference Appendix G.

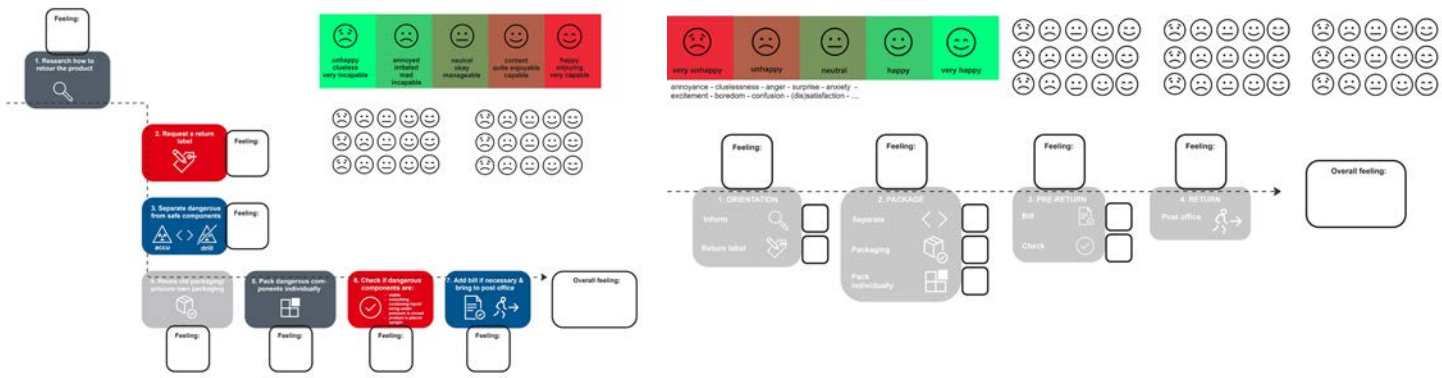


Fig 26: Test run version with more distinct steps (left) than adapted and simplified version on the right.

5.2.4 Participation agreement

Next to the 'participation agreement' that TestingTime had arranged with the participants, I also added two documents that needed to be signed: a participation agreement from Bosch (see Appendix H) and the informed consent form from the TU Delft. The latter two had differing points from TestingTime's agreement and hence needed to be added.

5.2.4 Data analysis

To obtain answers to the different research questions, the interviews were recorded and subsequently transcribed by a transcription service called 'Otter', resulting in approximately 180 pages of textual content. These transcripts were then color-coded according to their respective themes, and an analytical overview of the themes was created on Miro. For insights into the analysis process, Appendix I may be consulted which contains parts of the Miro overview.

5.3 Results and implications

The results are categorized according to the different phases of the drill's life cycle.

5.3.1 Purchase

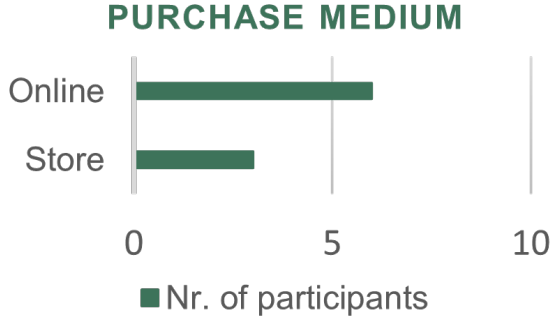
Current scenario

Most participants
bought their drill **online.**

8 out of 9
participants **bought** a new drill **after discarding** their old one.

5 out of 9
participants used **Amazon** either as a search tool or as a tool to order the drill. The most important factors considered during purchase were:

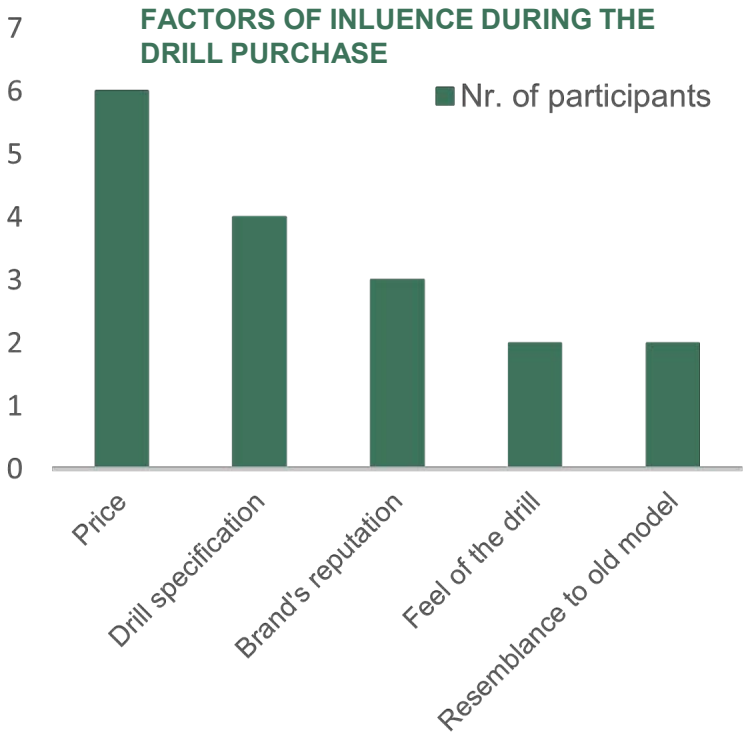
1. Perceived quality
   - Because of the brand's reputation
   - By looking at the drill specifications
2. Price



Wants and needs regarding the purchase of a new drill

7 out of 9
participants reported that they would be happy to **feel the physical properties** of the drill upon their purchase.

6 out of 9
participants reported being happy about **receiving advice** about their new drill.



'Based on what I learned about buying a drill online, I would really prefer to go talk to professional, try out the new model, see how heavy they are. And like if my cordless drill is broken, then I could get repair tips, person... face to face.'
- One of the participants

IMPLICATIONS FOR THE SERVICE DESIGN SOLUTION

Most participants buy a new drill after discarding their old one, meaning that 'factors of influence during drill purchase' (see graph) and wants and needs regarding the purchase of a new drill could be used as incentives.

Amazon and stores selling Bosch drills could be used as a touchpoint to inform users about the return service.

The purchase of a new drill can be integrated in the EOU return of the drill, building on Flora Poppelaar's design principle to 'Think outside the divestment phase' (2014).

5.3.2 Use

Current scenario
The drill is a shared tool of which multiple users can be considered the co-owner.

8 out of 9
participants indicate that they **share the drill** with others

3 out of 9
participants indicate being **co-owners** of the drill.

8 out of 9
participants indicate that the **person who bought the drill**, **also threw away** the drill even though someone else might use it more.

4 out of 9
participants use the drill for setting up **furniture**.

5 out of 9
participants watch **YouTube** as a means of inspiration/ help tool.

3 out of 9
participants know the **Bosch app**.
& 2 out of 9 remember the **notice** in the box regarding this app.

IMPLICATIONS FOR THE SERVICE DESIGN SOLUTION

Bosch needs to target the original customer for the returns. Some interviewees indicated that although other persons might use the drill more often, that the original owner felt responsible to throw away the drill.

New touchpoint opportunities during usage are: Youtube, furniture stores and a notice in the package. 3 out of 9 users indicates knowing about the Bosch app, although only one of them uses it.

The drill is a tool that is shared with other users who might consider themselves co-owners. This could be interesting regarding an incentive for product returns by leveraging the relationship between the user and the community (Poppelaars, 2014).

5.3.3 Return

By asking participants about their past return experiences, guiding them through the return steps and presenting the concept ideas to them, factors influencing the customer's ability and motivation were identified. These will be discussed subsequently.

A. Factors influencing ability

The following factors were obtained by grouping factors influencing ability through all the discussed return experiences (past experiences, the walk-through of the different steps and the concept ideas). They are ordered from most mentioned to least mentioned.

Brain cycles

8 out of 9
participants wanted **little to no work on the packaging label**. More specifically:
- 4 out of 9 participants didn't like having to procure the packaging label themselves (meaning to print it out themselves)
- 4 out of 9 participants mentioned not liking to procure an extra label for the drill battery (meaning to search for the correct label and print it out).

6 out of 9
participants wanted **little brain cycles/ mental effort**. These were for the following:
- Having to think about a complicated step such as the seperation of the battery and the drill (3 participants).
- Not wanting to do or think about anything preferrably (2 participants).
- Having to think about how to package the product (1 participant).

5 out of 9
Participants considered **unexpected events** as a a **roadblock** and hassle in returns. Unexpected events include:
- Unforeseen actions needed to complete return (3 participants)
- unforeseen additional fees (1 participant)
- Unexpected outcome (1 participant)

3 out of 9
participants mention **ease and clarity of communication** concerning the return steps as being pleasant. This can be linked to the absence of surprises or unexpected events.

3 out of 9
participants indicated that having to **keep or search for the receipt** for warranty was experienced as **burdensome** by them.

3 out of 9
participants experienced **not having to explain a reason for the return** as **pleasant**.

Physical effort

6 out of 9
participants would be **unhappy** about having to **procure the packaging themselves**.

2 of them
however, wanted to procure their own packaging when realising the **environmental impact** of sending packaging to their home.

5 out of 9
participants wanted **as little transport as possible.**

Time

5 out of 9
Participants do **not** want to spend **too much time** on their return. Here, **both** an **in-store** return and a return through the **postal office** were considered as time-consuming.

3 out of 9
participants stretched the **importance of flexible return times.** Here the **postal service** was mentioned of being more likely to cater to this need.

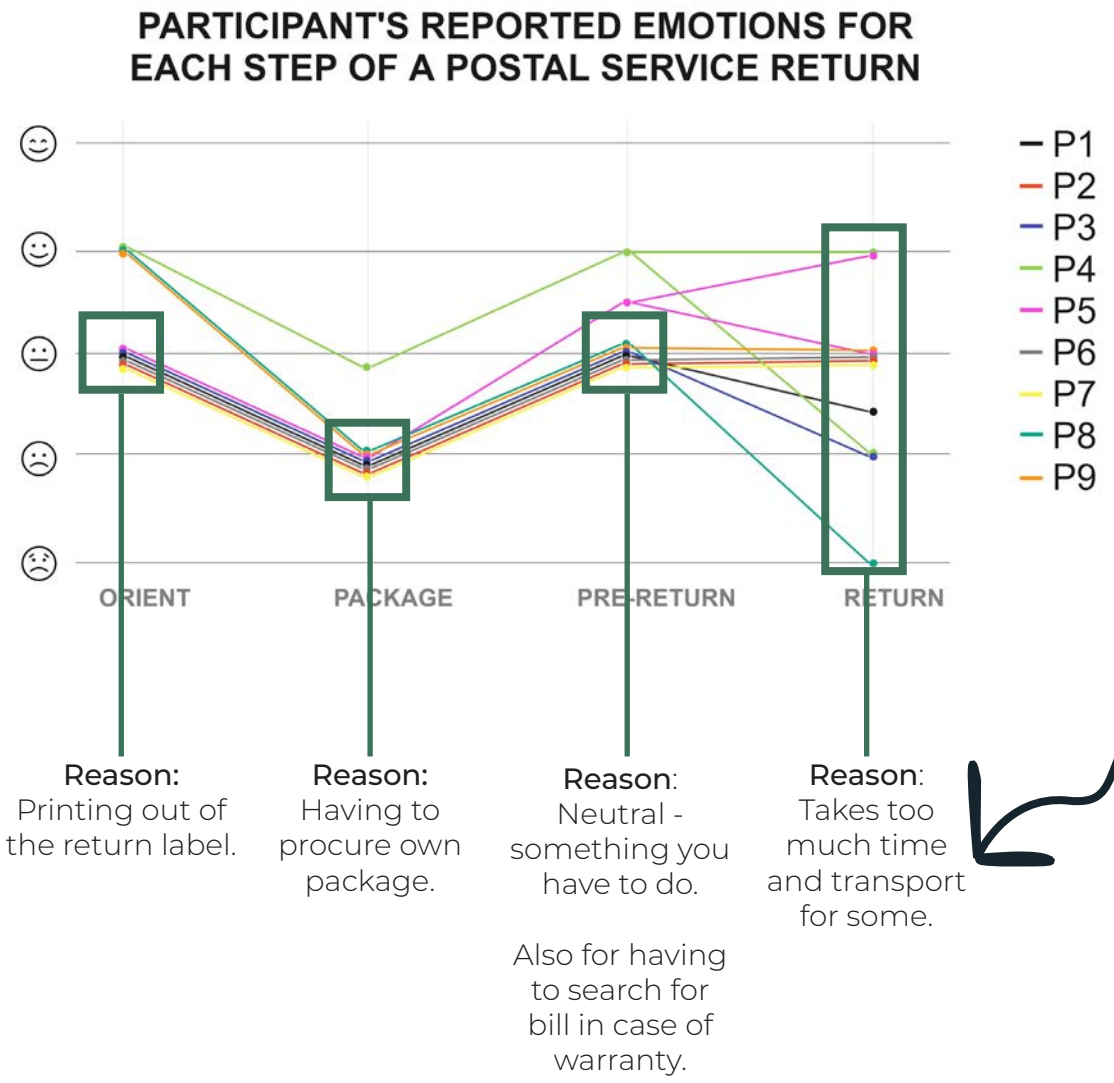
Money

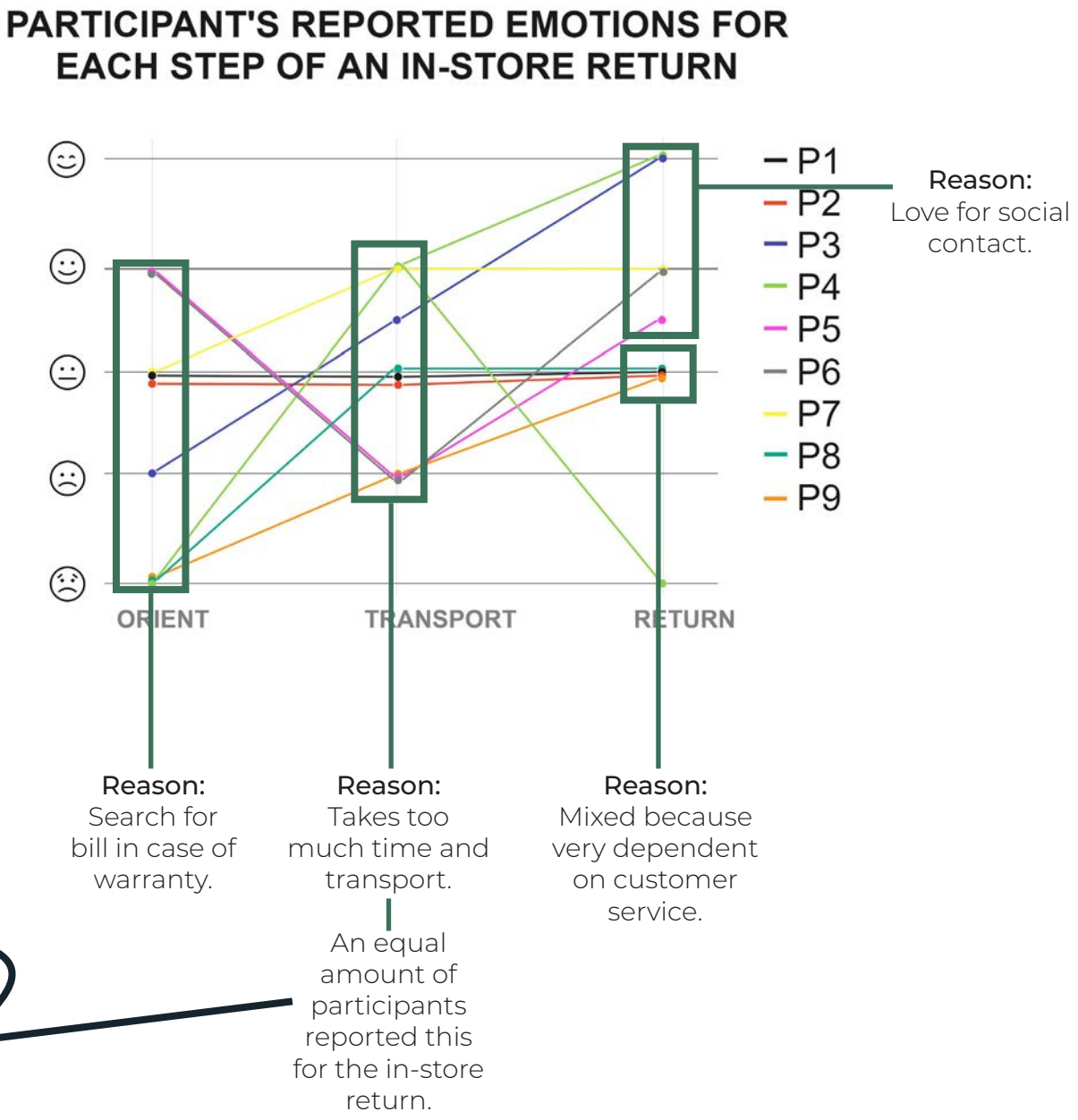
2 out of 9
Participants experienced **financial efforts** for the postal service or an additional package as an annoyance.

Lastly,

3 out of 9
Participants reported being **annoyed to not be able to use their drill** when having to return if for exchange/repair/... reasons.

The analysis of the interview section where customers were guided through the various return steps, consistently highlighted similar pain points. These findings are visually represented in the accompanying graphics. Only the most mentioned pain points are represented.





The factors influencing ability reveal the challenges faced during the return process. However, they do not indicate how these challenges impact participants' emotions. The graphs show a lower rating when participants are required to provide their own packaging, which eight participants considered displeasing. This underscores the significance of providing sufficient packaging to improve the return experience and enhance satisfaction. It should be noted that allowing users to provide their own packaging remains a viable option to consider.

In addition, the in-store experience graphic shows a more varied distribution of preferences among participants. While some participants favor the in-store option, others prefer the postal service. One reason for the preference toward the in-store option appears to be associated with the social contact aspect. As preferences vary, offering both an EOU return service in-store and through the postal service appears to be the most suitable approach based on the available data.

Lastly, considering the frequency of 'pain points' mentioned and their impact on participants' emotions indicates that providing materials and reducing mental effort or cognitive load by offering simple steps are the key factors that significantly influence ability. These factors either considerably diminish satisfaction, as depicted in the graphs, or are mentioned more frequently in the data.

B. Factors influencing motivation

Through presenting the different idea concepts to the participants, possible motivators could be identified. These will shortly be discussed next.

7 out of 9
participants are **enthusiastic about the 'feeling lazy option'** of the gamification concept. (one does not prefer it)

4 out of 9
participants would feel **happy about contributing to a bigger cause**.

3 out of 9
participants are **enthusiastic about the 'up for a challenge'** of the gamification concept if executed properly.

3 out of 9
participants indicated that they would l**ove to get advice on the repairability** of their drill.

3 out of 9
participants **prefer a good quality product over any of the rewards**.

3 out of 9
participants would like a **coupon/ credits** for their next purchase as a reward.

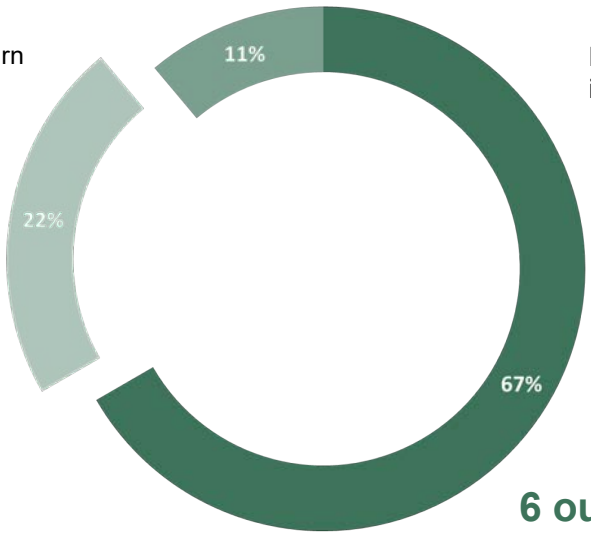
2 out of 3
participants with kids were **enthusiastic in involving their kids** in the return through a fun activity**.**

When looking at the responses in more detail, it could be concluded that most participants preferred the gamification concept idea, and more specifically the 'feeling lazy' option mentioning ease as the main reason. However two other participants opted for the in-store return solution mentioning the environmental impact of the return as a main reason. The following is visualised in the graphic 'reasons for the participants'preference'.

2 out of 9 (22%)

Participants prefer the in-shop return

All of them indicate that this is because of the **environmental impact** of the package delivery.



1 out of 9 (67%)

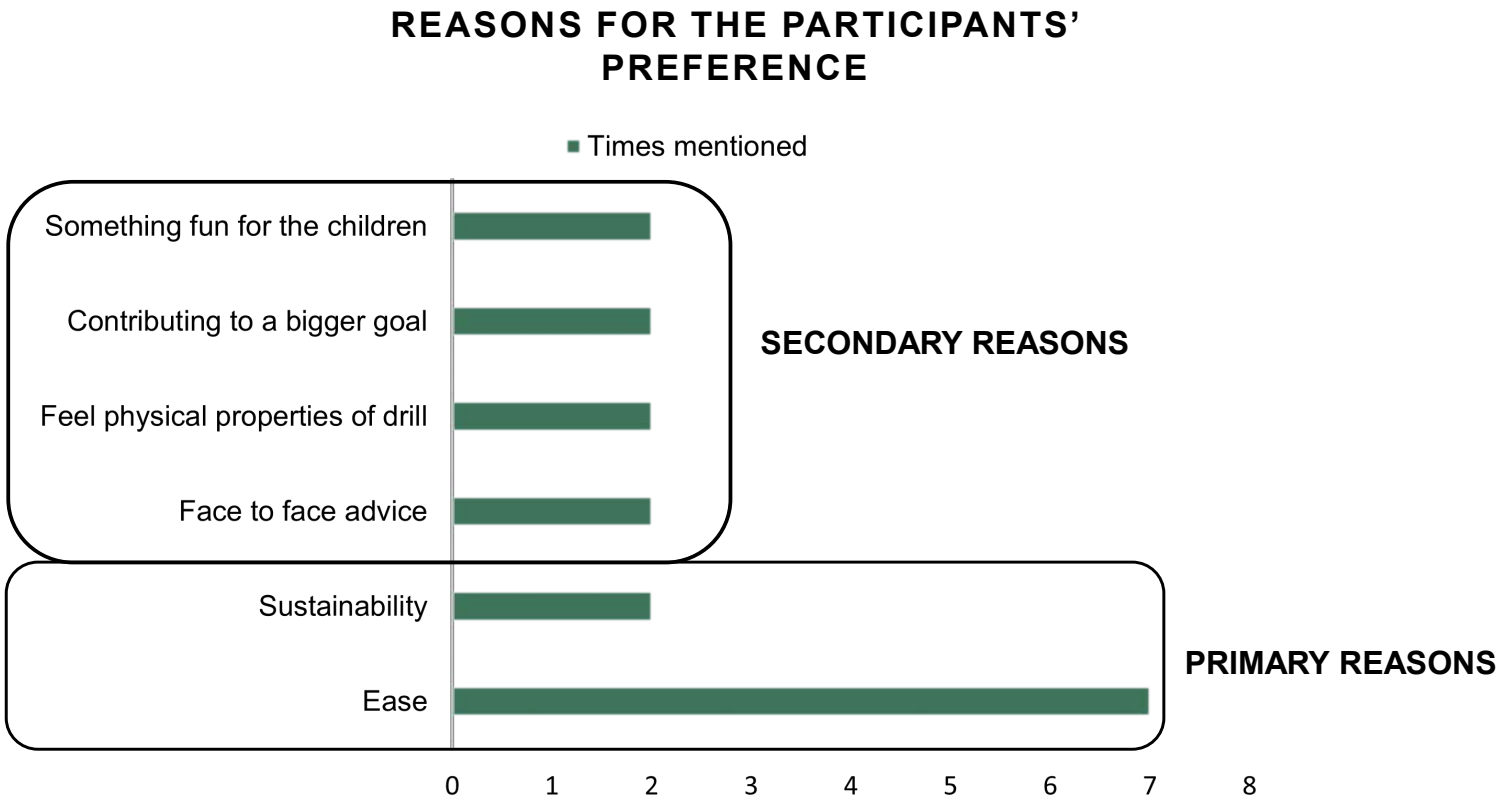
Participant wanted the QR code solution in combination with the loyalty program

The participant indicated interest in the sustainability program to **feel part of a bigger purpose**

6 out of 9 (67%)

Participants prefer the QR code solution to return their products

All of them indicate that this is because of **ease**



Other factors were also mentioned but were not as decisive towards the participant's preferred return decision, therefore they are considered as 'secondary factors'. From this, it can be concluded that using the durable goal of the return can be used as a strong motivator for some customers.

Some of the secondary factors that were also mentioned were: being able to feel the physical properties of the different drills and face to face advice. These were given as reasons for the in-store return solution. Although participants loved these aspects, the in-store solution was appreciated on a very case-specific basis. The customer mentioned liking this option when being on their way to another chore, when the store is not that far away, when customer service is good etc. Therefore, allowing customers to make use of their usual purchase methods (online/ in-store) and providing a return service through both of those channels would be recommended.

Lastly, it is important to mention that many customers, especially those who were parents, liked the idea of involving their kids in the return process as children often play with the cardboard boxes of their parcels. However, this approach received mixed reactions, with some customers expressing concerns about its suitability for a drill-related context. Despite the controversy, incorporating this option could be interesting for gaining traction about the return service and enhance the overall return experience for customers who find the idea appealing.

IMPLICATIONS FOR THE SERVICE DESIGN SOLUTION

Main takeaways for ability:

- **Simplify the return steps as much as possible so that minimal mental effort is required from the customer**
- **Offer the option to provide for packaging and labeling and/or ensure easy access to the adequate labeling.**

IMPLICATIONS FOR THE SERVICE DESIGN SOLUTION

Possible incentives can be found

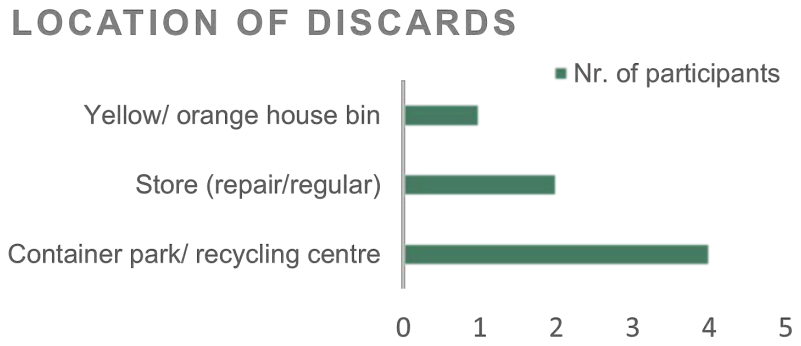
- **Enjoyable experience**
  1. **Involving kids**
  2. **Improved shopping experience**
- **A consistent well-functioning product at decent prices**
- **Contributing to a bigger cause**
- **A coupon/ credit for the next purchase**

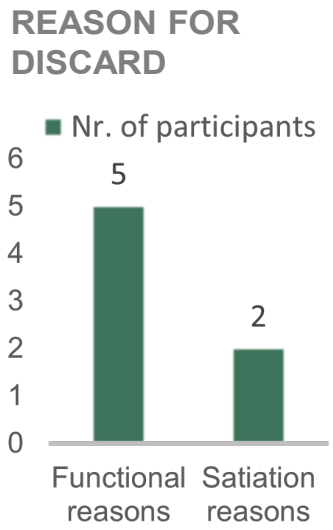
5.3.4 Discard

Current scenario

5 out of 7 participants indicate that they either (only 7 did the discard themselves):

- Need to go to the container park anyways to bring other goods
- Do it on their way to another task





When participants were asked about their choice of discarding method and whether they had explored different options, those who opted to discard their drill at a container park mentioned that 'this discard option is common knowledge' and that they 'did not have to do any research'. Among the participants who chose an in-store discard, one hoped for potential repair while the other mentioned awareness of a new legal regulation requiring stores to accept electronic waste. Additionally, the yellow bin option, available in specific municipalities in Germany, provided a convenient discard solution for participants residing in those areas. Important to note is that these were all participants that did discard of their drill. Therefore, there might be customers who consciously think about discarding their drill, are unsure on how to discard it and might look up discard options. However, from the customer responses during the interview, participants had a straightforward way to deal with their discard without looking too much into the different divestment options.

The graphs indicate that the primary reason for discarding drills is functional issues. As mentioned in 'A. Factors influencing ability', customers express annoyance when they cannot use their drill after returning it. Additionally, it was observed that a majority of customers tend to purchase a new drill after discarding their old one. These findings suggest that an EOU return service that incorporates the option for customers to purchase a new drill could be interesting to them.

IMPLICATION FOR THE SERVICE DESIGN SOLUTION

Current solution is convenient. Customer must thus be convinced by secondary reasons too (not only ease).

The combination of an EOU return together with the repurchase of a new drill might be an interesting opportunity to explore.

5.4 Conclusion

When aligning the obtained results with Fogg's behavioral model (2009), it can be concluded that the majority of participants considered ability factors as significant barriers in their past return experiences as well as the return steps they were guided through. To enhance the ability to engage in a desired behavior, Fogg suggests to use facilitators, which involve triggering the behavior while simplifying its execution. Strategies such as conveying information regarding the ease and efficiency of the action, such as completing it in a single click or within a few minutes, can be employed. However, based on the conducted interviews, it is crucial to emphasize to participants that Bosch can provide the necessary packaging and labels, as this aspect was identified as a major obstacle.

Overall there can be stated that participants' motivation is rather on the lower end with them stating reasons as 'having to do it' as a driver for their behaviour. Through the customer interviews, however, possible factors influencing motivation could be identified. Although participants showed little interest in the various rewards offered by the sustainability program concept, they expressed appreciation for being part of a larger purpose, such as sustainability, and for having a durable drill that can be repaired whenever possible. Some customers even preferred a less convenient solution in order to align with their sustainability values. The desire for sustainability and the intention to use the product for as long as possible provide an opportunity to develop a comprehensive return solution that not only focuses on ease of use but also emphasizes repair, as suggested in previous chapters. By making the return service more comprehensive, it is possible to tap into the aspect of durability and allow customers to feel connected to the sustainable purpose of the return.

Considering that price was regarded as an important factor in the purchasing decision, providing customers with a voucher upon returning their drill could serve as an incentive. Additionally, incorporating a fun experience for children during the return process, such as a box decorating competition, was appealing to some of the participants who were parents. The idea however did get some controversy as a drill is not considered a child-friendly tool. Overall, having a fun activity for kids such as participating in a box decorating competition can enhance the overall return experience as well as generate promotion for the return service.

Given that ease is already inherent in the current discard scenario, it becomes crucial for the EOU return service to emphasize and enhance these motivational aspects by employing sparks. In fact, it can be argued that the utilization of sparks may be even more imperative than facilitators in this particular context. Next to this, the return service should be simplified as much as possible as ability is often considered to be a barrier during returns.

The analysis of the results revealed that functional issues are the primary driver behind customers discarding drills. Participants expressed frustration when they found their returned drills to be non-functional. Moreover, a majority of customers subsequently purchased new drills after discarding their old ones. These findings highlight the importance of integrating the option for customers to purchase a new drill within the EOU return service. By providing this option, the service can effectively address customers' needs and preferences, increasing customer satisfaction and loyalty.

Additionally, participants expressed a strong desire for a replacement drill that is similar to their old one. Therefore, offering a service that matches customers' old drill with a similar drill could enhance their inclination to utilize the return service or make a purchase. As preference for an in-store or postal return is fairly case specific, both options should be offered to answer customer needs.

When participants were asked about the different divestment stages, most participants had a straightforward way to deal with their (potential) divestment without looking too much into divestment options. One notable observation is that as soon as a functional defect occurred, the individual considered the possibility of getting rid of the product. This particular moment is crucial as it marks the point at which the person should associate the return service with this incident.

Concluding the following touchpoints were identified:

Upon purchase:
- When buying the drill in store through the vendors
- Displays in store
- Description on Amazon

Upon usage:
- Notice in the package
- QR code on drill
- Bosch app: pop-up on the app explaining this new service
- Youtube was mentioned to be a used to get inspiration
- furniture stores

Upon discard:
- Info displayed on waste disposal websites
- QR code on drill

General:
- Ideas 'Feeling creative' and 'up for a challenge' could be interesting for marketing purposes and be showcased on social media platforms
- FAQ on Bosch website and app

5.5 Limitations

This section addresses the limitations of the customer interviews conducted in this study. The limitations are discussed in the following order: target group for the interviews, interview approach, data analysis, theories used, and results.

Target group

As mentioned before the target group was focused on customers who had discarded their drill in the past and who were evenly distributed among the different customer segments of the DIY tool. They were either co-owners or owners of the drill and were Bosch customers at the time of the interview. Although the following option was also included in the screener: 'I would like to dispose of a drill' and was deemed as qualifiable (meaning the participant could be selected for the interview), there were no participants from the final pool who selected this option. This means that no customers who wanted to dispose of their drill but did not do it were considered. Due to this, the potential barriers that might be specific to such a scenario couldn't be identified.

Interview approach

The interview approach had several limitations that should be noted. To determine the wants and needs of customers, their opinions were obtained regarding three proposed return solutions. However, it is important to note that this approach may have influenced the customers' opinions by directing their focus towards the specific needs and wants addressed by each solution. Thus, the results should be interpreted with caution, as they may not fully reflect customers' preferences and needs. Secondly, although efforts were made to consider non-verbal cues and were checked upon during the interview process, it should be noted that this method is still subject to bias and may not always be reliable in reflecting the true emotional state of the participant. Similarly, the

use of self-report measures to assess emotions is also subject to bias and may not always be completely accurate.

Data analysis

Regarding data analysis, only one iteration of data grouping could be performed during the study due to time constraints. As a result, there may have been missed opportunities for a deeper analysis and identification of additional themes.

Theories used

As a main guiding thread for the interviews, Fogg's behavioral model was used. While Fogg's behavioral model provided a useful framework for understanding participants' behavior and motivations, it does not account for habits as mentioned previously. To mitigate this limitation, the interview questions asked participants about their reasons for specific behaviors, such as why they disposed of their drills in a certain way. However, this approach can only address habits to the extent that the consumer is aware of them.

Results

Finally, due to the scarcity of research in the domain of drill returns, achieving data saturation was challenging. Although the findings provided a broad understanding of the customers' preferences regarding the return of their drills, some aspects of the qualitative data may require further exploration through (for example) quantitative research, particularly in cases where opinions were more diverse.

6. Design guidelines

6.1 Design requirements
6.2 Design opportunities
6.3 Conclusion

This chapter merges the previously identified design opportunities and requirements. Here a distinction is made between 'more generally applicable guidelines' and 'guidelines applicable specifically to drills'.

LEGEND

Guidelines that are drill- and/ or powertool-specific are indicated with a drill icon next to them.

Guidelines that are electronics-specific are indicated with a lightning icon next to them.

6.1 DESIGN REQUIREMENTS

1. The return service allows for a safe return where the product's residual value can be maintained (packaging/ handling/ depositing).

Environment:

2. The return service is durable (resource consumption, transport).

Company: Legal regulations:

3. The return solution should be designed to appeal to the entire DIY customer base to ensure economic viability.

Legal regulations:

4. The return process should facilitate the repurchase of returned goods based on their residual value to support non-waste post-return processes.

5. The return service should provide adequate labels for the packaging as outlined in '2.3.2' The company' to comply with the legal regulations.

6.2 DESIGN OPPORTUNITIES

General

Make other consumption stages an integral part of the EOU return solution.
This is also suggested by Poppelaars (2014) with the design principle to 'Think outside the divestment phase' (2014). The following consumption actions were identified for this during previous chapters:

Registration of the tool at start of usage (see '2.1.3 The product'):
Integrating the current registration service with a user-friendly touchpoint would enhance its accessibility, enabling a larger user base to utilize the service and yielding a higher volume of usage data. Moreover, this would prove beneficial for customers, as registering within a month of purchase entitles them to an extended warranty period of one year.

- **Warranty (see '5. Customer research'):**
  Participants indicated having the need to find the receipt when the product is still within warranty as a pain point. Similar to registering the drill, the warranty could be coupled to a data carrier, enhancing customer experience during drill usage.
- **Other circular initiatives (9R framework) such as repair:**
  The return promotes and/ or integrates other circular initiatives such as repair. In the future maintenance and upgradability could potentially be integrated as well. This would align well with the customer's wish to have a 'consistent well-functioning product at decent prices'.
- **Drill purchase (see '5. Customer research'):**
  By integrating the purchase process within the End-of-Usage (EOU) return service, a new drill can be provided to participants quickly, eliminating the frustration of being without a tool (See results customer research). Moreover, there is a significant demand for a replacement drill that closely resembles the old one. This presents an opportunity to offer a service that matches customers' old drill with a similar one, enhancing their motivation to engage with the return service.

By having an all-encompassing service, the customer gets reminded of the EOU return throughout the consumption cycle utilizing, preferrably, the same touchpoint. Also, by including other services such as repair, the durable aspect is not only emphasized but the customer is also immediately 'held by the hand' (Poppelaar, 2014) in case the customer decides to divest upon encountering functional problems.

Using the same data carrier as a touchpoint for 'the other consumption stages' that are integrated in the return service.
By doing this, the following points would benefit:

- **The Digital Product Passport (DPP)**
  As the DPP will be set in place in the upcoming years and will be available through a data carrier that would also 'empower' customers, the DPP could be integrated into the return service.
- **European green deal and reverse logistics research**
  By adopting a data carrier, data collection concerning the drill's condition could be initiated. By doing this, post-return decision-making can be streamlined and potentially be automated. Additionally, automating the decision making and drill evaluation has the potential to reduce the costs associated with post-return processes.

Bosch needs to target the original customer for the returns. Some interviewees indicated that although other persons might use the drill more often, that the original owner felt responsible to throw away the drill.

Potentially:

Use AI to forecast product return volumes, sort mixed materials and evaluate the product's condition (Wilson & Goffnett, 2021).

Customer motivation and ability

Simplify the return service as much as possible as well as providing sparks to enhance customer motivation.
The ease of returns played a very important factor for customers during customer research. As current discard options are fairly convenient, the customer must also be motivated enough to make the EOU return to Bosch and thus not following their 'custom discard route'. The following overview provides possible incentives, sparks, factors influencing ease, facilitators and triggers that were identified during customer research.

Identified incentives:
- Enjoyable experience
  1. Involving kids
  2. Improved shopping experience such as offering a service where a similar model to the old odel can be found.
- A coupon/ credit for the next purchase
- Utilize the relationship between the user and the community (Poppelaars, 2014) as it was found that the drill is a shared tool.
- Being part of a bigger goal

Identified sparks:
- Highlight the contribution to sustainability that the customer partakes in by making use of the service.
- Emphasize the fact that customers can experience the benefit of a consistently durable and high-performing product through the utilization of the service.
- Highlight the financial incentive upon purchase and when initiating the EOU return.

Suggestions to increase ability based on most mentioned pain points:
- Simplify the return steps as much as possible so that minimal mental effort is required from the customer.
- Offer the option to provide for packaging and labeling and/or ensure easy access to the adequate labeling.

Identified facilitators:
- Emphasize the procurement of the labels and packaging from Bosch, hence saying that the customer 'does not need anything to do the return'.
- Emphasize the simplicity of the steps.

Triggers
- Triggers can be provided in the form of a reminder to the customer through the identified touchpoints discussed on the next page.

Touchpoints

Upon purchase:
- When buying the drill in store through the vendors
- Displays in store
- Description on Amazon

Upon usage:
- Notice in the package
- QR code on drill
- Bosch app: pop-up on the app explaining this new service
- Youtube was mentioned to be a used to get inspiration
- Furniture stores
- Manual

Upon discard:
- Info displayed on waste disposal websites
- QR code on drill

General:
- Ideas 'Feeling creative' and 'up for a challenge' could be interesting for marketing purposes and be showcased on social media platforms
- FAQ on Bosch website and app

6.3 CONCLUSION

Guidelines can be used for a variety of return solutions not only cordless drills as it addresses pain points in reverse logistics too and promotes general circular initiatives. Next to this, customer interviews both tackled general return annoyances where ease was mostly a pain point. Certain incentives or facilitatos are drill-specific as can be seen by the use of the icons while others could also be used for other return types. Overall, 'The return service should be designed as a comprehensive solution that integrates and collects data from various stages of the consumption cycle, including those preceding and following the return process.'

'The return service should be designed as a comprehensive solution that integrates and collects data from various stages of the consumption cycle, including those preceding and following the return process.'

7. Suggested return service

7.1 Second iteration
7.2 The suggested return service
7.3 Detailing: Positioning QR code, logo, website, check, voucher
7.4 Evaluation

This chapter provides a brief overview of the second idea iteration, followed by the presentation and evaluation of the final concept. The concept is assessed based on its feasibility, viability, and desirability.

7.1 Second iteration

A second iteration was conducted based on the customer research results. This yielded in the following concepts:

Concept making use of current discard method
As customer research revealed, participants discard of their drill mostly through container parks/ recycling centra. This option was considered as fairly convenient as participants often discarded of their drill on their way to another chore or when they had to go there for other goods too.

Collaboration with furniture stores
Since many participants communicated that they used their Bosch drills for setting up furniture, a collaboration with popular furniture stores where the old drill would be collected and a discount would be given could be set up.

Concept where customer can bring back any drill
This idea based itself on the fact that participants mentioned they wanted to find a drill similar to their old one. By offering a service that helps customers to find a similar drill as the customer's prior model, customers would become a client of Boscn which in turn would increase Bosch's customer base.

Improve QR code solution
Here a QR code would be visible on the drill that would lead to a webpage providing the EOU return as well as a purchase option, a maintenance option and an upgradability option.

Hybrid solution combining leasing and selling
For this return solution, the customer pays an annual fee to receive repairs at a reduced cost and free spare parts. Every two year participants would be prompted to do a health check of the drill with the option to upgrade it. When the drill reaches its EOU and the customer returns it to Bosch, a '1 year no fee' for the program on the new drill is applied (if applicable).

These different concept ideas were first discussed with Bosch and were then assessed based on this thesis' design guidelines. Both results resulted in a preference for the QR code solution. This assessment can be viewed in appendix J.

7.2 The suggested return service

7.2.1 Introduction

Based on the identified design requirements, opportunities and Bosch's feasibility assessment, the QR code solution was selected as final concept. The QR code solution became an all-encompassing service that can be used throughout the entire consumption cycle integrating services such as the registration of the tool at the start of usage, requests for repair and more. On the following pages, the service blueprint and further detailing of the concept are presented.

7.2.1 The concept

The final return service concept introduces a QR code feature on the drill, providing customers with an enhanced end-of-usage (EOU) return service, along with various other services throughout the drill's lifecycle. This concept aims to make existing services more easily accessible, such as drill registration at the beginning of usage, which extends the customer's warranty, and drill repair. Additionally, the QR code provides access to important information regarding the drill's circularity, positioning Bosch as a pioneer in durability, as regulatory requirements for such services are expected to be established.

By offering these diverse "durable services," the concept emphasizes the goal of promoting durability and encourages customers to repair their drills. This approach aligns not only with circular economy principles but also with customer preferences for long-lasting, high-quality products. As an added benefit, participants would receive a voucher when returning their drill EOU. Moreover, the concept includes a service to help customers find a similar replacement for their old drill, thereby incentivizing the use of Bosch's purchase channels and enabling Bosch to gather usage data. Furthermore, gathering data on the drill's initial usage and monitoring its condition throughout its lifecycle, while linking this information to the specific drill model, facilitates informed decision-making after the return process.

Addressing past pain points, such as the inconvenience of procuring materials and dealing with labeling requirements during returns, the proposed service provides easy access to necessary materials and labels. This ensures a seamless return process for customers.

The return solution also encompasses various touchpoints. While the QR code solution is accessed through the drill itself, the "Join the Circle Program" can also be integrated into the website. Additionally, a prompt during the purchase process on the Bosch website could encourage customers to opt for EOU returns of their old drills.

The service is structured around four key components: evidence, front-stage actions, backstage actions, and support processes. These components play a crucial role throughout the entire consumption cycle, spanning the stages of pre-usage, during usage, and end of usage. To provide a clearer understanding, a service blueprint and website mock-ups have been created, which will be further discussed in the following sections.

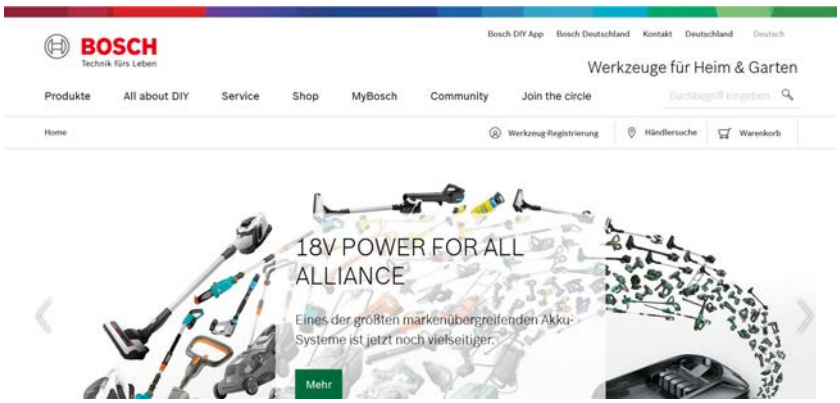


Image 17: Website add-on leading to the return service website for customers without a drill containing a QR code.

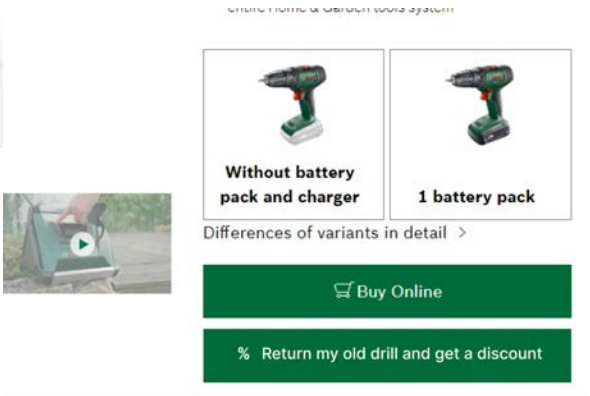


Image 18: Purchase add-on.

7.2.2 The service blueprint journey

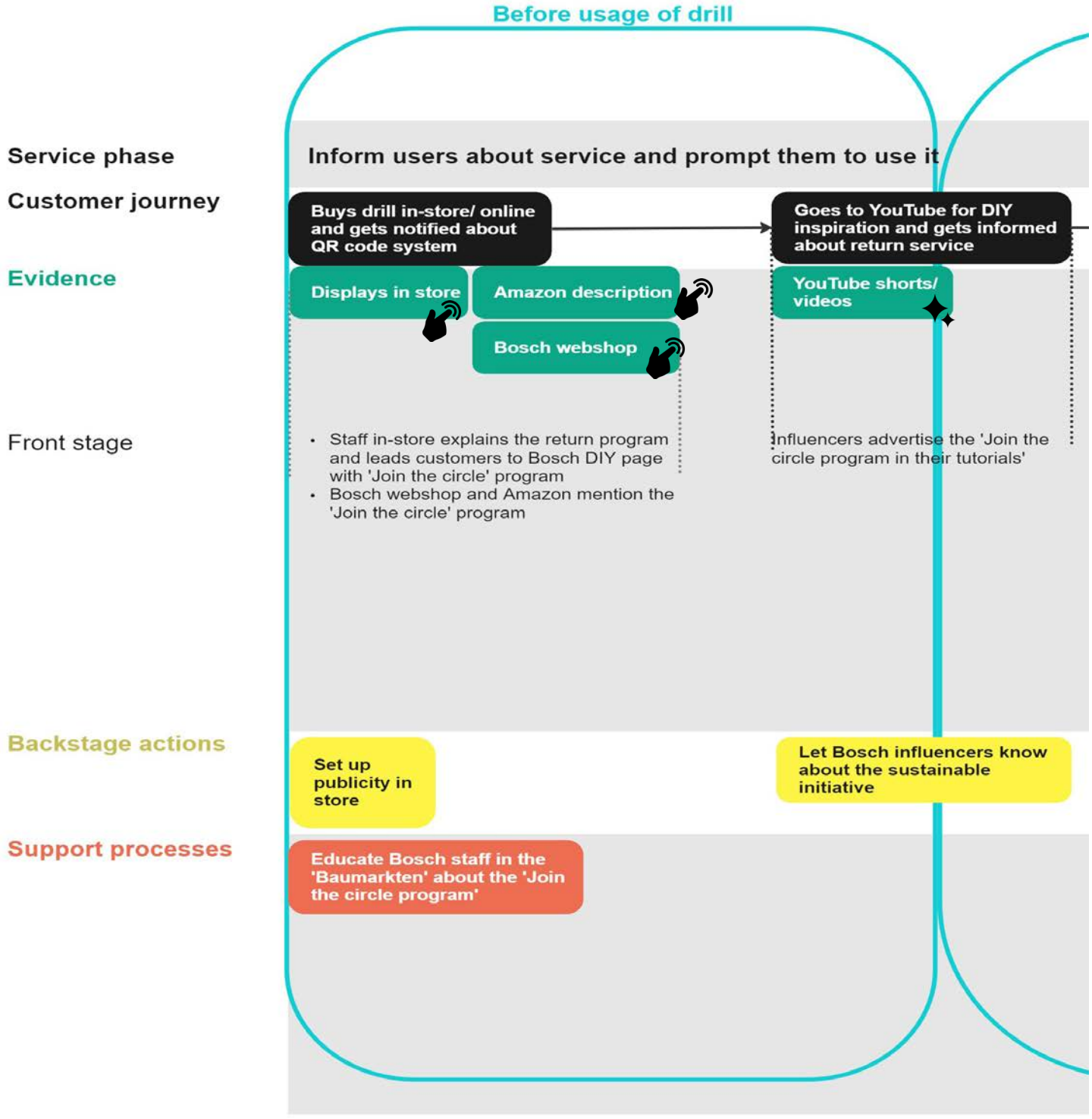
The service blueprint describes the entire process of the system, which will be explained in the three phases of the consumption cycle in the following section. The 'evidence' row of the blueprint describes the points of contact between the service and the consumer, and 'front stage' describes the actions and processes that occur during the interaction. The set-up of the system including hardware, infrastructure and resources constitute the 'support processes', and the decisions and actions taken within the system are the 'backstage actions'. The consumer does not interact with the backstage actions and support processes.

ICON LEGEND

Facilitator Enhances ability

Spark Enhances motivation

Signal Reminders

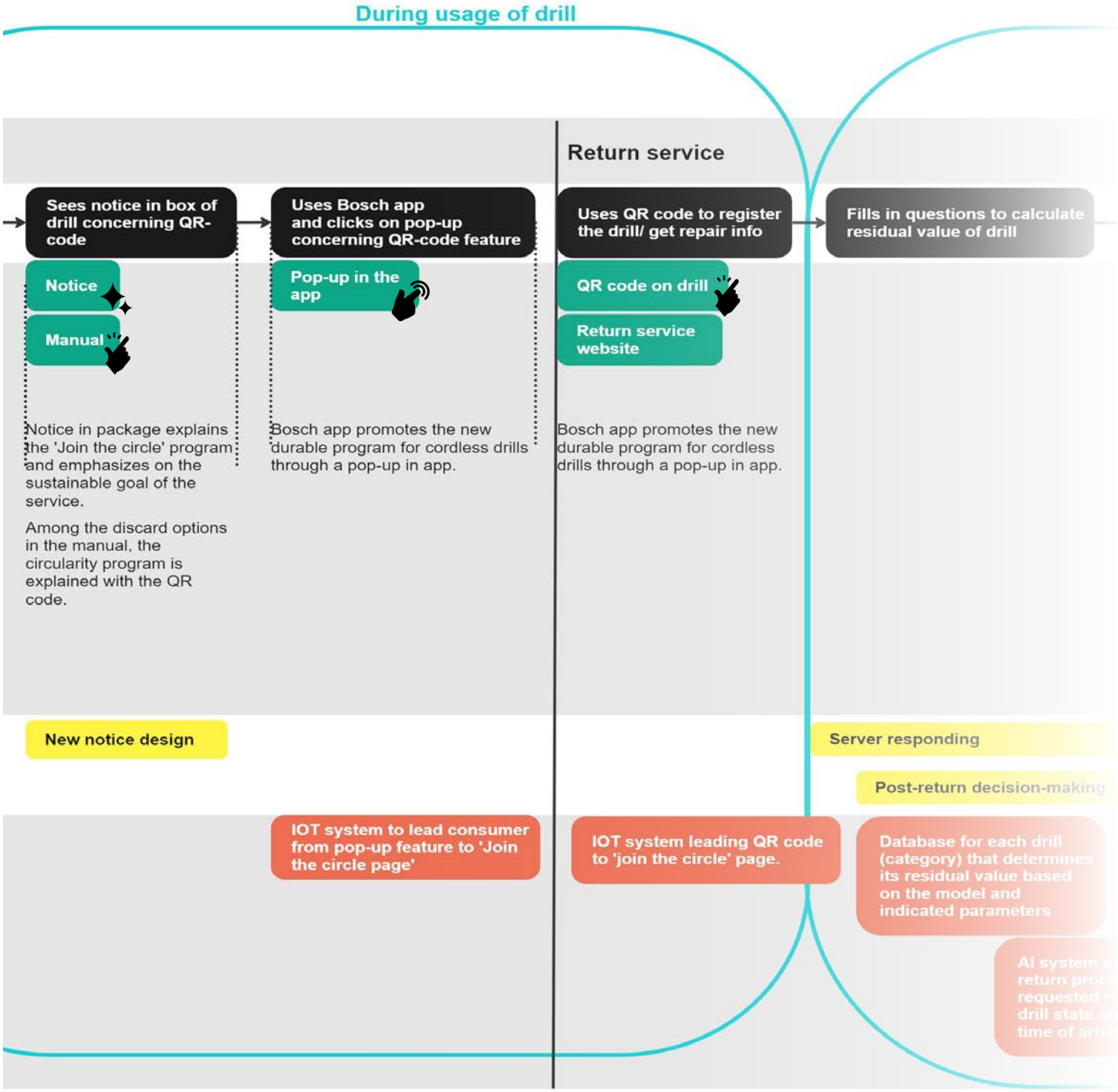


Before usage of the drill

In the pre-usage phase, consumers become aware of the return service when buying a drill online or in-store. They receive information through employees and web shop descriptions, as well as DIY influencers. Bosch promotes the service through marketing materials and training for employees.

During usage of drill

During the usage phase, the return service is promoted through the drill's packaging and the Bosch app. Evidence is provided through the packaging's notice and manual, app notifications, and the service website. The front stage emphasizes the program's existence and sustainability goals through the manual, notice, and app. A QR code on the drill and manual enables quick registration via phone camera or the Bosch app. Backstage actions involve updating the notice's design and implementing an IoT system to guide users to the service page.



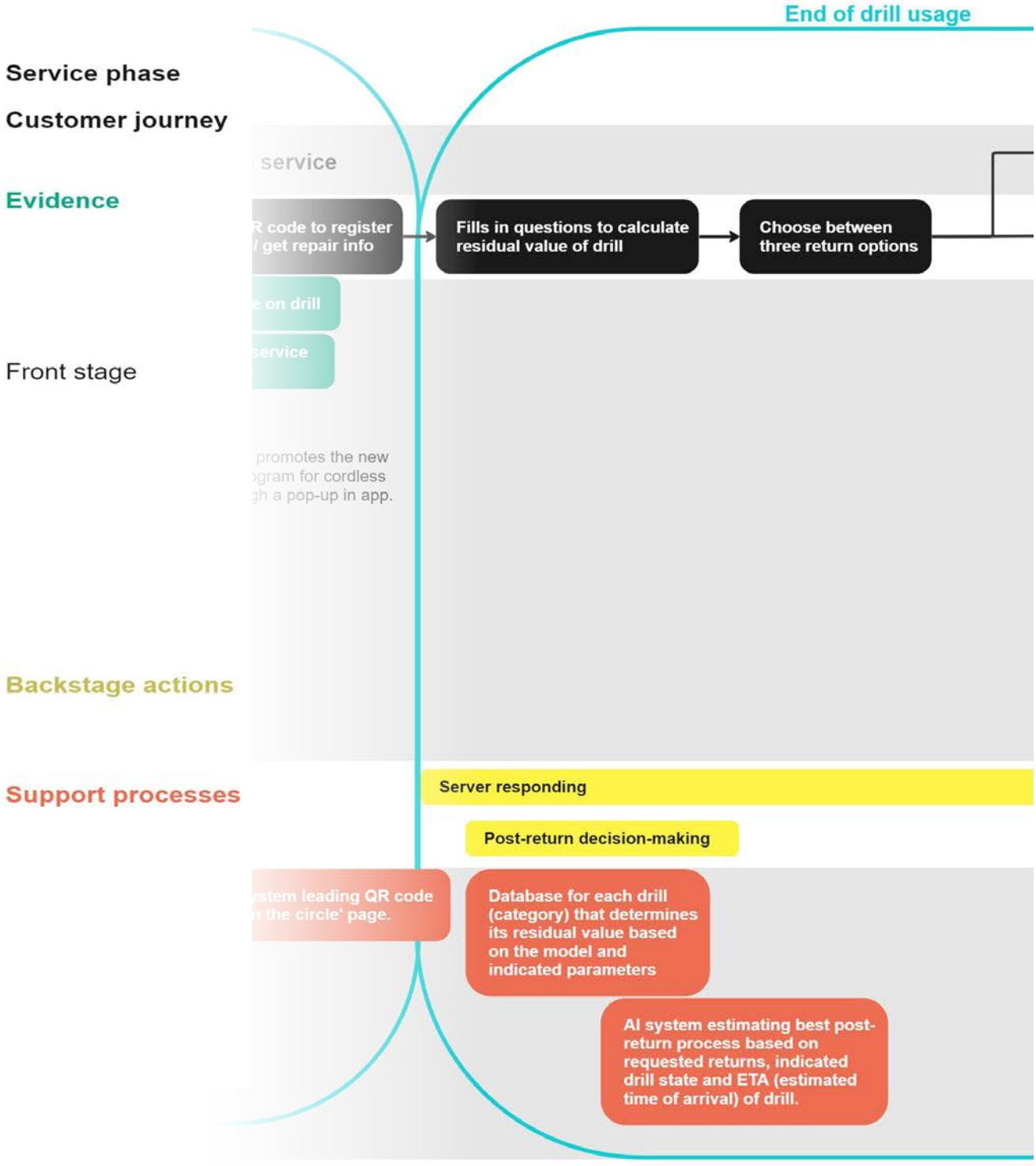
End of drill usage

During this phase, the consumer has already used the drill and it has reached the end of its usage. The aim of the consumers in this phase is to return the drill and buy a new one with the voucher code in a hassle-free manner.

As can be seen by the colour coding, three types of returns are offered to the customer, the first one allows the customer to return the drill in-store and buy a new drill in-store, the second one allows the customer to return the drill to postal service and buy a new one online and lastly, the return service where the customer doesn't want to purchase a new drill is provided.

By having this dual return-purchase solution, the return can immediately be checked and the voucher code provided. More explanation concerning this can be found in '7.3.2 Verification of the return'.

As can be observed on the service blueprint, front stage support comes from customer service and



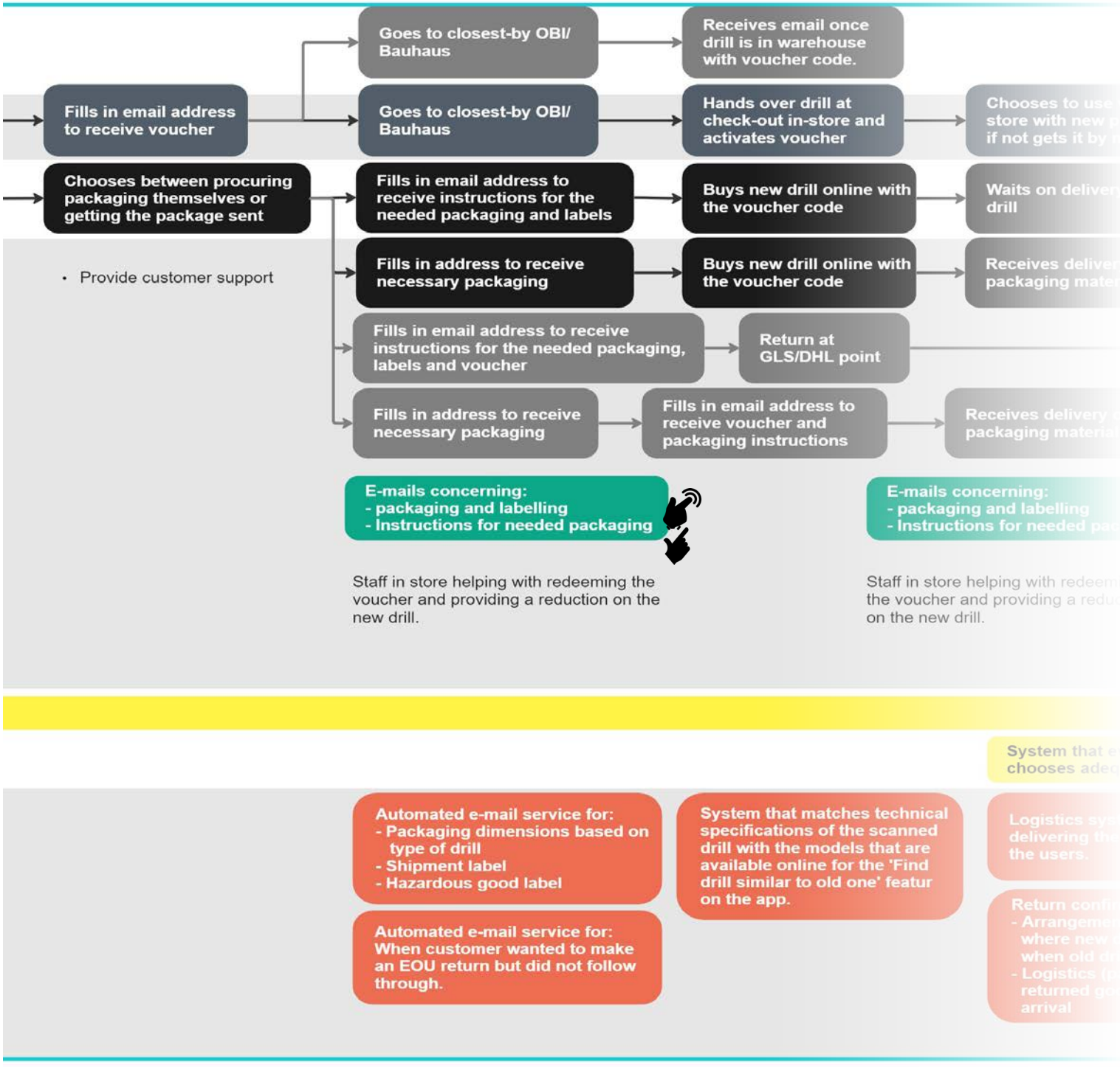
store staff who help customers redeem vouchers for new drills.

Backstage actions include server responses, evaluation of returned drills, decision-making on refurbishment or remanufacturing, and sending voucher codes.

Support processes involve a database for residual value, an AI system for post-return processes, automated emails for instructions and reminders, a system to match drill specifications, logistics monitoring, return confirmation, voucher distribution, and data management for QR code information.

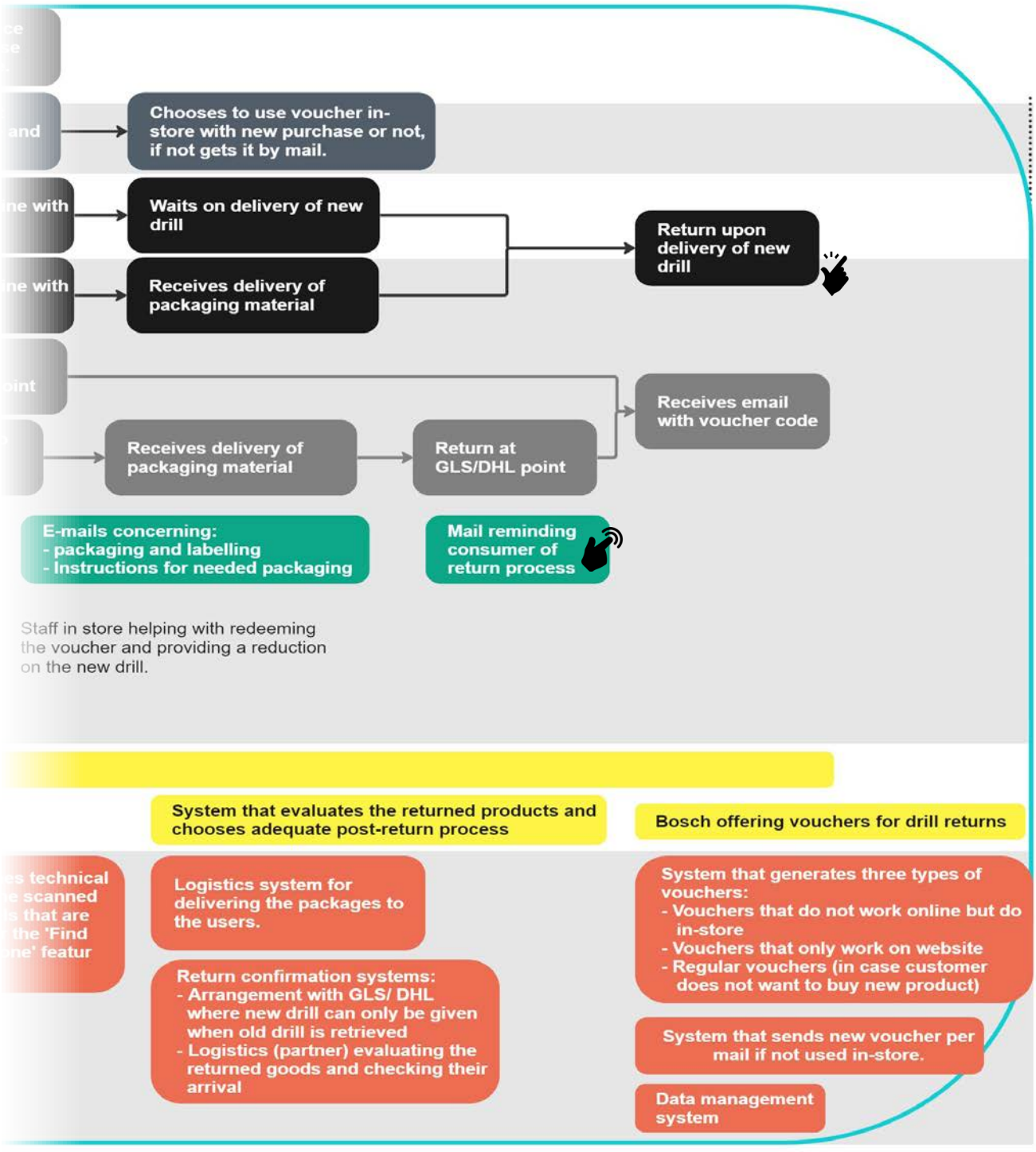
COLOUR LEGEND

- **Return drill in-store and buy new drill in-store.**
- **Return drill through postal service and buy new drill through postal service.**
- **Return drill without buying a new one**



COLOUR LEGEND

- Return drill in-store and buy new drill in-store.
- Return drill through postal service and buy new drill through postal service.
- Return drill without buying a new one



Service phase

Customer journey

Evidence

Front stage

Backstage actions

Support processes

7.3 Further detailing

7.3.1 The QR code

As the durable aspect of the solution is used as one of the main incentives to participate in the customer service, the QR code had to convey this message too. Upon meetings with Bosch, there had been discussed that the QR code could 'be laser engraved on whichever surface of preference'.

Fig 25: QR code on drill.

Fig 26: QR code.

7.3.1 QR code placement on the drill

The QR code had to be placed in such a way that it would:

1. Also be visible when in hand.
2. Not be on a point of contact to minimse damages to the code.
3. Have enough space for the QR code.
   Minimum size for a QR Code is 2 x 2 cm (The Ultimate Qr Code Sizing Guide - What Size Should A Qr Code Be?, z.d.-b).

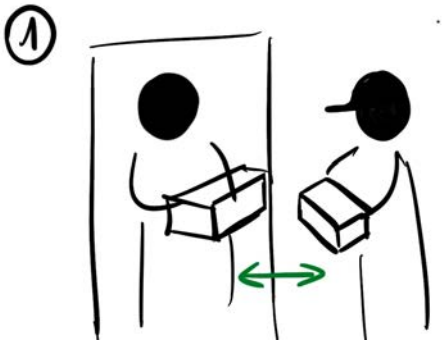
For this there had been looked at what are common contact points during drill usage. A drill that resembled the DIY Bosch models was used, resulting in the lower image. Two options were discussed with Bosch: the QR code in the accu and on top of th drill. Due to the top being less of a contact surface and it being a viable option for all drill models (some have a built in accu as was mentioned in '2.1.3 The product'), the top got chosen.

Image 19: Different drill positions, its visibility and contact points .

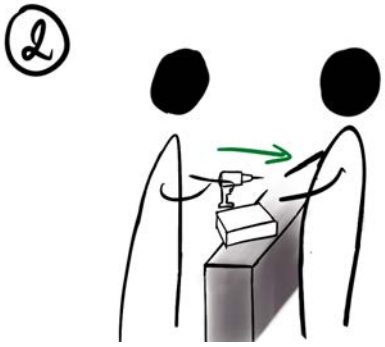
7.3.2 Verification of the return

To facilitate verification of the drill return when the customer immediately purchases a new drill upon retun, multiple "return & purchase" combination scenarios were examined. Possible solutions were explored and as a result, customers are presented with the following options to choose from to ensure verification:

1. **Returning the drill in-store and using the coupon in-store:**
   This approach enables customers to hand over the old drill at the checkout and redeem the coupon code on-site. This option is suitable for those who prefer to shop in-store.



2. **Returning the drill through the postal service and using the coupon online:**
   This option allows customers to return the old drill when the new one is delivered. They can then use the coupon code to make a purchase online. This option is ideal for those who prefer to shop online.



To have a further understanding of this verification step, the website mock-up can be consulted (Appendix K).

By providing the above mentioned verification method, it is possible to have an immediate verification of the return in-store or with postal service. However, GLS/ DHL would need to be informed that the packages need to be exchanged however. This system eliminates the need for users to await confirmation from the warehouse regarding the drill's return, thereby avoiding delays in receiving their voucher.

Next to this, the option offers significant ease to the customer as no extra steps are needed (go to collection points for example). The drill can just be returned at your door or when you are planning on going to the store to purchase a new one.

In comparison to other return solutions (although their availability is limited), Apple has been observed to credit the residual value of returned electronic goods back to the customer's bank account upon arrival at the warehouse. This alternative, however, may be less motivating or attractive as the customer needs to wait for their money.

7.3.3 The voucher

One of the challenges faced during the development of the return solution was the need to determine the drill's residual value. This determination was essential from a legal perspective and can potentially easen the post-return process decision-making (refurbishment/ part harvesting/ recycling) by categorizing the drills upon their return.

To address the latter issue, the drill's model, age, appearance, and functionality were taken into account as assessment criteria for the customer upon wanting to do a return.

Although the drill would still need to be checked upon arrvival, the voucher could immediately be applied based on the filled in parameters. The filling in of those parameters would in the first place be to have the legal aspects in 'check' as only one or two euros would differ depending on the filled in criteria.

7.3.4 Mock-up of the website

As explained previously, the QR code redirects the customer to the "Join the circle program" website, which is an added feature to the current Bosch website. In this section the most important website pages are displayed. For a full overiew of the mock-up, please refer to appendix K.

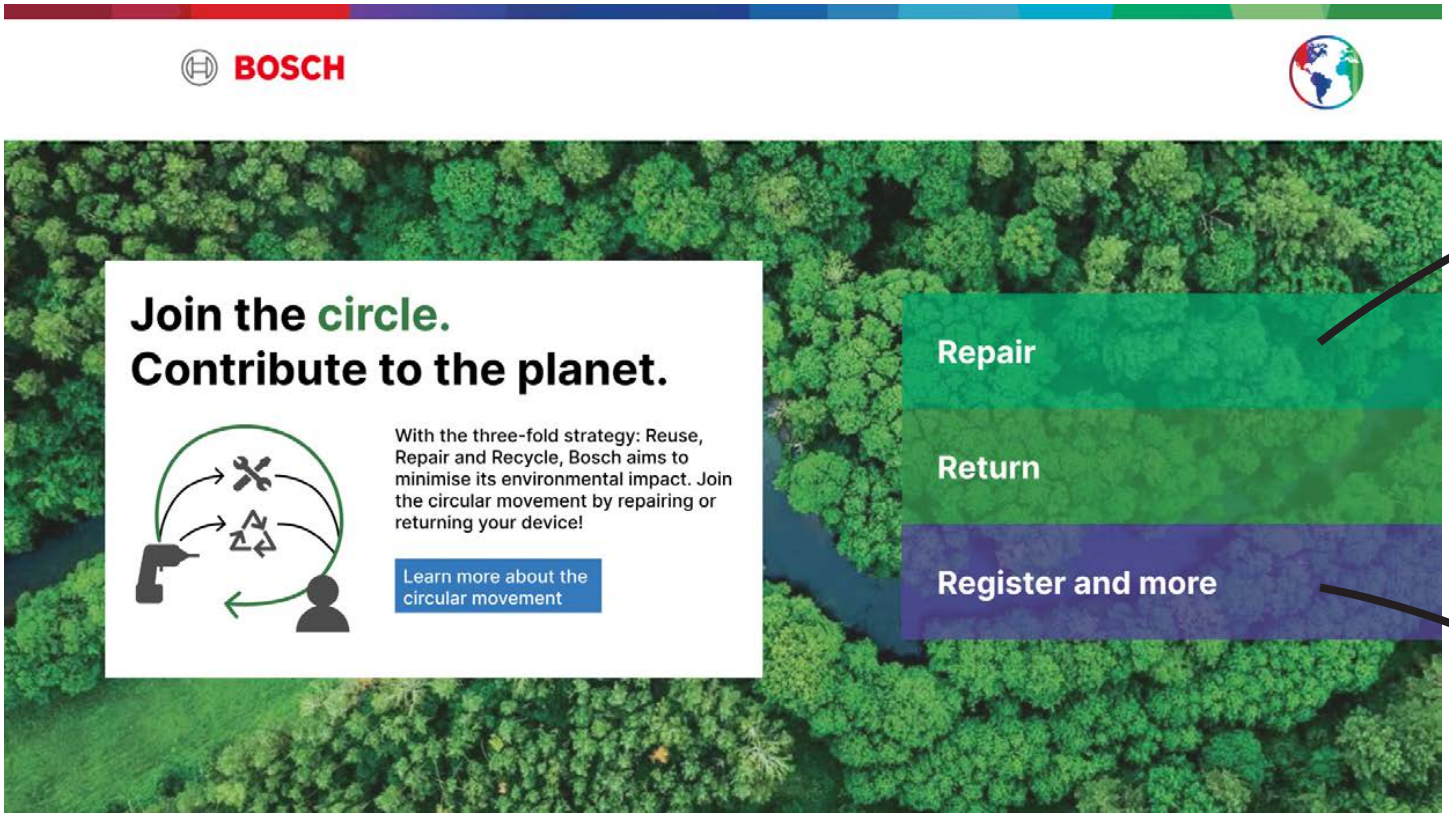


Image 20: Landing page of QR code.

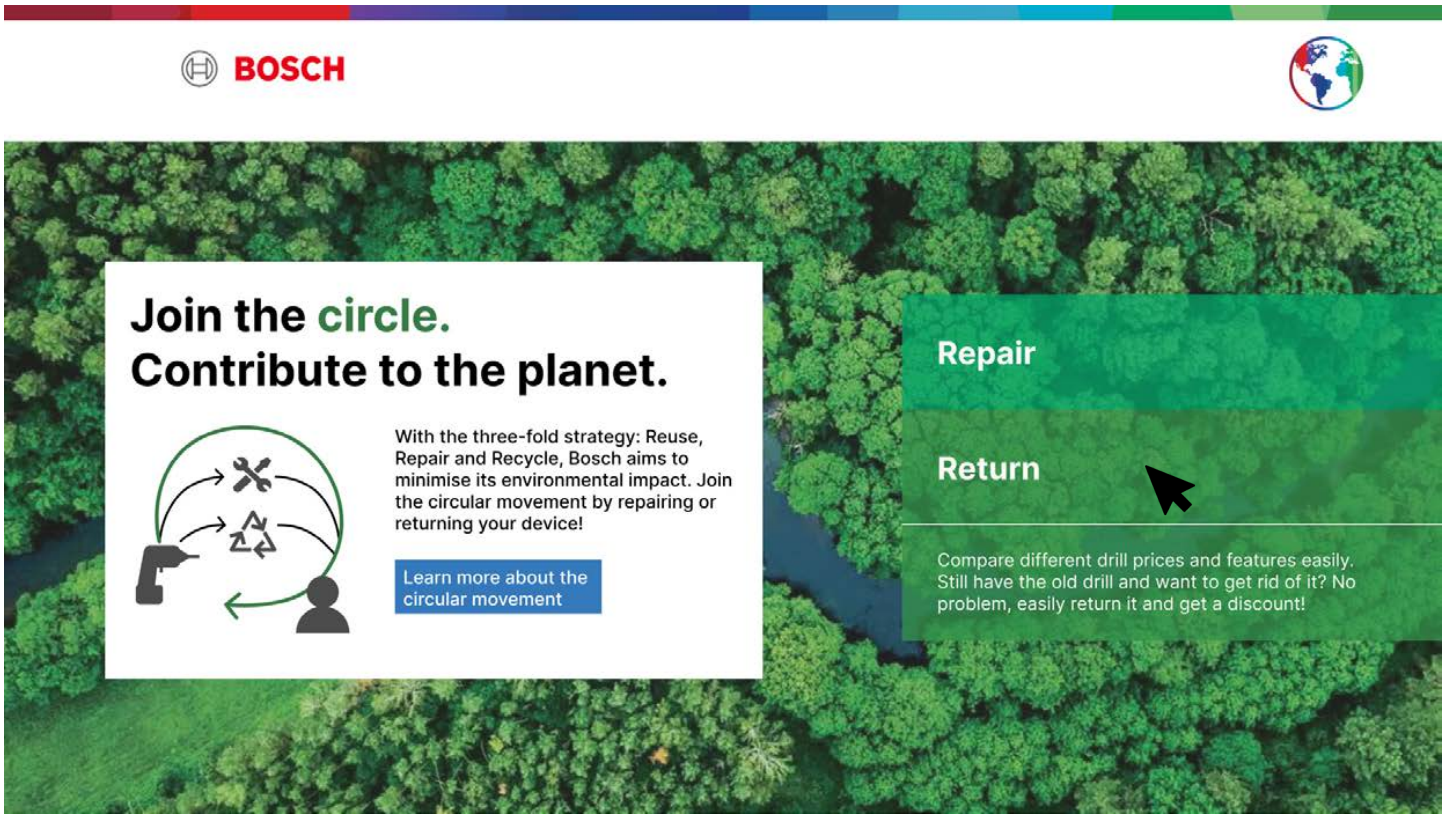


Image 21:Explanation given to the return option emphasizing the financial incentive and ease of return..

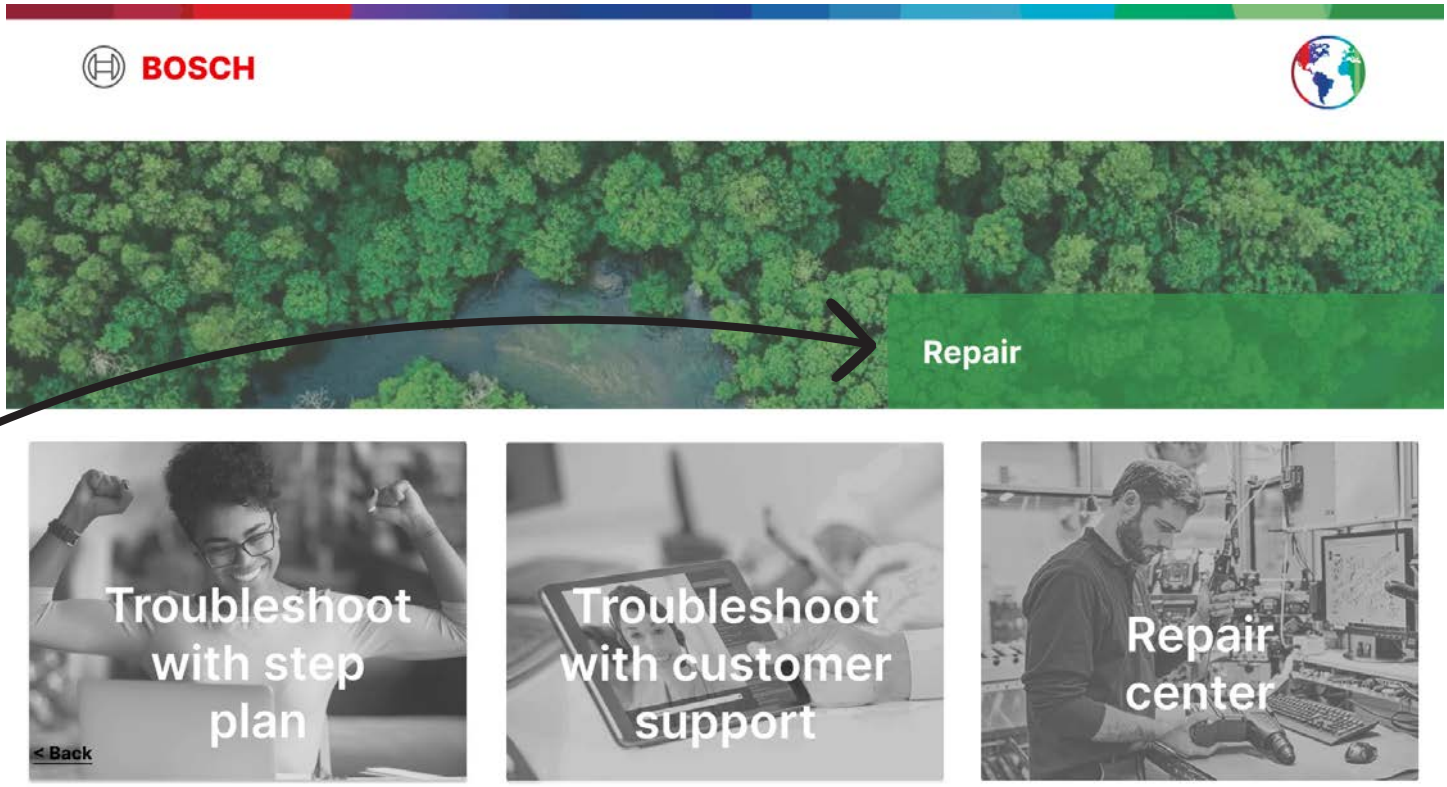


Image 22: Options given when selecting repair.

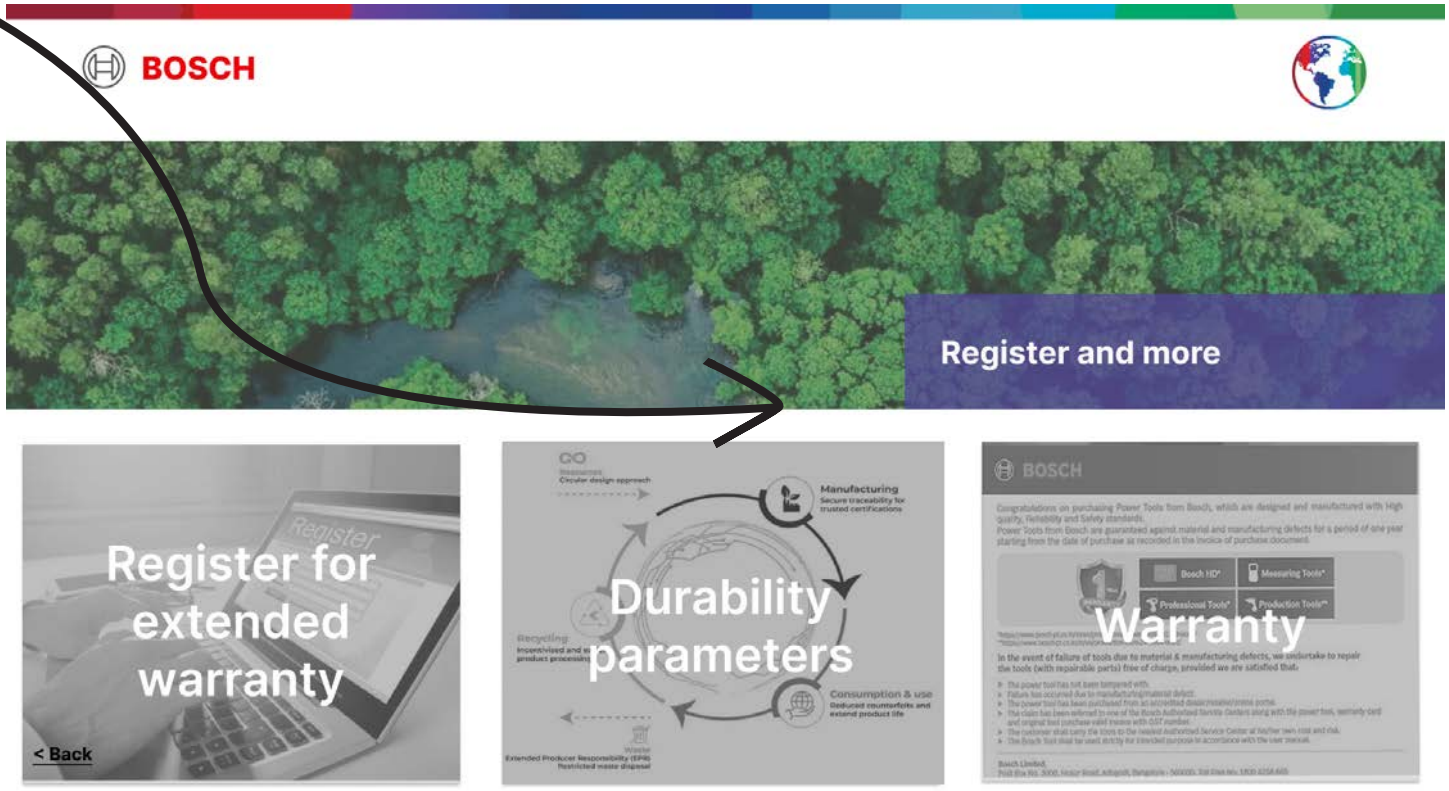


Image 23: The register and more option.

This option allows customers to directly register their tool (the QR code would differ per drill hence the drill model could be identified instantly) and thereby receive an extended warranty. Next to this, this option would allow for the implementation of the necessary data requirements for the upcoming DPP. For this, the option 'durability parameters' can be selected by the customer. Information about the product's repairability, material composition, production data etc. could be provided.

7.4 Evaluation

7.4.1 Feasibility

The back-end's feasibility got assessed by Bosch yielding to the following points:

Touchpoints

- Amazon
  Through a meeting with Bosch there was clarified that Amazon usually asks for specific information from the companies themselves. Hence, it may not be accepted to add information or even a line with the link to the "Join the circle program".
- Staff in-store
  As Bosch does not have their own stores, educating staff about the return option might be a hassle. Here, further clarification would be required
- Other touchpoints such as in-store displays, influencers, Bosch website mentioning the return service etc. would be feasible.

QR code

An option that was explored was that the QR code could for example replace the currently present nameplate on the Bosch drills. However, it was clarified this is not possible as there are legal requirements that obligate Bosch in showing some specific things on the tools (tool number, serial number, production date etc.)

There are codes similar to QR codes currently present on the drill (called DMC codes). However these are used for in the internal logistics department and can not be scanned by other parties (such as the consumer). In theory, the DMC (Data Matrix Code) could be replaced with a QR code. If the proposed approach involves using an app for the QR code instead of being lead to a website, it opens up the possibility of developing different apps. These apps could enable customers to access information relevant to them through a "customer app," while internal logistics personnel could access their relevant information through an "employee app."

Lastly, it is feasible to laser engrave the QR code anywhere on the drill. Although laser engraving is less sensitive to damage (OSU, 2023), the QR code could still become damaged over time. Therefore, it is recommended to position the QR code in a way that minimizes contact with its surroundings to ensure its feasibility.

Legal

At the beginning of the project, it was determined that Bosch should repurchase the product in order to refurbish the drill or use its parts. However, this decision was reconsidered by a Bosch legal department employee during the presentation of the final concept.

Essentially, having the product classified as waste before Bosch acquires ownership, Bosch would be restricted from engaging in non-waste-related activities with the returned goods such as refurbishing the tool or utilizing its parts. By repurchasing the tool based on its residual value instead of a standard lump sum, Bosch can demonstrate that the product has not yet been treated as waste.

While legal ownership can be obtained without repurchasing the tool, it is important to clarify whether the purchase aspect of this approach is necessary or if offering a voucher based on the drill's residual value would be sufficient. This requires further examination and consideration.

Vouchers

Currently, vouchers are already being offered hence this would not necessarily form a problem.

In-store storage

For the returns performed in-store, the stores would need to have a storage space for that. Next to this, as there are arrangements between pick-up services and the stores for 'waste', the Bosch drills would need to be picked up seperately from the general electronic waste. This might pose additional challenges for the in-store return option.

7.4.2 Desirability

The final solution encompasses the majority of the wants and needs identified by the customers. However, it is important to note that not all identified elements could be fully integrated into the concept. Additionally, there is potential for further exploration in leveraging the relationship between the customer and the environment. While the customer played a significant role in this thesis, providing valuable feedback and contributing to the design guidelines incorporated into the final concept, additional user testing would still be necessary to ensure its desirability and effectiveness.

7.4.3 Viability

As mentioned at the start of this thesis, Bosch's internal goals regarding the cordless drill returns were a parallel process to this thesis. Hence, it was difficult to assess the economical viability.

From research however, it could be conclded that recycling would likely increase the price of the drills. The same could be assumed for refurbishment since these require even more cost-intensive processes that require more employee labour and less automation.

What could be stated however, is that the development of this return service mostly requires software development and that regulations will be set in place that include a variety of elements present in the return solution. Additionally, the return service has the potential to enhance automation through generated data, addressing the challenges identified during reverse logistics research. From this perspective, the return service can be viewed as a promising investment.

8. Recommendations

8.1 Important recommendations
8.2 Optional recommendations

This chapter is split into important recommendations and optional recommendations. The important recommendations cover the back end of the service, steps for manufacturers, the intermediary for the material flow, economic viability and user experience. The research into recycling, the (re-) design of drills and upgradability are elaborated in the optional recommendations.

8.1 Important recommendations

Back end of the service
The back-end of the return service requires exploration at a variety of stages.

First of all, a comprehensive review of the post-return possibilities should be undertaken in the future, considering both their economic and logistical implications. Questions such as:

- What processes would be needed for the different possible post-return processes and what level of difficulty and expertise would these processes require?
- What drill quality level can be attained considering various drill condition scenarios?
- How many virgin/recycled materials should be integrated?
- What would be the cost to bring the drill to such a processed quality
- How environmentally friendly are these post-return processes?

By having a database for this, the post-return processes and their economical viability can more easily be assessed.

Then the logistics of the drill, i.e: where the drills will end up and if they need to be stored in a warehouse or workshop, requires further exploration.

Lastly, the system for implementing a closed-loop of material flow requires further exploration.

Legalisation

In the proposed system, Bosch 'buys' the drill back from the consumer in the form of a voucher which the consumer uses when buying a new powertool. For Bosch to have the legal authority to perform post-return processes, they would have to assess the residual value of the drill and pay the consumer accordingly. To ensure that the legal obligations are met, this incentive needs to be revisited in a future iteration. Lastly, regulations should be followed up both on a national and European level.

Manufacturers

For Bosch to make the shift towards a circular manufacturing process, it is important for them to set up a continuously collaborative and communicative network between the design team, manufacturing division, external manufacturers and suppliers, and industry experts.

Intermediary for material flow

As mentioned in 2.1.2 Internal goals, Bosch would like to establish closed loop material flows when recycling their drills. For this, Bosch could either enlist companies or set up an internal department that acts as intermediaries between them and recycling centres, and regulate this process.

Economic Viability

At the end of the day, while this service contributes to the circular economy, it must also be economically viable for Bosch to implement this. Bosch must perform an economic viability analysis by considering three parts of the service blueprint which are the 'evidence', 'backstage actions' and 'support processes'. Performing a Return on Investment analysis would help Bosch determine how many drills must be returned over how many years to justify investing in this system. The different elements of these three parts are discussed in appendix L.

Anther important factor for the economic viability is the market scenario: What would be the consumer's acceptance towards refurbished products (brand perception/ how much would they be willing to pay for a refurbished product etc.) This should further be explored by Bosch.

User Experience

From the user interviews and research, it was observed that consumers wanted the service to be accessible and easy to use. Therefore, the service model must be tested with users to assess the ease of navigating through the system, and analyse if the message of circularity is the primary driver for the service adoption as it is used as the main motivating factor.

Beyond this, other motivational factors could be further explored such as 'leveraging the relationship between the user and the

community' (Poppelaars, 2014). This is an important area of consideration since the drill was a shared tool for 8 out of 9 interviewed participants, and it was not explored further due to the constraints of this thesis.

Finally, thanks to the three types of return 'formula' offered to customers, they can instantly utilize their voucher upon returning the product. However, it is recommended to simplify the communication regarding the three types of returns, as the current messaging might come off as challenging for customers.

8.2 Optional recommendations

These recommendations are aimed at creating a more complete circular economy within Bosch's system, and they are based on the research findings of the European Commission regarding the DPP.

Investing in research
As mentioned in the stakeholder analysis, the main barriers for recycling are the recycling efficiency and the cost of recycling. Bosch could work with recycling centres and invest in the research necessary to reduce these two barriers.

(Re-)Design of drills
The design of the drill may need to be revisited to ensure that the drills are easier and safer to maintain and repair at home. This would require a disassembly and reassembly map, and an analysis on priority components. By making the parts most susceptible to a need of maintenance and/or repair, we can motivate the consumers to extend the lifespan of the drill, contribute to the circular economy and increase Bosch's reputation.

Upgradability
The return service has the added advantage of providing Bosch with the necessary information on failure modes and product usage that can used to improve future products. Bosch can get more information on the product line and generate an additional revenue stream.

Ludwigsburg, 2023.

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10. Appendices

A. Project brief
B. Data carrier assessment
C. Group brainstorm
D. Harris profiles
E. Screener for participant recruitment
F. Interview guide
G. Test run results
H. Participation agreement
I. Data analysis
J. Quick assessment second idea generation
K. Mock-up QR code website
L. Economical viability assessment

A. Project brief

Personal Project Brief - IDE Master Graduation

TU Delft

Developing a service design solution for the return of Bosch DIY drills

project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 20 - 10 - 2022 15 - 03 - 2023 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Robert Bosch GmBH is an international technology and service company active in four different business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. Bosch strives to deliver high-quality products that spark enthusiasm and improve quality of life. Next to this, they want their products to help conserve natural resources by acting in an economically, environmentally, and socially responsible manner. Bosch's 'four levers' is used as a guiding thread for this. They consist of :1) increasing material efficiency, 2) enabling second life of the products, 3) recycling materials and 4) compensating the emissions with carbon offsets (Robert Bosch GmbH, 2021).

Lever two (enabling second life) is, according to Bosch's 2021 sustainability report (p.27), the 'most complex lever in the circular economy strategy, but it also offers the greatest potential' (Robert Bosch GmbH, 2021). Currently Bosch mostly focuses on extending the lifetime of their products by providing a leasing system, optimising their customer support and easening repairs. Bosch's main product retention strategy is thereby supporting the product's functional value (van den Berge et al., 2021) and is mostly applied on the household appliances, E-bikes and PowerTools.

While product retention is a resource-efficient strategy (Achterberg et al.,2016, cited in Wallner et al., 2022, p.9), 'refurbishment is an especially interesting strategy for products that are difficult or dangerous for consumers to repair (e.g., high power batteries).' according to Wallner et al. p.9. The latter will be the focus of his master thesis. More specifically: researching user motivation and barriers to return Bosch DIY drills, developing guidelines and design solutions for optimized return processes with its corresponding touchpoints.

One of the major challenges in this project will be the multitude of stakeholders. Because of the large-sized nature of Bosch, internal decision-making and communication might be slower. Hence, meeting with the employees and taking into account all of these stakeholders can become challenging. On the other side, it would also offer an opportunity to maximise my time-management and organisational skills. Interesting stakeholders within Bosch concerning this project would be: the PT/OSU (PowerTools Sustainability unit), BMC/UXE (Central User Experiene Department), MKR (Market research), PO (product owners), ENG (engineering) and of course my mentors in the company. On Figure 1 current return systems can be viewed for Powertools.

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Wallner, T., Magnier, L., & Mugge, R. (2022, February). Do consumers mind contamination by previous users? A choice-based conjoint analysis to explore strategies that improve consumers' choice for refurbished products. Resources, Conservation and Recycling, 177, 105998. https://doi.org/10.1016/j.resconrec.2021.105998

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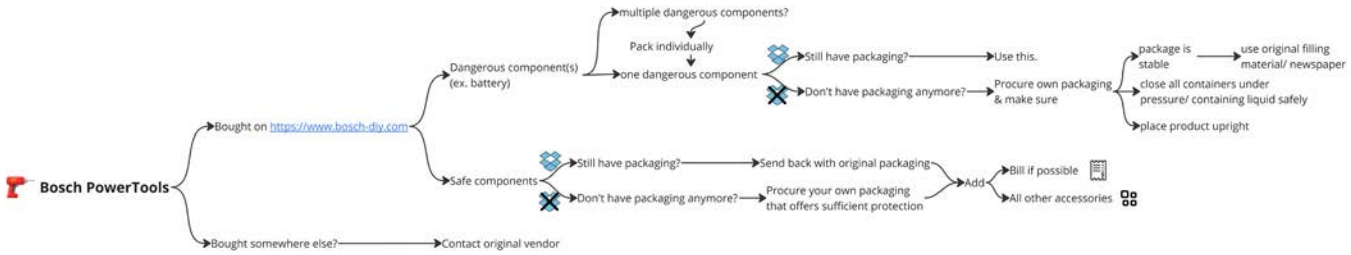


image / figure 1: Current returns at Bosch PowerTools in case customer changes their mind.

TO PLACE YOUR IMAGE IN THIS AREA:

- **SAVE THIS DOCUMENT TO YOUR COMPUTER AND OPEN IT IN ADOBE READER**
- **CLICK AREA TO PLACE IMAGE / FIGURE**

PLEASE NOTE:

- **IMAGE WILL SCALE TO FIT AUTOMATICALLY**
- **NATIVE IMAGE RATIO IS 16:10**
- **IF YOU EXPERIENCE PROBLEMS IN UPLOADING, COVERT IMAGE TO PDF AND TRY AGAIN**

image / figure 2:

Initials & Name M.M. Welsch Student number 4590678

Title of Project Developing a service design solution for the return of Bosch DIY drills

Personal Project Brief - IDE Master Graduation

TU Delft

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

An important part of this master thesis' scope will be to align all the stakeholders their expectations towards the project and the outcome of it. Defining what each stakeholder wants and needs and implementing this throughout the project. Interesting stakeholders within Bosch would be: the PT/OSU (PowerTools Sustainability unit), BMC/UXE (Central User Experiene Department), MKR (Market research), PO (product owners), ENG (engineering) and of course my mentors in the company.

Next to this, which will be the main topic of this graduation project, will be to optimize the return service for Bosch cordless drills. Since Bosch has a variety of drills, the cordless drills from Green Products DIY range will be the ones within scope. During the project further specification on the type of cordless drill might be needed. Bosch already offers repair services where the product is being picked up at the customer's home. The current return systems are either for exchanging the product or because the client changed their mind. The return system follows a general process that mostly requires effort from the client's side (see image 1). Return for refurbishment is not yet done by Bosch itself and the end of life of the Bosch products are mostly the clients' responsibility. However, by creating a successful return system Bosch will have more influence on the end of life.

Since the client is key in this return process, the user will take on a central position in this project. By finding out the users´ needs and wants as well as appropriate triggers and possible barriers, a return process will be created with the aim of making the user feel motivated but also capable of returning the Bosch drills. This resulting return service will be presented in a service blueprint with user touch points. Important to note is that this thesis will focus on optimizing returns from a user perspective. There will also be taken into account limitations that can arise from the logistical side within the company. However, any further investigation on how this return system for example can be achieved within Bosch, is out of scope. Next to this is the aim to focus on the German customer (/ market).

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

Develop a service-design solution for the return of Bosch DIY drills (from the green product range) that makes the user feel motivated and capable of returning the drill. A possible outcome for this project would be a service blueprint and different user touchpoints for the return of the DIY Bosch drills.

During this project, the user will take on a central position (finding out its needs, wants, preferred triggers etc.) but also how the type of drill might affect these wants/ needs /preferred triggers. Depending on the outcomes of the latter, one type of drill might be chosen to create the return service for.

To understand the user better, there will be looked at existing research within Bosch and interviews will be conducted with (hopefully) the Bosch customer. During these interviews, different tools will be used to understand the context of the returns as well as the current experience when returning a product better. Next to this, built up assumptions and hypotheses from the research phase will be checked. Different persona's will be made out of these results and based on the gathered data, a return service for the Bosch cordless drills will be created. Stakeholders from within Bosch will also be part of the solution and they will be informed throughout the project about the process. When useful, there will be brainstormed/ co-created together with these stakeholders.

During the project, both the VIP model and the service design model will be used. Using the former, it will be possible to generate a wide area of solutions starting from the product-user interaction and context of use. By using the latter model, the service design model, the user's values and needs are mapped out so that the service - user interaction can tune to the user's daily life.

Initials & Name M.M. Welsch Student number 4590678

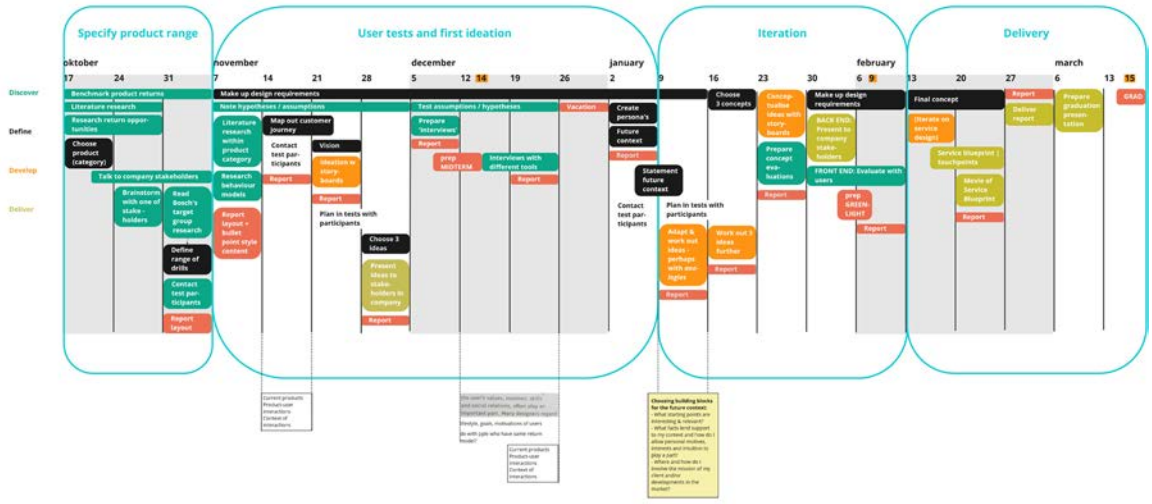
Title of Project Developing a service design solution for the return of Bosch DIY drills

Personal Project Brief - IDE Master Graduation

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 20 - 10 - 2022 15 - 3 - 2023 end date



PRODUCT CATEGORY
During the first three weeks additional research concerning product returns will be conducted and there will be communicated to the different stakeholders within the company to receive input from them but also to align expectations. Resulting from this, the type of drill might be more specified. There will also be a start in contacting customers for the next phase and a start in brainstorm sessions (also one with a stakeholder from company).

USER TEST & FIRST IDEATION
During this phase, a first ideation will take place that will be based off further research within the chosen product range. This will be presented to the company stakeholders and user research will be conducted by using interviews where the participant will be given tools and be interviewed while using the tools (timeline tool and social circle tool for example). This will be qualitative research. At the end persona's and a 'future context' will be determined.

ITERATION
Based on this new vision and persona's previous ideas will be adapted and further developed, again presented to the company stakeholders and tested with the users.

DELIVERY
A final adaptation of an optimized return system will be done if there is time otherwise, there will only be made a choice between the different return system concepts / blueprints. In the final three weeks the report will be optimised and the graduation presentation will get prepared. The final deliverable will most likely be a service blueprint and the different user touch points.

Initials & Name M.M. Welsch Student number 4590678

Title of Project Developing a service design solution for the return of Bosch DIY drills

Personal Project Brief - IDE Master Graduation

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

One of the reasons I changed to a master in Integrated Product design from a bachelor in Mechanical Engineering, was to learn more about sustainable design. All the projects so far in my design portfolio also represent this interest and I would love to keep expanding my knowledge and skills in this area further.

This thesis immediately spoke to me upon hearing about it through a meeting with Professor Conny Bakker. I had expressed wanting to do a graduation project that covered the end of life of products but also my interest in the corporate world. The master thesis at Bosch seemed like a great opportunity that combines both.

Next to this, I also followed the course Sustainable consumer behaviour next to my courses of IPD. I really liked the psychology aspect of it and this is a topic that I am very eager to dive into further.

The competences I would like to prove and learn are mostly:
- Expand my knowledge on sustainable consumer behaviour
- Improve my organisational skills further
- Improve my communication skills further
- Learn more about the corporate world

FINAL COMMENTS

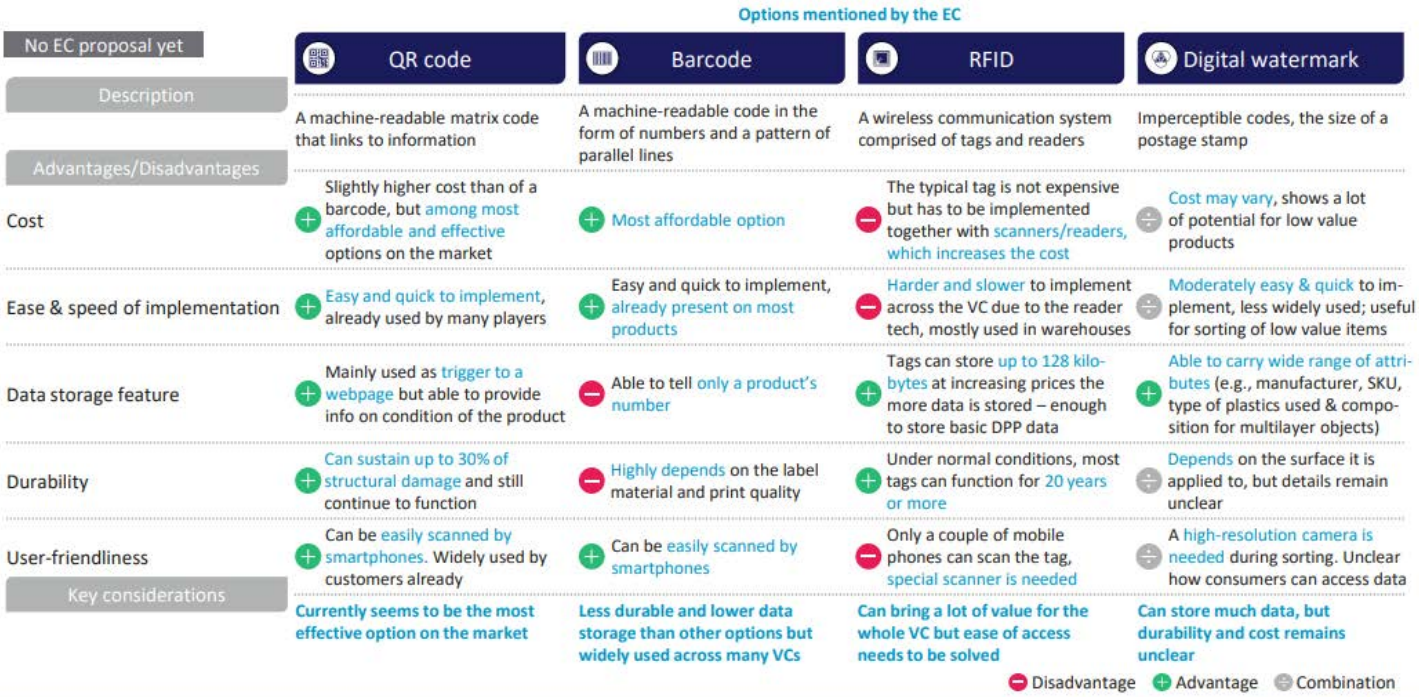
In case your project brief needs final comments, please add any information you think is relevant.

Initials & Name M.M. Welsch Student number 4590678

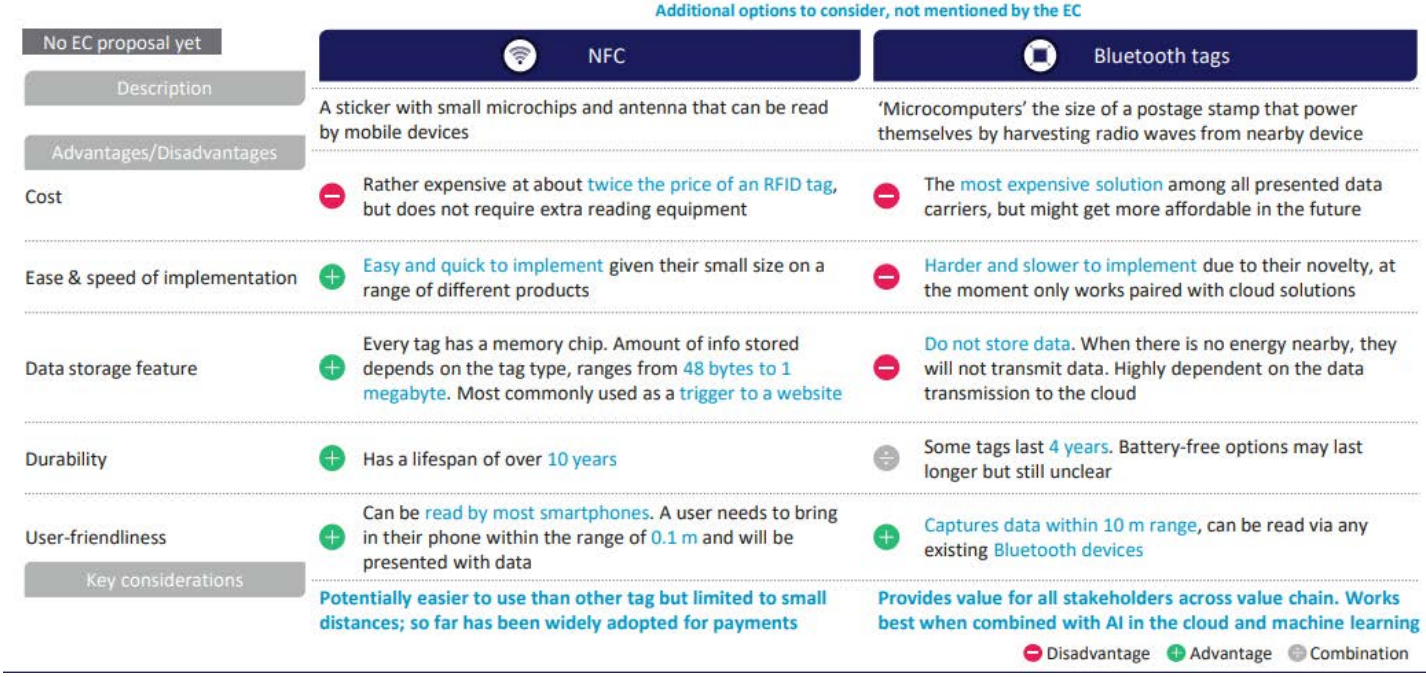
Title of Project Developing a service design solution for the return of Bosch DIY drills

B. Data carrier assessment

QR code offers benefits but is not the single best option



Although not mentioned by the EC, NFC and Bluetooth tags could have potential



Assessment by the BCG (Boston Consulting Group) of the different possible data carriers (Boston Consulting Group & World Business Council For Sustainable Development, 2023).

C. Group brainstorm

2. Get into the skin (5mins)

Nadine

What could be the personality of this person?

- Introverted (finds peace on her own doing her own stuff by herself.)
- Could have a pet
- Aesthetics minded
- Wants a drill that works. Basic.

How would this character's views be towards society?

- Modern art
- Sustainable
- Owns drill to fix stuff (cat broke)
- Into yoga

What would be their good an bad traits?

- Rich, can afford to be aesthetic
- Patient.
- Beige house

3. What would I, (name of persona), find a terrible idea to... (5mins)

Nadine

This would really demotivate me to return a drill...

- Financial incentive makes her look cheap
- Sustainable! Not carbon-zero
- Not enough transparency
- Lack of info
- Finds better outlet for the product e.g. thrift/charity
- The outcome, what they will do with drill

This would really make me feel incapable to return a drill...

- If the drill is too sustainable she would display not return
- Having to talk to someone
- Too much human contact
- Bad neighborhood area for returns.

3. What makes the ideas bad? Can we transform them? (10mins)

Good 2 know:
Improvement (not judgement)
Don't hide / Be honest
Build on the idea
Be spe
Helpi

SEE the impact

Non-monetary reward for returns

Sponsor a polar bear

She keeps NFT/art/metaverse of drill

Upgraded drill, colour options. limited edition.

Novelty factor

Nadine

This would really motivate me to return a drill...

This would really make me feel capable to return a drill...

Location of return specific reward (special colourway)

Return is in public view

Aesthetics

Social/cool return spot (coffee shop)

Chic/attention giving return process

Options for returns. E.g. dropbox or counter

E.g. art/NFTs as visual rep.

Visual representation of returns, outcomes etc.

I returned the Bosh drill.

Instagrammable journey of return.

2. Get into the skin (5mins)

German

Engineer

Repair not discard oriented

Helpful realtrastic

How would this character's views be towards society?

Community oriented

Prioritises others over himself

What could be the personality of this person?

Klaus

Company car. (white colour)

Cannot please his wife

Chill

Appreciating quality

Suburb/ village

Grew up poor

Hero type (superheroes)

Frugal

Kind

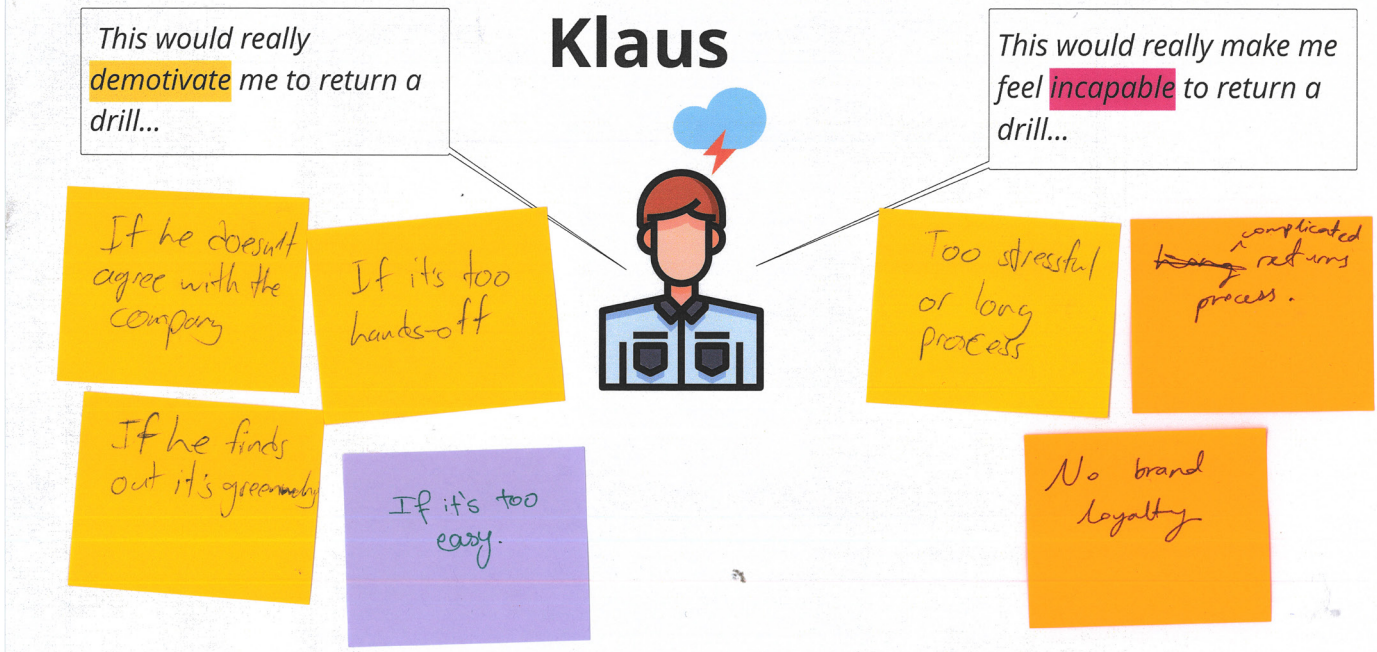
Bad childhood

What would be their good and bad traits?

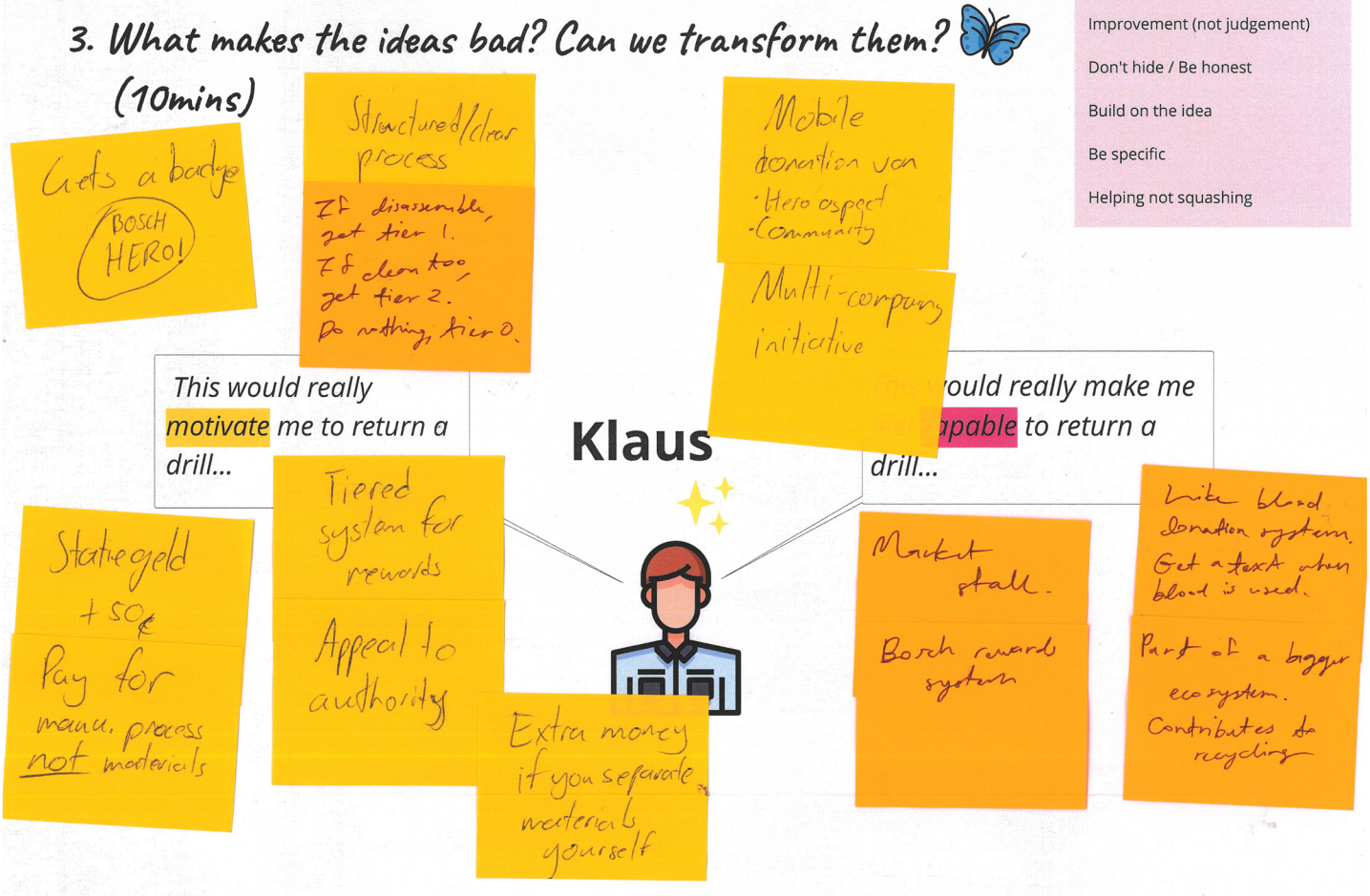
Not cheap. But calculated spending.

Anxiety (benadryl)

3. What would I, (name of persona), find a terrible idea to... (5mins)



3. What makes the ideas bad? Can we transform them? (10mins)



2. Get into the skin (5mins)

Busy man

Big city bachelor

Product manager

Perfectionist (bad)

Jef

What could be the personality of this person?

Superficial (show off mech parts) - aesthetics?

Perfectionist.

Has specific requirements

Bespoke custom furniture

How would this character's views be towards society?

Van Roof Owner

Show-off

Brand aware

White supremacist

What would be their good and bad traits?

Brand person. Cares about the products he owns.

American Psycho vibes

Doesn't trust that others will do work as well as him

If he can tell his mum

3. What would I, (name of persona), find a terrible idea to... (5mins)

~~Stop~~ lack of bragging rights as one of the many returnees

If it wasn't a posh location

This would really demotivate me to return a drill...

Jef

This would really make me feel incapable to return a drill...

Not tax deductible

If he can't tell everyone about it

No value. personal

Feeling of Cog in the system

Monetary rewards (Status)

Effort

Inconvenience

3. What makes the ideas bad? Can we transform them? (10mins)

Good 2 know:

- Improvement (not judgement)
- Don't hide / Be honest
- Build on the idea
- Be specific
- Helping not squashing

Pitched to him in a way he can understand

Value that can be exchanged for company 'rights'

Not forced into it

*This would really **motivate** me to return a drill...*

Jef

*This would really make me feel **capable** to return a drill...*

More directly involved
↳ (considered as volunteering)

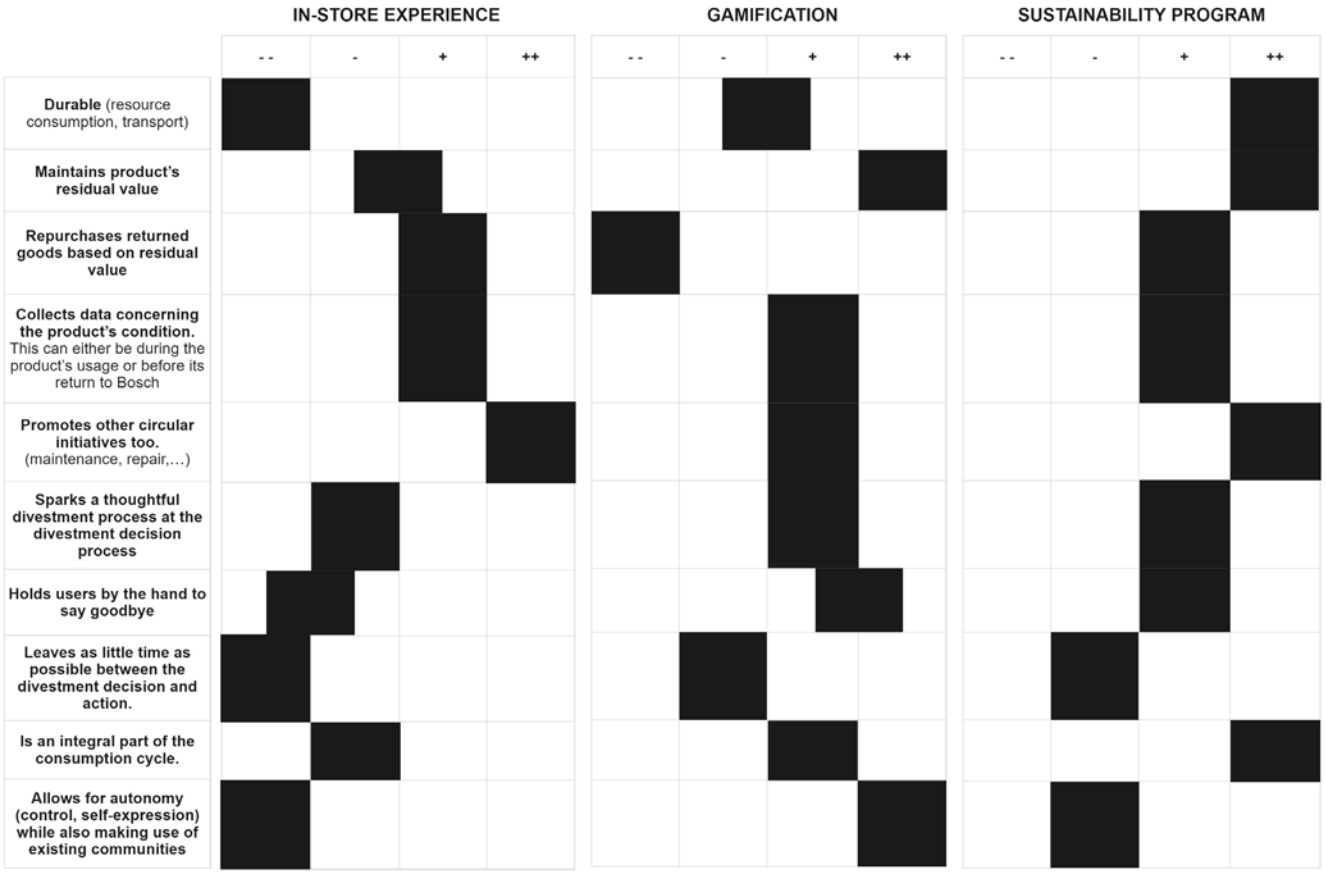
Company/country rewards for sustainability

KPI (key perform. indicator) driven

Can brag about it

Optimized process

D. Harris profiles



In-store experience:

- **Durability:** All the consumers have to go all the way to the OBI which is not the most durable option.
- **Maintains residual value:** Currently dropping the drill in the box doesn't ensure the maintenance of the product's residual value. However, if the drill would just be returned at the checkout and be carefully stored by the employees, the residual value of the drill could be maintained. This however requires more work on the staff's end.
- **Repurchase returned goods based on their residual value:** Not currently the case but could be easily integrated by transferring money to the consumer's bank account upon the drill's return.
- **Collects data concerning the product's condition:** Data could be checked by in-store staff before the return. (For example, fill in a list with following criteria: damage in drill's appearance or not (scratches>5mm), functioning or not, battery swollen or not). However, staff would need to be trained to do this and since drills would most likely not be returned on a regular basis, they might forget about it.
- **Promotes other circular initiatives too:** In-store, consumers get advised about their repairability of the drill and if the drill has really reached its EOU.
- **Sparks a thoughtful divestment process:** The divestment decision is not integrated in the concept. The concept idea does not include this decision making process and it would be hard to integrate it. The reason for this is that the solution is very store-focused and a store is not a common touchpoint. A solution that has a more recurring touchpoint and which would remind the customer through this touchpoint about a thoughtful divestment process, would be more effective.

QR code:

- **Durability:** There are durable options available (such as return through postal service). Picking up the drills at consumers their home is less durable however.
- **Maintains residual value:** All the options ensure that the drill is well packaged upon their return. The consumer is however given the responsibility for the packaging which might negatively affect it.
- **Repurchase returned goods based on their residual value:** Not currently the case and not as easy to integrate as the in-store case where there can be checked that the drill is returned and where the money transfer can happen directly.
- **Collects data concerning the product's condition:** Has the potential to store data but doesn't at the moment.
- **Promotes other circular initiatives too:** Doesn't promote other circular initiatives but also has the potential to do so - however, this is not its current concept.
- **Sparks a thoughtful divestment process:** Currently no other consumption actions (repair, registering of tool etc.) are included in the QR code concept direction. However since registering is already an action requiring the scanning of a barcode, this idea could be extended to the QR code. By using the QR code as an active feature during consumption (including the option to return the drill EOU), it is likely to spark a thoughtful divestment decision. Because of the potential to spark a thoughtful divestment process, a + is given to the option.

Sustainability program:

- **Durability:** The drill is returned through postal service which is the most durable option (requires the least individual transport and drill needs to be packaged anyways to ultimately bring it to a Bosch warehouse - be it the in-store option or not).
- **Maintains product's residual value:** Postal service ensures that the drill is well packaged upon its return. The consumer is however given the responsibility for the packaging which might negatively affect it.
- **Repurchase returned goods based on their residual value:** This could be integrated through the website's account where the consumer would then fill in their bank account number or through credit that would become available to the customer.
- **Collects data concerning the product's condition:** Data is being collected and is part of the concept.
- **Promotes other circular initiatives too:** Promoting other circular initiatives is the main theme in this return concept, hence ++.

IN-STORE EXPERIENCE

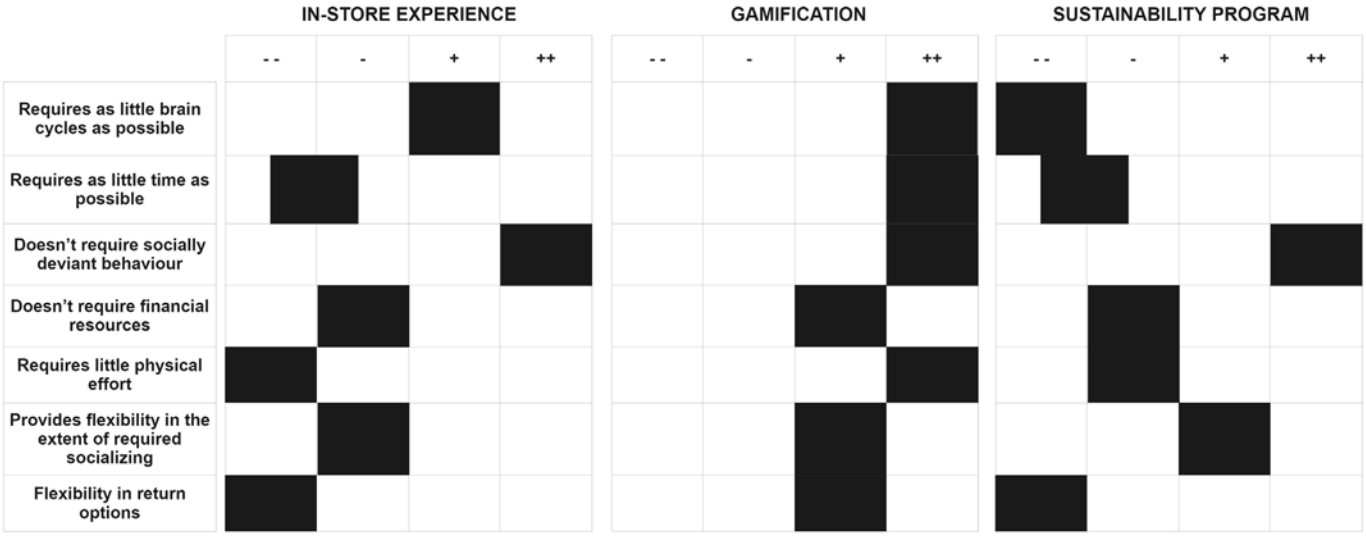
- **Holds users by the hand to say goodbye:** The consumer is not held by the hand during the divestment option evaluation (see Flora Popeelaar's "Conceptual model of divestment and the position of the design principles"). However, by only providing one EOU option, the consumer is somewhat held by the hand since there is not much to choose from. However, the user could still bring the drill to a recycling park. For the divestment preparation, no initiative to 'hold users by the hand' is taken either since it is up to the consumer to go to the store and not forget their drill before leaving. For the final act of disposition however, the user does not need to do much and is guided in the store. How well the guidance would be, would depend on the staff and how many clients are waiting for help etc. For this solution, the evaluation phase could potentially be better guided and ideally for the divestment preparation, a notification would pop up to not forget the drill before the consumer leaves their house to go to the store. A possible way to do this, would be to allow the consumer to choose a date to return the drill and that this can then be added to the consumer's agenda. Through the agenda, a reminder could then be given to not forget the drill. This however would require additional steps from the consumer and on top of that, not everyone uses an agenda. As mentioned before, integrating the divestment decision process in the return solution also poses some difficulties for this idea concept.
  Half of the decision processes (see Poppelaar's conceptual model) can only be influenced in a fairly complicated manner, therefore the solution is in between a - - and a -.
- **Leaves as little time as possible between the divestment decision and action:** Users could be prompted to bring the drill back as quickly as possible, however only very limited influence is possible for this option.
- **Is an integral part of the consumption cycle:** Already discussed previously, therefore a minus.
- **Allows for autonomy (control, self-expression) while also making use of existing communities:** Not much autonomy since there is not much choice and no communities are leveraged.

GAMIFICATION

- **Holds users by the hand to say goodbye:** In comparison with the in-store concept idea, this option offers more guidance throughout the divestment steps starting from the evaluation of different divestment options to preparing the divestment (packaging the product and getting the materials for this if necessary) and the final divestment action where the consumer can choose its level of autonomy. Because of this, a plus is given. How '*intuitively guided, supportive, simple, effortless and seamless*' this would be depends however greatly on the way the QR code portrays this information and the efficiency of the front-stage, back-stage and supporting processes. Therefore, a plus is given.
- **Leaves as little time as possible between the divestment decision and action:** Depending on which return option the customer chooses, the return happens fairly quickly. If the consumer chooses to receive the box, it is up to them when they return the box (they can return it whenever it suits them). If the consumer chooses to get the drill picked up, it is most likely that the options which will be shown would be in the near future. Since not much can be changed about the time in between the divestment decision and action for when the box gets delivered, a minus is given.
- **Is an integral part of the consumption cycle:** This is not the case at the moment but the QR code solution has the potential to integrate this aspect in the solution.
- **Allows for autonomy (control, self-expression) while also making use of existing communities:** The solution allows for autonomy through offering different return options and has the potential to create communities through posting the creative boxes on social media or offering puzzle solve platforms on the Bosch app.

SUSTAINABILITY PROGRAM

- **Sparks a thoughtful divestment process:** Since other return options such as repair and return for maintenance and even EOU are already on the website; it is a common touchpoint that customers might use when in need. However, it is a touchpoint that is not easily visible and also not a very memorable touchpoint meaning that customers are not confronted with it during usage although a notice in the package informs customers about the program. Once registered in the program, the customer can be reminded about this EOU return option and other circular initiatives. Also when buying the drill through the Bosch website or when wanting to repair the drill through the Bosch website, customers can be prompted to participate in the program. The customer however might not repair their drill through Bosch if it is out of warranty or might buy their drill through another retailer. Only a handful of ways can thus remind the customer of the program: notice in the package, information on the regular Bosch websites and mails once the consumer is registered. Since these are not a lot to stimulate the consumer during drill usage, only a plus is given.
- **Holds users by the hand to say goodbye:** This is not really the case as the consumer has to start the return by going on their registered account. Here, the customer can of course be informed about the different return steps but has to be the one bringing it to a postal point/ postal service in the end. The evaluation of the different divestment options, the divestment preparation and act of divestment is thus mainly the consumer's responsibility. More initiatives in these areas could however be integrated.
- **Leaves as little time as possible between the divestment decision and action:** The consumer can be prompted through emails to return the drill as soon as possible once having shown interest in returning the drill EOU, however how much time it would tale to divest the product after the customer decided it reached its EOU, is up to the customer.
- **Is an integral part of the consumption cycle:** Yes, this concept idea also integrates other circular initiatives such as repair.
- **Allows for autonomy (control, self-expression) while also making use of existing communities:** The concept idea does create a possible community based on the sustainability level associated to the customer. This could potentially be added to the already existing communities on the Bosch app. However, it is unlikely customers would really be interested in communities based on their sustainability level. Lastly, the concept idea does not promore self-expression.



In-store experience:

- **Requires as little brain cycles as possible:** The return does not consist of a lot of steps and just requires the customer to take the drill and go to a store. The need to address customer service in-store could be considered as adding more 'brain cycles' to the return. The brain cycles for social interactions differ from person to person. However, seen the steps needed to make the return and simplicity of them, the return is fairly simple though.
- **Requires as little time as possible:** This depends greatly on if the customer does the return on their way to another chore or not. In comparison to bringing the drill to the postal service (which can also be combined with other chores), going to stores is more time-consuming however. From customer interviews, the stores selling Bosch drills were also further away than the closest-by postal service point. If the customer does not own a car, transport can be even more time-consuming. The block is therefore placed between - and - -.
- **Doesn't require socially deviant behaviour:** Going to the store is considered a 'normal' action.
- **Doesn't require financial resources:** Although the user does not need a box for this return, they would have to pay for the transport to the store. This transport aspect can be seen as expensive depending on the customer's situation.
- **Requires little physical effort:** The return requires the customer to go to the closest-by store that sells drills. Although the customer does not need to pack the product, this requires extensive physical effort in the sense of transport.
- **Provides flexibility in the extent of required socializing:** The customer has to socialize with customer support in this concept idea, they can however choose to say the bare minimum or be more social, hence the minus.
- **Provides flexibility in return options:** Only one return option is offered hence there is no flexibility.

In-store experience:

- **Requires as little brain cycles as possible:** The concept idea provides a pick-up option where the drill is picked up at the customer's home, not much brain cycles are needed for this option except planning to stay at home on the selected pick-up day.
- **Requires as little time as possible:** Through the pick-up option of this idea, this concept idea also requires very little time.
- **Doesn't require socially deviant behaviour:** Some of the concepts are fairly new (such as decorating the box and solving the foam puzzle). This is however not required from the participant and is optional.
- **Doesn't require financial resources:** In case the box is sent and picked up, no financial resources are required.
- **Requires little physical effort:** Through the pick-up option, minimal physical effort is required.
- **Provides flexibility in the extent of required socializing:** The customer has to socialise somewhat through returning the drill, either through the pick-up or returning it themselves by postal service. If the customer uses drop-off points for their package, the customer does not need to however. Therefore, a plus is given.
- **Provides flexibility in return options:** The return is given in different forms but is always through postal service, hence providing an in-store return could offer even more flexibility.

In-store experience:

- **Requires as little brain cycles as possible:** This concept idea is probably the most complex out of the three since it requires the customer to fill in their personal details to make a Bosch account, couple it to their drill through the Bosch drill registering option and eventually return the drill through postal service if desired by the customer. A lot of additional steps are thus requested from the participants that include the early stages of drill usage. Although these 'early drill usage' steps are optional, the customer is still required to return the drill EOU by setting up the return themselves.
- **Requires as little time as possible:** If this return solution would be executed entirely (with the early usage steps), it would take quite some time from the participants.
- **Doesn't require socially deviant behaviour:** This concept idea normalises sustainable behaviour and encourages it, no steps are required that are considered 'socially deviant'.
- **Doesn't require financial resources:** The customer needs to provide a box, hence this solution requires financial resources.
- **Requires little physical effort:** The customer needs to bring the box to the postal service or a package drop-off, hence physical effort is required. Usually, post offices are in every municipal while stores selling drills are most often found in cities. It can thus be assumed that the physical effort (measured in distance needed to travel by the consumer) is less when bringing it to postals service. However, if the customer also needs to provide packaging themselves, additional physical effort would be required. Therefore, a minus is given.
- **Provides flexibility in the extent of required socializing:** The customer can also make use of a drop-off option for the package, hence a plus.
- **Provides flexibility in return options:** Only one option is provided to the customer, hence no flexibility is given.

E. Screener for participant recruitment

TestingTime

Summary of your recruitment

Do not use this as an invoice. The final invoice will be sent after the order has been completed.

Printed on 21/12/2022.

Set-up

Project name:
Interview, Remote (Moderated)

Study method:
Interview, Remote

Amount of test users:
9 test users

Subtotal

Characteristics

Recruit from:
TestingTime Public Pool

Age range:
Only one specific age range
1. 18-75 years: 9 test users

Gender:
Evenly balanced gender distribution

Languages:
English

Country of residence:
Germany

Subtotal

Total
(VAT free)

Total contains:

Incentives

Screening

1. The following statements are all about cordless drills. In case you have other types of drills of which none is cordless, then please select 'Not applicable to me'.
Which statement is true: (Single-select)

Not applicable to me. (Disqualify)
I share cordless drill(s) with others and we consider ourselves co-owner(s) of the drill(s). (Qualify)
I use someone else's cordless drill(s) but I don't consider myself as an owner of the drill(s). (Disqualify)
I share a cordless drill with others, however I am the owner of the drill(s). (Qualify)
I am the only owner of the cordless drill(s) and I do not share the drill. (Qualify)

2. Select all options applicable to you: (Multi-select)

I disposed of a drill within the last 5 years. (Qualify)
I disposed of a drill more than 5 years ago. (Disqualify)
I have never disposed of a drill. (Disqualify)
I would like to dispose of a drill. (Irrelevant)
None of the above (Disqualify)

3 participants answered the following question as well:
Please select the statement that applies to you. Please be aware that the product doesn't need to be a drill:

- I have returned a product from the brand of the previous question. This was to repair the product. (Qualify)
- I have returned a product from the brand of the previous question. This was because I no longer wanted the purchased product. (Qualify)
- I have returned a product from the brand of the previous question. This was for other reasons than repair/ no longer wanting the purchased product. (Qualify)
- I have never returned a product from the brand of the previous question. (Disqualify)
- I have been wanting to do a return to the brand of the previous question, but I didn't end up doing it (Qualify)

Also, would it be possible to change 'I would like to dispose of a cordless drill. (Irrelevant)' to (Qualify)?

3. From what brand is/are your current drill(s)? Select all applicable options. (Multi-select)

I don't (co-)own a drill at the moment. (Disqualify)
Makita (Irrelevant)
Hilti (Irrelevant)
FESTOOL (Irrelevant)
Bosch (Qualify)
Stihl (Irrelevant)
None of the above (Disqualify)

4. Which statement is true regarding DIY projects.
You can agree to more than one statement. (Multi-select)

If I do DIY tasks the visual results especially need to be perfect and I also like to get praised for the projects I do. If I cannot achieve those results myself I am happy to ask a professional craftsperson to do it for me. Power tools have to have a proper performance for the tasks - but should also visually appeal to me with their design. (Disqualify)
When it comes to DIY projects, I also like bigger projects and I am capable and experienced to do these projects. I always try to achieve the best or even perfect results - comparable to a professional. I am very knowledgable when it comes to power tools. I always look for very high quality tools of good brands that meet my high demands. (Qualify)
I really enjoy doing new and also sometimes challenging DIY tasks. I am quite ambitous to learn new skills and to realize also more demanding projects. But finally it is not about being perfect all the time. When it comes to power tools I mainly look for durable, performing tools which are not too complicated in usage. (Qualify)
DIY is a way to have fun or to relax myself. It is all about beautifying and improving my home the way I want it to be. I am proud of what I can achieve, even with the rather limited DIY-Skills I have. A good power tool needs to be very easy to use, safe but also durable. For this I am willing to sacrifice on power. (Qualify)
I can do a DIY tasks myself, but I do not particularly enjoy doing them - it's more a means to an end that helps me to have a cosy home and keep things in order so it is a place to relax. Power Tools need to function in a safe and easy way to fulfil their tasks, I don't really care about the brand I buy. (Disqualify)
I don't do DIY. I usually buy products that are already set up. I do love beautifying my home, however, DIY is nothing for me. (Disqualify)
None of the above (Disqualify)

5. Which statement is true regarding your DIY skill level: (Single-select)

Very high (Qualify)
High (Qualify)

Total
(VAT free)

Total contains:

Incentives

Planning

Remote tool:
Microsoft Teams

Remote access details:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_N2Y5YzYyOWMtZTEzZi00YmQxLWI5ZDItOWQxY2IzNGY4MGJl%40thread.v2/0?context=%7b%22Tid%22%3a%220ae51e19-07c8-4e4b-bb6d-648ee58410f4%22%2c%22Oid%22%3a%2259f85ef6-9779-474b-baa8-f4910105f9a6%22%7d

Device requirements:
1x device required
Device: Computer

Message to test users:
Please agree to the participation agreements (2 pages that require a signature) before starting the interview. Open Teams a bit before the start of the interview so that we can start the meeting on time.

Additional information for TestingTime:
For the screening, 3 participants for each qualified solution of question 4 should be chosen - leading to a total of 9 participants. (Q4: 'Which statement is true regarding DIY projects. You can agree to more than one statement.') Next to this, for the qualified solution of Q4 to be valid, each group needs to answer Q5 followingly:

1) Qualified solution 1 Q4: 'When it comes to DIY projects...' for this solution to be valid, the participant needs to have answered one of the following in Q5: "Very high /High/ Moderate"
2) Qualified solution 2 Q4: 'I really enjoy doing new...' for this solution to be valid, the participant needs to have answered one of the following in Q5: "High/ Moderate/ Intermediate"
3) Qualified solution 3 Q4: 'DIY is a way to have fun or to relax...' for this solution to be valid, the participant needs to have answered one of the following in Q5: "Moderate/ Intermediate/ Low"

Duration per session:
60 minutes

Tuesday, 3 January 2023
09:00 - 10:00 (Preferred)
10:30 - 11:30 (Preferred)
12:00 - 13:00 (Preferred)
13:30 - 14:30 (Preferred)
15:00 - 16:00 (Preferred)
16:30 - 17:30 (Preferred)
20:00 - 21:00 (Preferred)

Wednesday, 4 January 2023
09:00 - 10:00 (Preferred)
10:30 - 11:30 (Preferred)
12:00 - 13:00 (Preferred)
13:30 - 14:30 (Preferred)
15:00 - 16:00 (Preferred)
16:30 - 17:30
20:00 - 21:00 (Preferred)

Thursday, 5 January 2023
09:00 - 10:00 (Preferred)

Total
(VAT free)

Total contains:

Incentives

F. Interview guide

Interview Guide

https://bcgov.github.io/design-research-guide/activities/interviews.html

1. Intro

➢ **Who is responsible for throwing a drill away?**

Hello, my name is Margo and together with Bosch I am looking at ways to bring used tools that are ready for disposal back to Bosch. The tool I am more specifically looking at is the cordless drill. The reason we are doing this, is so that Bosch can reuse materials of old drills. Do you have any remarks or questions so far?

Okay 😊

You can always ask questions while the interview is ongoing. Some questions might seem a bit weird to you but I would still get valuable information from your answer.

During this interview we will first talk about your current drill use for 15 to 20mins, then we will take about the same amount of time to talk about general returns and Bosch. And then we will end the interview by talking about your past discard behavior of a drill and quickly rate some current solutions that I came up with.

- You indicated on the survey that you consider yourself as the sole owner or co-owner of a cordless drill. Could you explain this a bit more by telling me when the drill was bought and with who you maybe share this drill?
- If you would have to map the persons you share the drill with on the circle (Miro), who would you consider to make the most use out of the tool? This person is placed closer to the center.
- Would you consider yourself therefor the person responsible to throw your current drill away? Or would you rather think someone else would be responsible for that regarding your drill?
- Why? ^
- You also indicated that you have already thrown out a drill once? How was the situation in this scenario? Why were you the one responsible for disposing the drill?

Okay so now a bit more about your drill usage…

What were your goals for using the drills, did you want to solve little chores in the house or make your own furniture…? -> Try to delve deeper into that,

- Where do they get their DIY ideas from?
- What other different tools do they use during this process (other people/ magazines/ their phone)?

I saw that there is also a Bosch app where you can for example get DIY ideas from, do you have this?

- How do you ask questions to Bosch when you need info/ help?
- What would be your preferred way to communicate with Bosch employees?

2. Returns

➢ **Hassles, motivators, and reasons for feeling incapable in returning a product**

So, we want to bring the drills that are ready for disposal back to Bosch. Currently the most common way to bring a purchased product back to its company, is through returns. Either you bring back the purchased product to the store or you send it back by post. This is done when a product is defect, or when you end up not wanting the purchase. Now we will be talking a bit more about such return.

- Is there a return you remember that you found particularly annoying, and do you remember why? This can be any product you have ever returned.
- Is there also a return you really enjoyed? And why did you? This can again be any product?
- Okay you gave two interesting examples, how did you find out in these cases how you needed to return the product?

GENERAL

- Have you ever done a return? Do you remember what your last return was and how it went? (Could you tell me a bit more about that?)
- What was the **reason** for the return?
- What in this process was **annoying** to you?
- What did you **enjoy** in this process?
- What **motivated** you to do this return?
- Was there a moment or were there moments you felt **incapable** to do the return?
- Do you remember **how you found out** how you needed to return the product?

The previous return you are talking about was by bringing the product back to the strore/ by sending the product by mail. Do you remember a return where you…?

- What was the **reason** for the return?
- What in this process was **annoying** to you?
- What did you **enjoy** in this process?
- What **motivated** you to do this return?
- Was there a moment or were there moments you felt **incapable** to do the return?
- Do you remember **how you found out** how you needed to return the product?
- Has there ever been a return where you thought 'oh this is really done in a nice way, I find it easy and chill or even original'?

BOSCH - 1

Now we will talk a bit about returns that are done specifically to Bosch. This again, can be for repair reasons or because you end up not wanting the purchase. Have you ever done such a return to Bosch? It could also be for different reasons that I did not mention.

IF THEY DID:

- Do you remember what it was and what the **reason** was for the return?
- What **motivated** you to do this return?

We will now look at the different steps of a Bosch return, you can then indicate when you feel annoyed about a step or when you feel happy about a step. You can give some additional information of course since you have already done a return. Maybe you did a certain step differently for example.

- Was there a moment or were there moments you felt **incapable** to do the return?
- Do you remember **how you found out** how you needed to return the product?

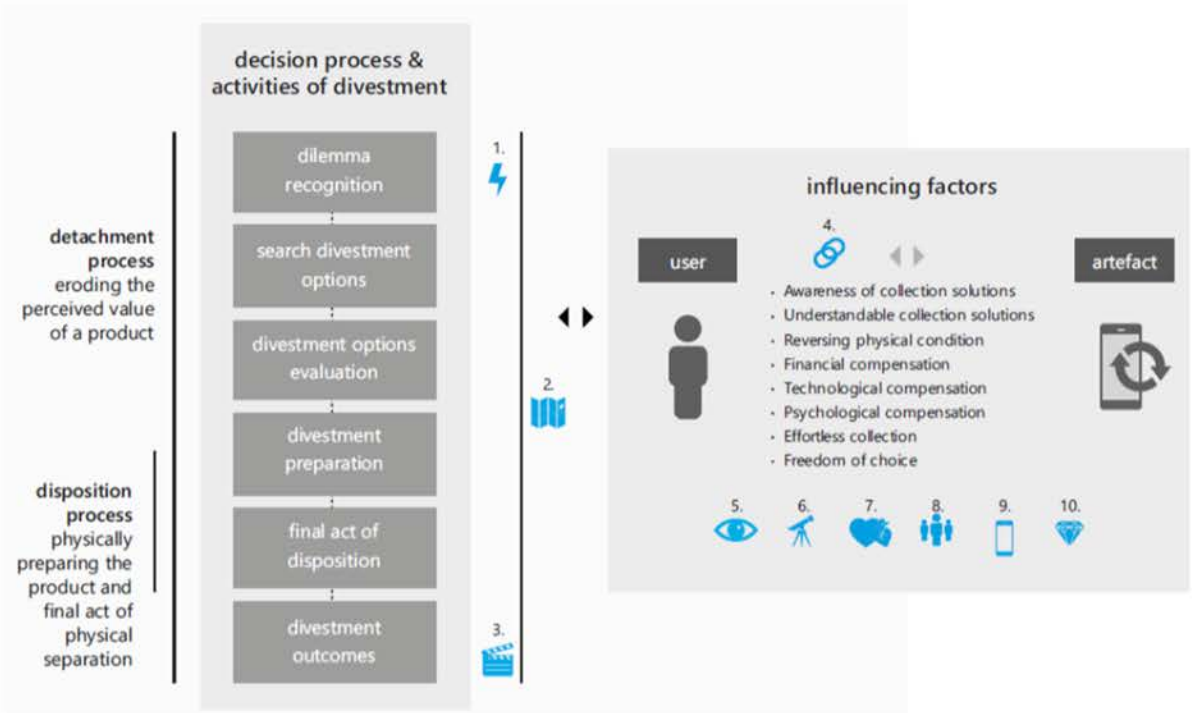
IF THEY DIDN'T:
BOSCH – 2 (If people haven't done a return to Bosch)
Now we will quickly look how such a return is done when a product needs to be returned to the warehouse. I will need you to imagine that you bought a product from Bosch on their website and once it arrived, you changed your mind and didn't want the purchased product anymore.
On the Miro board you see the different steps for this return. Here you can easily indicate with the smileys how you would feel about the different steps. A variety of emotions are mentioned to help you express yourself. You can put the smiley in each square.

For the next one, I will need you to imagine that you want to return your Bosch drill to the store. I will again guide you through the different steps and you can indicate what emoji suits how you feel about it. Please give some explanation while adding the emoji's. For the transportation step, let's imagine you need to bring the drill to the closest by OBBI. (BRICO)

3. Discards

You have indicated that you have already thrown out a drill in the past 5 years. Could you explain a bit on how you did this, meaning where you threw the drill away?

- When did you decide to throw the drill out and why? *(thinking about buying a new drill?)*
  *check this: functional (**loss of function/performance?/want more features**) | emotional (arouses affective states or feelings) | epistemic value (curiosity/novelty) |social value (belonging to group) – **product was old in comparison to fam/friends** | conditional value (circumstances)) | product **appearance** was damaged*
- Did you **research different options to discard** your drill and if yes, how did you research this?
- And **why** did you choose this option of discard?
- Did you have to do anything that was **annoying** to discard the drill? What was the process like, this can also be elements that you **enjoyed**?
- When did you buy a **new drill**? Was this before you discarded your old drill/ during or after?
- How did you **choose a new drill**? Was this difficult/ easy for you?



4. <u>Rating possible solutions</u>

Now I will be showing some possible return formulas that were developed to bring a drill back to Bosch at its EOU (end of use). I explain each concept idea using the visualizations on the Miro board and pointing out the distinct features of each solution. You can then rate these features with the same smileys as before and give a short explanation for why you gave that rating. Lastly, an overall rating for each concept idea is asked, again using the smileys.

SOLUTION 1:

- Ease option
  - *Underlying assumption:*
    - *The customer has a hectic life and just wants the drill out of the house w/o putting any effort in.*
- Family aspect option
  - *Underlying assumption:*
    - *The customer doesn't mind putting time and effort in a task when it is combined with an aspect of their life which they value (similar to Ikea's approach where they combined selling furniture with making a family trip).*
- Challenge option
  - *Underlying assumption:*
    - *According to the characteristics of the different customer segments from the customer research conducted by Bosch, there is a potential that a challenge integrated in a return might be experienced as fun and rewarding for a specific customer segment.*

SOLUTION 2:

- Professional aspect
- Advice on new/ old drill

Underlying assumptions:

- *The customer has difficulty in determining if the drill should be repaired / thrown out.*
- *The customer has difficulty knowing the needed technical specifications when buying a new drill.*

- Feel physical properties of new drill

  Underlying assumption:

  - *The customer would like to feel the physical properties of the drill before buying it. (I would like to know how comfortable and heavy a drill is before buying it.)*

SOLUTION 3:

- The rewards
- The Bosch account that tracks usage behavior

Additional question:

What rewards would you personally like?

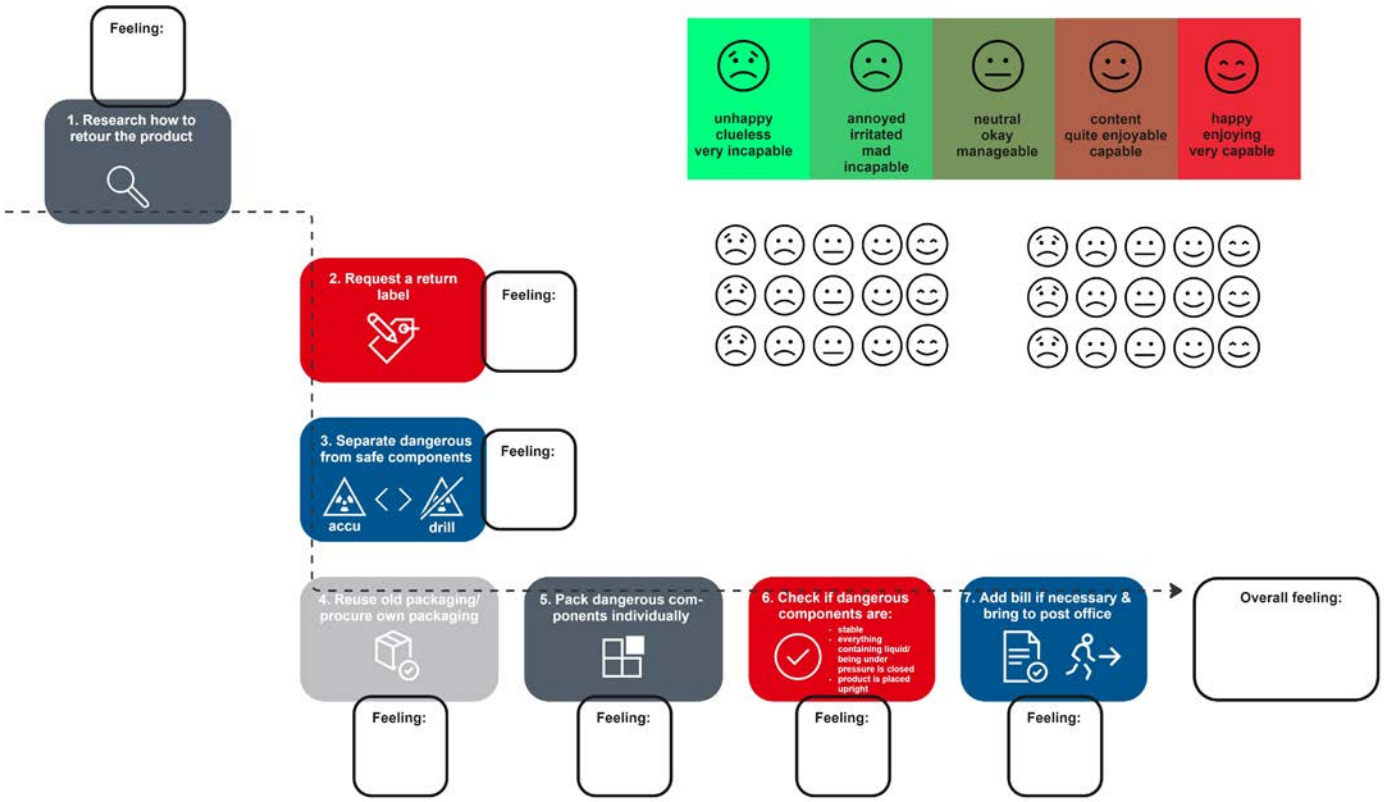
5. <u>The end</u>

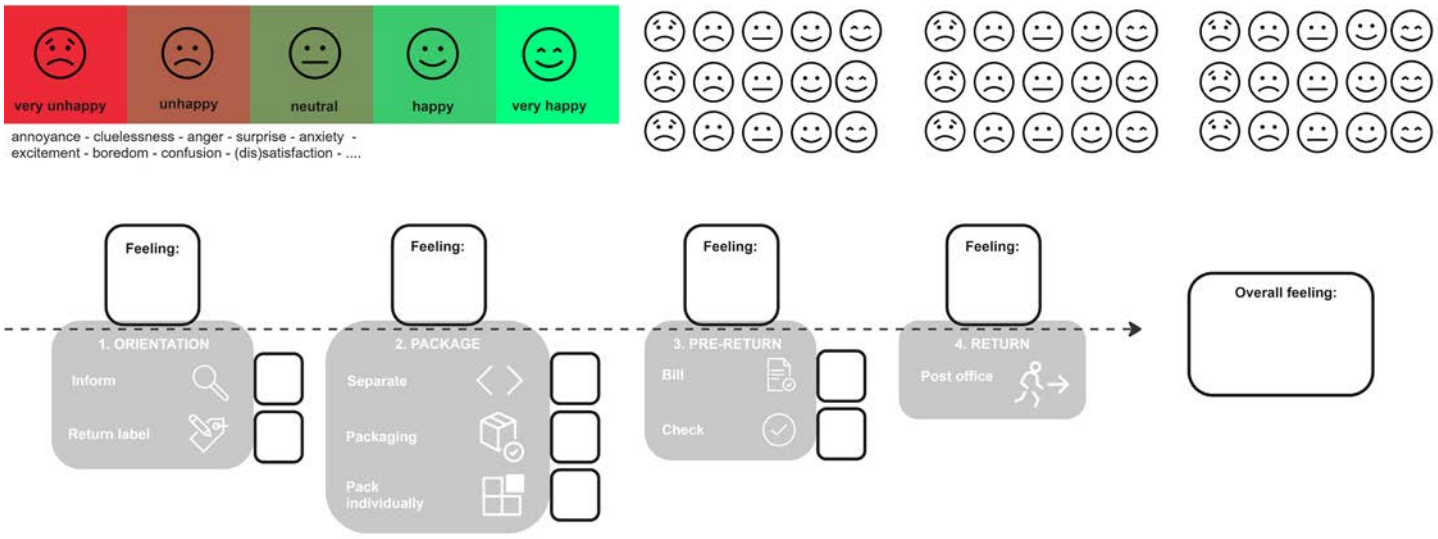
   Now we are at the end of the interview, is there some idea or remark that popped up or something you want to share still?

   .....

   Okay, thank you so much, I really appreciate your time and effort and also the valuable insights you gave me. I hope you have a wonderful day.

G. Test run results





Upper graphic was used during the pilot test and was deemed too complicated, hence it was simplified leading to the lower graphic.

H. Participation agreement

Research Bosch GmbH

This research is conducted as part of the MSc study Industrial Design Engineering at TU Delft.

Student: Margo Welsch

Contact person: Margo Welsch,

Informed consent participant

I participate in this research voluntarily.

I acknowledge that I received sufficient information and explanation about the research and that all my questions have been answered satisfactorily. I was given sufficient time to consent my participation. I can ask questions for further clarification at any moment during the research.

I am aware that this research consists of the following activities:

1. Viewing and comparing visual and audio scenes online
2. Fill out a paper form
3. Online or in person interview

I am aware that data will be collected during the research, such as notes, photos, video and/or audio recordings. I give permission for collecting this data and for making photos, audio and/or video recordings during the research. Data will be processed and analysed anonymously (without your name or other identifiable information). The data will be part of a master thesis that will be published on the following website: https://repository.tudelft.nl/islandora/search/?collection=education

The photos, video and/or audio recordings will be used to support analysis of the collected data. The video recordings and photos can also be used to illustrate research findings in publications and presentations about the project.

I give permission for using photos and/or video recordings of my participation:
(select what applies for you)

- ☐ in which I am recognisable in publications and presentations about the project.
- ☐ in which I am not recognisable in publications and presentations about the project.
- ☐ for data analysis only and not for publications and presentations about the project.

I give permission to store the data for a maximum of 5 years after completion of this research and using it for educational and research purposes.

With my signature I acknowledge that I have read the provided information about the research and understand the nature of my participation. I understand that I am free to withdraw and stop participation in the research at any given time. I understand that I am not obliged to answer questions which I prefer not to answer and I can indicate this to the research team.

I will receive a copy of this consent form.

_____	_____
Last name	First name
___ / ___ / 2021	_____
Date (dd/mm/yyyy)	Signature

Participation Agreement

BOSCH
Invented for life

1. Explanation of the user study

The Robert Bosch GmbH, corporate department User Experience (BMC/UX), Robert-Bosch-Platz 1, 70839 Gerlingen-Schillerhöhe, Germany (hereinafter: "we" or "Bosch") intends to conduct interviews with you about your experiences with certain products and/or services as part of the user study "Motivation, pain point and potential triggers for EOL drill returns" (hereinafter: "user study").

2. Subject of this Agreement

This Participation Agreement contains the conditions for the user study, which the participant agrees to comply with.

3. Participation

Participation is voluntary and without any remuneration, unless this is separately agreed with the participant. Participants must be of legal age.

4. Temporary provision of products

For the time and purpose of the user study and within the scope of this Participation Agreement, Bosch may provide the participant with products or Bosch may temporarily provide a service and grant corresponding rights of use to the respective service for the purpose of the user study. The participant is not entitled to provide products or the service to third parties or to make them accessible in any other way. The participant shall handle products properly and with care. After the end of the study, the products shall be returned to Bosch or the right to use the service shall end.

5. Recordings

In order to record reactions, personal impressions and opinions of the participant with regard to the subject of the user study, Bosch may take audio and video recordings of the participant. **The participant agrees that these recordings may be taken and used by Bosch internally (e.g. for employee training, publication on the intranet) in connection with the user study unlimited in time and space and free of charge.** Any further publication of the recordings (e.g. on the Internet, for advertising purposes) requires the separate explicit consent of the participant.

6. Participation

The participant will conduct the user study in person and, if a product is provided to him or her, he or she will get familiar with the operation of the product. The participant is also obligated to keep access data, including passwords, secret and not to make them accessible to unauthorized third parties if he or she has received access data. In addition, the participant agrees to be available during the user study and also after its completion for questions from Bosch regarding the experiences gained from the user study. Furthermore, the participant agrees, if requested by Bosch, to answer a questionnaire and/or to write a report on his experiences and to provide this to Bosch.

7. Reports

The participant irrevocably grants Bosch the non-exclusive, perpetual, transferable, sublicensable and worldwide right to store, display, copy, publish, edit or otherwise use any reports created by the participant without expecting any remuneration. The participant waives the naming of his or her name as the author.

8. Remuneration

If a remuneration is paid for participation in the study, this is subject of a separate agreement with the participant. If there is no explicit agreement regarding a remuneration, the participant does not receive any remuneration for participating in the user study.

9. Confidentiality

Does not apply.

10. Termination

This Agreement may be terminated by the participant and by Bosch at any time. Notice of termination may be given in text form, e.g. by e-mail; it must be addressed in each case to the contact person or contact address specified in this Participation Agreement.

11. Changes in the conditions

Bosch is entitled to amend this Participation Agreement at any time. For this purpose, the participant will receive a notification by e-mail, fax or letter stating the amended conditions and the effective date. Amendments to this Participation Agreement shall become effective if the participant has expressly agreed to them or if they have been brought to the participant's attention and the participant does not object within 14 days. If he or she rejects the changes, the Participation Agreement ends automatically.

12. Dispute resolution

Bosch does not participate in dispute resolution proceedings before a consumer arbitration board.

13. Final provisions

Should any provision be or become invalid in whole or in part, this shall not affect the validity of the remaining provisions. Verbal collateral agreements have not been made. German law shall apply. As far as permissible, Stuttgart is determined as the place of jurisdiction.

I accept the above mentioned conditions of the Participation Agreement.

I have taken note of the Data Protection Notice on page 2.

Family name, given name

Address

Place, date

Signature

Data Protection Notice according to Art. 13 GDPR

The protection of your privacy throughout the course of processing personal data as well as the security of all business data are important concerns to us. We process personal data confidentially and only in accordance with statutory regulations. Data protection and information security are included in our corporate policy.

Principles

Personal data consists of all information related to an identified or identifiable natural person, this includes, e.g. names, addresses, phone numbers, email addresses, contractual master data, contract accounting and payment data, which is an expression of a person's identity. We process personal data only when there is a statutory legal basis to do so.

The Robert Bosch GmbH, corporate department User Experience (BMC/UX), Robert-Bosch-Platz 1, 70839 Gerlingen-Schillerhöhe, Germany (hereinafter: "we" or "Bosch") is responsible for the processing of the personal data.

Purpose of processing and legal basis

We as well as the service providers commissioned by us process your personal data for the following processing purposes:

* Execution of the contract.

The legal basis for the processing of this personal data is Art. 6 (1) s. 1 lit. b GDPR, because the processing is necessary for the performance of the contract between Bosch and the participant of the user study.

Duration of storage, retention periods

Principally, we delete your personal data if a purpose and legal basis for data processing does not exist anymore or we are legally obliged to delete. Please note that we are not allowed to delete personal data, which we have to keep to fulfill a legal obligation (eg. retention periods under the tax and commercial codes, which require the availability of certain documents such as contracts and invoices for a certain period of time).

Rights of data subjects

To enforce your data subject rights and to notify possible data protection incidents please use the following link: https://www.bkms-system.net/bkwebanon/report/clientInfo?cin=18rbds19&language=eng. When doing so, please ensure that an unambiguous identification of your person is possible. You may also contact our Data Protection Officer using the contact information stated below.

Right to information and access

You have the right to obtain confirmation from us about whether or not your personal data is being processed, and, if this is the case, access to your personal data.

Right to correction and deletion

You have the right to obtain the rectification or completion of inaccurate personal data or deletion of your data as far as statutory requirements are fulfilled.

Restriction of processing

As far as statutory requirements are fulfilled you have the right to demand for restriction of the processing of your data.

Data portability

You are entitled to receive data that you have provided to us in a structured, commonly used and machine-readable format or – if technically feasible – to demand that we transfer those data to a third party.

Objection to data processing based on the legal basis of "legitimate interest"

In addition, you have the right to object to the processing of your personal data at any time, insofar as this is based on legitimate interest. We will then terminate the processing of your data, unless we demonstrate compelling legitimate grounds according to legal requirements which override your rights.

Withdrawal of consent

In case you consented to the processing of your data, you have the right to revoke this consent with immediate effect. The legality of data processing prior to your revocation remains unchanged.

Contact

If you wish to contact us, please find us at the following address: Robert Bosch GmbH, corporate department User Experience (BMC/UX), Robert-Bosch-Platz 1, 70839 Gerlingen-Schillerhöhe, Germany

Data Protection Officer

For suggestions and complaints regarding the processing of your personal data we recommend that you contact our data protection officer:

Data Protection Officer
Information Security and Privacy (C/ISP)
Robert Bosch GmbH
P.O. Box 30 02 20
70442 Stuttgart
Germany

Email: DPO@bosch.com

Right of complaint with supervisory authority

You have the right to lodge a complaint with a supervisory authority. You can appeal to the supervisory authority which is responsible for your place of residence or your state of residency or to the supervisory authority responsible for us. This is:

State Commissioner for Data Protection and Freedom of Information

Street address:
Lautenschlagerstrasse 20
70173 Stuttgart
Germany

Postal address:
P.O. Box 10 29 32
70025 Stuttgart
Germany

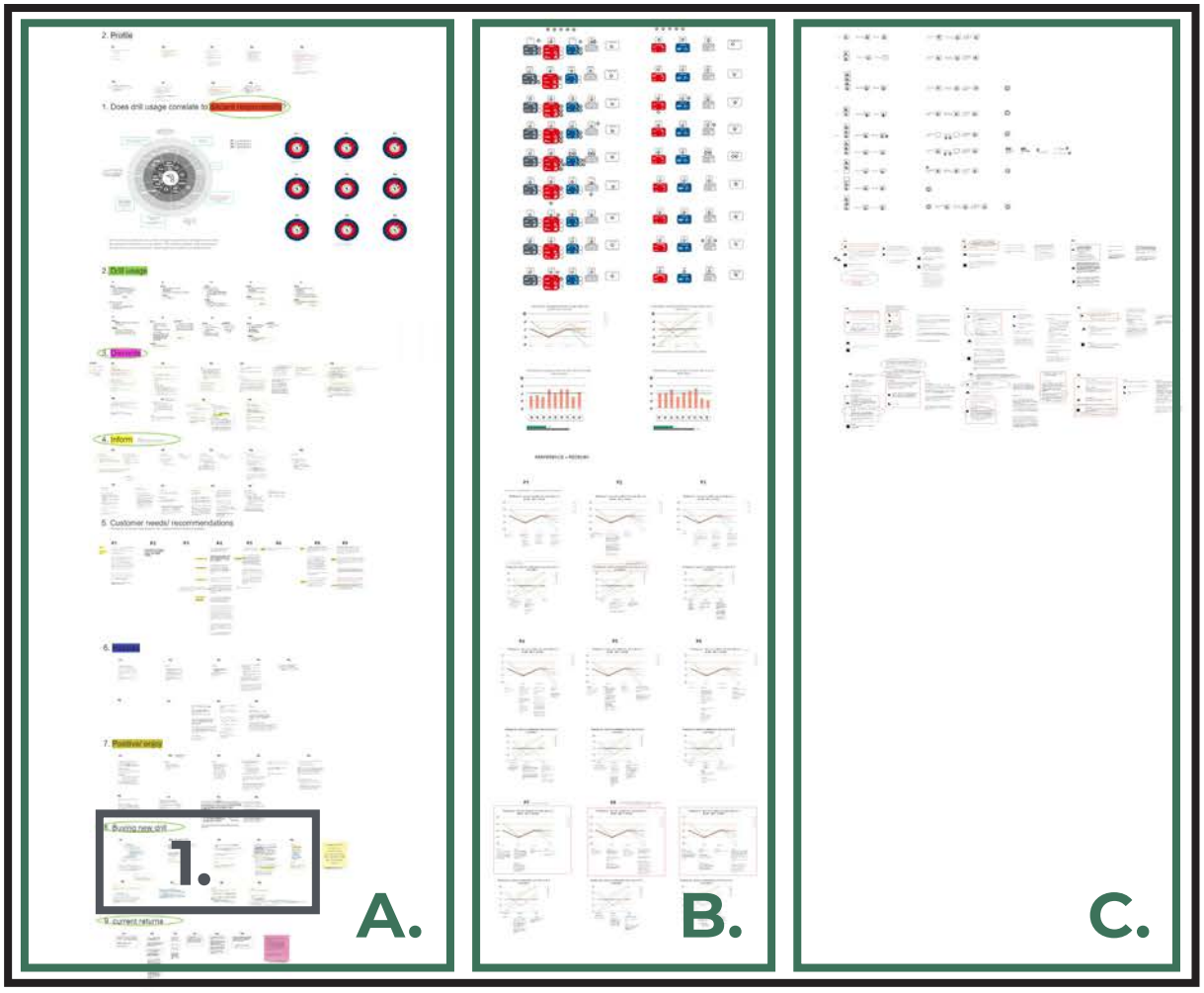
Phone: +49(711)615541-0
Fax: +49(711)615541-15
Email: poststelle@lfdi.bwl.de

Changes to the Data Protection Notice

We reserve the right to change our security and data protection measures. In such cases, we will adjust our data protection notice accordingly. This data protection notice is effective of February 26, 2020.

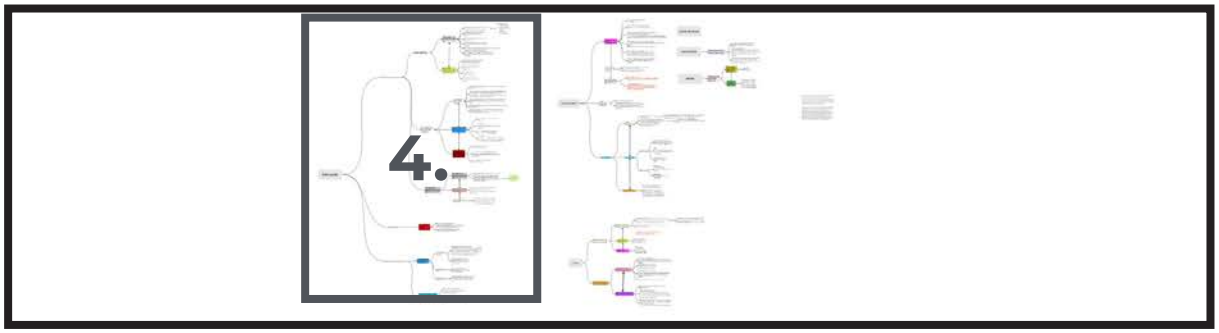
I. Data analysis

I.



II.

III.



METHOD

I. **Write out highlighted data from transcripts and find common themes across interview questions within the A/ B/ C category.**

II. **Group the common themes and count the amount of times they have been mentioned within the A/B/C category.**

III. **Group common themes across all categories.**

INTERVIEW “CATEGORIES”

A. Context of use

B. Run through Bosch return experience

C. Feedback on concept ideas

EXAMPLES ON THE NEXT PAGES

1. (put into A4 format)

2.

3.

4.

1.

8. Buying new drill

P1

- Through Amazon
  - Never had problems
  - **Easier** than Bosch website
  - Read the drill's features
    - Accu
    - **'I'm not interested in the technique** I'm not a technical...'
  - **Compare prices**
- In case I need more detailed explanation - I would go on Bosch website

'Maybe **if I need more detailed information,** I would **go to Bosch and** then maybe I would **compare the prices** but it's **easier to go to Amazon.'**

WHEN

after? discarding of the older drill

'I was not very happy with the system. It was another system that was not the Bosch system and so I took it away. And **then** I bought the new one from Bosch.'

P2

'I like returns in the store more'

'I put on my mobile for the exact same model, but I couldn't find it. So **I find a newer one** so I bought a newer one.'

Feeling the drill: So I bought my first thing in a shop so I have the **feeling the touch** to feel.

WHEN

after discarding of the older drill

P3

- 'Because for usual **I prefer buying things online'**
- 'I know that Bosch for example, or other brands have a **certain reputation'**

It was easy because when we did it, we were more beginners

requirements were not super high.

WHEN

after discarding of the older drill discard was 5-6 years ago and new drill 4-5 years ago

P4

- Bought it with sister 'So, we bought that for the two of us really.'
- 'We **didn't upgrade because we knew how to handle this model.'**
- Didn't research how to discard drill
- Feeling the new drill: 'but I **held obviously in the shop** I had another... I had one of these blue that were just like this and it just felt a little **bit I like it when it's a bit more heavy**.'

WHEN?

- Bought it after discarding old drill

1. always I always look up **Amazon** because it's easy and they have options.
2. usually go to the shop because I also like to talk to... I'd **like to explain** to the salesperson what I use the drill for and **see what they recommend.**

'I went onto Amazon and just typed in this specific drill and just saw what came up and had a look there and then I went to the shop and had a look there and asked somebody and then bought the exact same drill that I discarded...'

P5

- at OBI
- **asked the guy** 'I wanted it to be strong, a little compact, not too expensive'
- **Compared** two given options
- **No research on Google**

WHEN

'before I discarded *(the old drill)* it because you always need one'

P6

WHEN

after discarding of the older drill - bought bcse of moving

1. Google drills
2. Check price - quality

When you google it, you have a lot of options. Yeah. And there I had a lot of sellers Yes. Which offered the item and I guess **I found by Amazon** which was quite good price.

P7 didnt throw out a drill

- Bought her drill on Amazon
- **didn't do too much research into it**
  - Bosch is a well-known reliable **brand**
  - **Price** wasn't too bad
- Didn't look into technical specifications: just needed **something small**... that was **easy for me to use.**

P8

WHEN

'I bought a new one... after I have thrown it away, but I'm not 100% sure.'

It was **pretty easy**. I just **bought it online**

I think that **bought it by Toom Baumarkt online** it I'm sure

1. **Look what tools I like**
2. **Look where it's the cheapest** price.

P9

WHEN

Before I discarded the old one.

CHOOSE A NEW DRILL

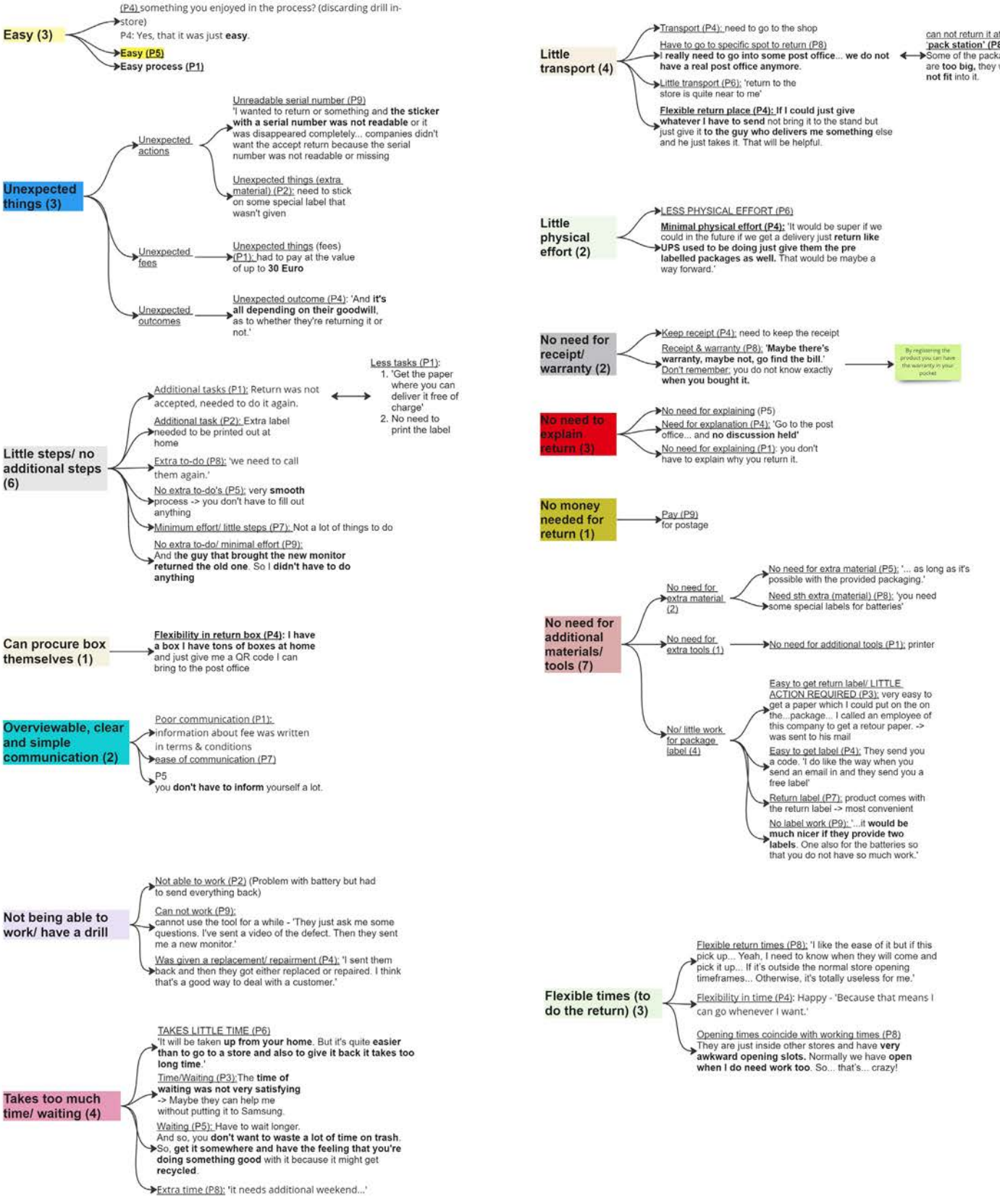
easy

1. **went to Amazon**
2. **sort by price** or whatever and then don't take the cheap stuff.

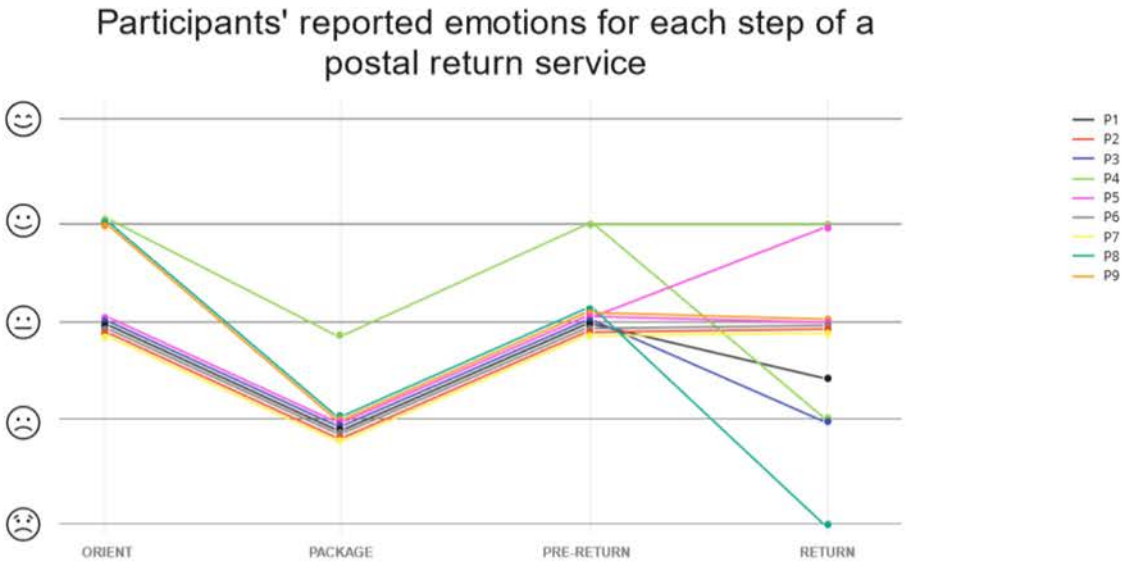
'So maybe I even took it because it's **Bosch** and it is a **German**... **high quality** company and the **price was okay**.'

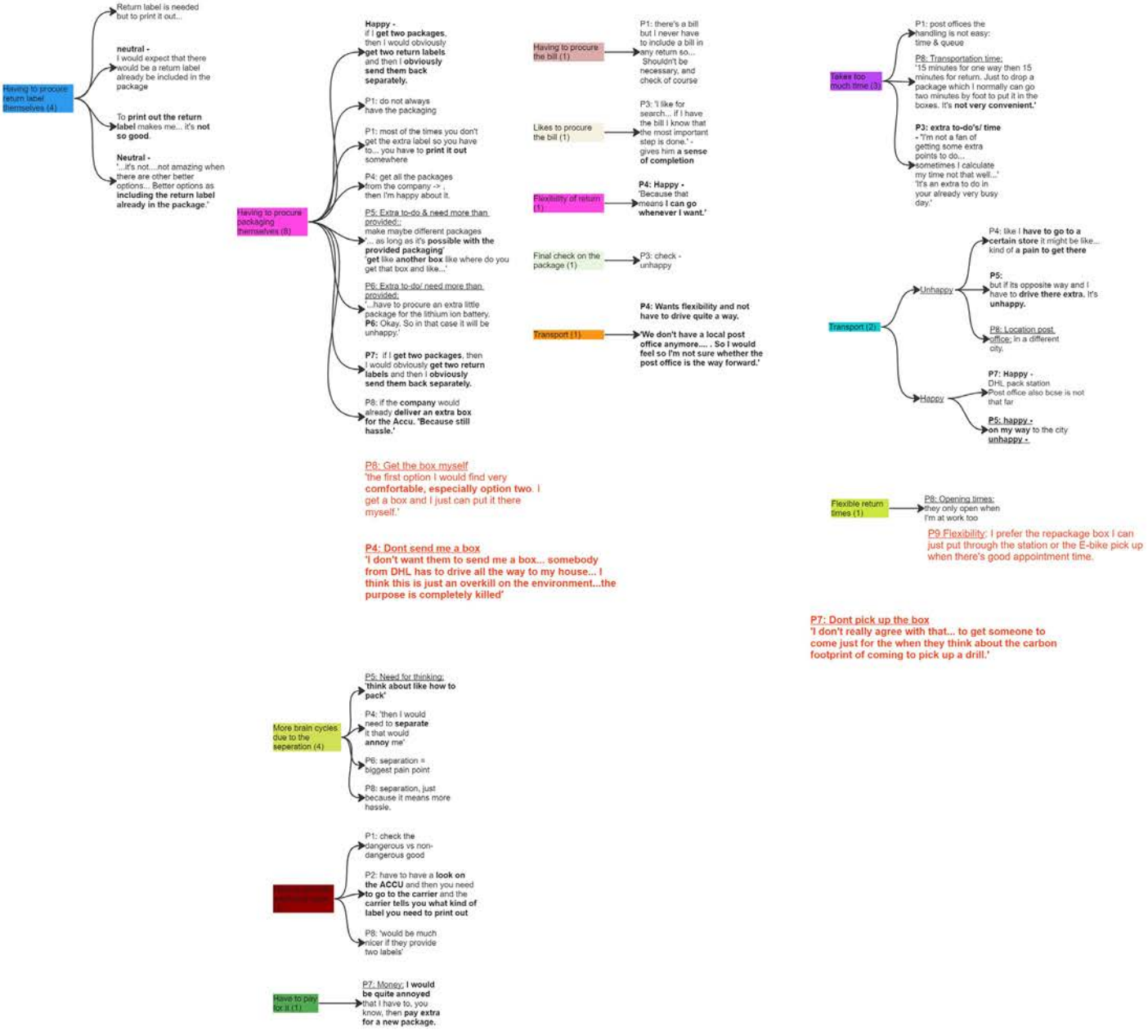
-> no difficulty with the technical specifications

2.

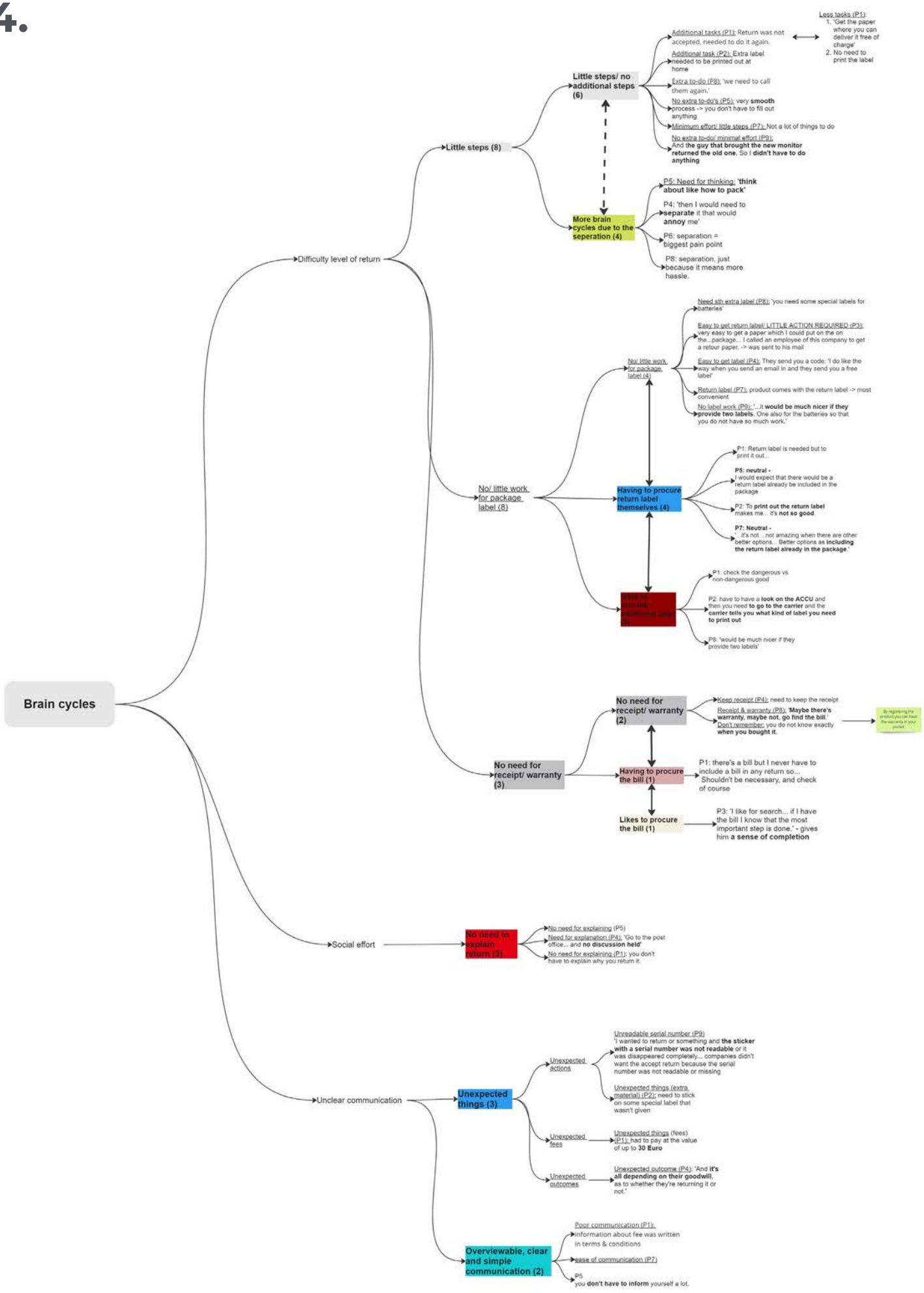

Easy (3)
(P4) something you enjoyed in the process? (discarding drill in-store)
P4: Yes, that it was just easy.
Easy (P5)
Easy process (P1)
Unexpected things (3)
Unexpected actions
Unreadable serial number (P9)
'I wanted to return or something and the sticker with a serial number was not readable or it was disappeared completely... companies didn't want the accept return because the serial number was not readable or missing
Unexpected things (extra material) (P2): need to stick on some special label that wasn't given
Unexpected fees
Unexpected things (fees) (P1): had to pay at the value of up to 30 Euro
Unexpected outcomes
Unexpected outcome (P4): 'And it's all depending on their goodwill, as to whether they're returning it or not.'
Little steps/ no additional steps (6)
Additional tasks (P1): Return was not accepted, needed to do it again.
Less tasks (P1):
1. 'Get the paper where you can deliver it free of charge'
2. No need to print the label
Additional task (P2): Extra label needed to be printed out at home
Extra to-do (P8): 'we need to call them again.'
No extra to-do's (P5): very smooth process -> you don't have to fill out anything
Minimum effort/ little steps (P7): Not a lot of things to do
No extra to-do/ minimal effort (P9): And the guy that brought the new monitor returned the old one. So I didn't have to do anything
Can procure box themselves (1)
Flexibility in return box (P4): I have a box I have tons of boxes at home and just give me a QR code I can bring to the post office
Overviewable, clear and simple communication (2)
Poor communication (P1): information about fee was written in terms & conditions
ease of communication (P7)
P5 you don't have to inform yourself a lot.
Not being able to work/ have a drill
Not able to work (P2) (Problem with battery but had to send everything back)
Can not work (P9): cannot use the tool for a while - 'They just ask me some questions. I've sent a video of the defect. Then they sent me a new monitor.'
Was given a replacement/ repairment (P4): 'I sent them back and then they got either replaced or repaired. I think that's a good way to deal with a customer.'
Takes too much time/ waiting (4)
TAKES LITTLE TIME (P6)
'It will be taken up from your home. But it's quite easier than to go to a store and also to give it back it takes too long time.'
Time/Waiting (P3): The time of waiting was not very satisfying -> Maybe they can help me without putting it to Samsung.
Waiting (P5): Have to wait longer. And so, you don't want to waste a lot of time on trash. So, get it somewhere and have the feeling that you're doing something good with it because it might get recycled.
Extra time (P8): 'it needs additional weekend...'
Little transport (4)
Transport (P4): need to go to the shop
Have to go to specific spot to return (P8)
I really need to go into some post office... we do not have a real post office anymore.
can not return it at 'pack station' (P8): Some of the packages are too big, they will not fit into it.
Little transport (P6): 'return to the store is quite near to me'
Flexible return place (P4): If I could just give whatever I have to send not bring it to the stand but just give it to the guy who delivers me something else and he just takes it. That will be helpful.
Little physical effort (2)
LESS PHYSICAL EFFORT (P6)
Minimal physical effort (P4): 'It would be super if we could in the future if we get a delivery just return like UPS used to be doing just give them the pre labelled packages as well. That would be maybe a way forward.'
No need for receipt/ warranty (2)
Keep receipt (P4): need to keep the receipt
Receipt & warranty (P8): 'Maybe there's warranty, maybe not, go find the bill.'
Don't remember: you do not know exactly when you bought it.
By registering the product you can have the warranty in your pocket
No need to explain return (3)
No need for explaining (P5)
Need for explanation (P4): 'Go to the post office... and no discussion held'
No need for explaining (P1): you don't have to explain why you return it.
No money needed for return (1)
Pay (P9) for postage
No need for additional materials/ tools (7)
No need for extra material (2)
No need for extra material (P5): '... as long as it's possible with the provided packaging.'
Need sth extra (material) (P8): 'you need some special labels for batteries'
No need for extra tools (1)
No need for additional tools (P1): printer
No/ little work for package label (4)
Easy to get return label/ LITTLE ACTION REQUIRED (P3): very easy to get a paper which I could put on the on the...package... I called an employee of this company to get a retour paper. -> was sent to his mail
Easy to get label (P4): They send you a code. 'I do like the way when you send an email in and they send you a free label'
Return label (P7): product comes with the return label -> most convenient
No label work (P9): '...it would be much nicer if they provide two labels. One also for the batteries so that you do not have so much work.'
Flexible times (to do the return) (3)
Flexible return times (P8): 'I like the ease of it but if this pick up... Yeah, I need to know when they will come and pick it up... If it's outside the normal store opening timeframes... Otherwise, it's totally useless for me.'
Flexibility in time (P4): Happy - 'Because that means I can go whenever I want.'
Opening times coincide with working times (P8) They are just inside other stores and have very awkward opening slots. Normally we have open when I do need work too. So... that's... crazy!

3.


Participants' reported emotions for each step of a postal return service
ORIENT
PACKAGE
PRE-RETURN
RETURN
P1
P2
P3
P4
P5
P6
P7
P8
P9


Having to procure return label themselves (4)
Return label is needed but to print it out...
neutral - I would expect that there would be a return label already be included in the package
To print out the return label makes me... it's not so good.
Neutral - '...it's not....not amazing when there are other better options... Better options as including the return label already in the package.'
Having to procure packaging themselves (8)
Happy - if I get two packages, then I would obviously get two return labels and then I obviously send them back separately.
P1: do not always have the packaging
P1: most of the times you don't get the extra label so you have to... you have to print it out somewhere
P4: get all the packages from the company -> , then I'm happy about it.
P5: Extra to-do & need more than provided:: make maybe different packages '... as long as it's possible with the provided packaging' 'get like another box like where do you get that box and like...'
P6: Extra to-do/ need more than provided: ...have to procure an extra little package for the lithium ion battery. P6: Okay. So in that case it will be unhappy.'
P7: if I get two packages, then I would obviously get two return labels and then I obviously send them back separately.
P8: if the company would already deliver an extra box for the Accu. 'Because still hassle.'
Having to procure the bill (1)
P1: there's a bill but I never have to include a bill in any return so... Shouldn't be necessary, and check of course
Likes to procure the bill (1)
P3: 'I like for search... if I have the bill I know that the most important step is done.' - gives him a sense of completion
Flexibility of return (1)
P4: Happy - 'Because that means I can go whenever I want.'
Finial check on the package (1)
P3: check - unhappy
Transport (1)
P4: Wants flexibility and not have to drive quite a way. 'We don't have a local post office anymore.... . So I would feel so I'm not sure whether the post office is the way forward.'
Takes too much time (3)
P1: post offices the handling is not easy: time & queue
P8: Transportation time: '15 minutes for one way then 15 minutes for return. Just to drop a package which I normally can go two minutes by foot to put it in the boxes. It's not very convenient.'
P3: extra to-do's/ time - 'I'm not a fan of getting some extra points to do... sometimes I calculate my time not that well...' 'It's an extra to do in your already very busy day.'
Transport (2)
Unhappy
P4: like I have to go to a certain store it might be like... kind of a pain to get there
P5: but if its opposite way and I have to drive there extra. It's unhappy.
P8: Location post office: in a different city.
Happy
P7: Happy - DHL pack station Post office also bose is not that far
P5: happy - on my way to the city unhappy -
Flexible return times (1)
P8: Opening times: they only open when I'm at work too
P8: Get the box myself 'the first option I would find very comfortable, especially option two. I get a box and I just can put it there myself.'
P4: Dont send me a box 'I don't want them to send me a box... somebody from DHL has to drive all the way to my house... I think this is just an overkill on the environment...the purpose is completely killed'
P9 Flexibility: I prefer the repackage box I can just put through the station or the E-bike pick up when there's good appointment time.
P7: Dont pick up the box 'I don't really agree with that... to get someone to come just for the when they think about the carbon footprint of coming to pick up a drill.'
More brain cycles due to the seperation (4)
P5: Need for thinking: think about like how to pack'
P4: 'then I would need to separate it that would annoy me'
P6: separation = biggest pain point
P8: separation, just because it means more hassle.
P1: check the dangerous vs non-dangerous good
P2: have to have a look on the ACCU and then you need to go to the carrier and the carrier tells you what kind of label you need to print out
P8: 'would be much nicer if they provide two labels'
Have to pay for it (1)
P7: Money: I would be quite annoyed that I have to, you know, then pay extra for a new package.

4.


Brain cycles
Difficulty level of return
Little steps (8)
Little steps/ no additional steps (6)
Less tasks (P1):
1. 'Get the paper where you can deliver it free of charge'
2. No need to print the label
Additional tasks (P1): Return was not accepted, needed to do it again.
Additional task (P2): Extra label needed to be printed out at home
Extra to-do (P8): 'we need to call them again.'
No extra to-do's (P5): very smooth process -> you don't have to fill out anything
Minimum effort/ little steps (P7): Not a lot of things to do
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P8: separation, just because it means more hassle.
No/ little work for package label (8)
No/ little work for package label (4)
Need sth extra label (P8): 'you need some special labels for batteries'
Easy to get return label/ LITTLE ACTION REQUIRED (P3): very easy to get a paper which I could put on the on the...package... I called an employee of this company to get a retour paper. -> was sent to his mail
Easy to get label (P4): They send you a code, 'I do like the way when you send an email in and they send you a free label'
Return label (P7): product comes with the return label -> most convenient
No label work (P9): '...it would be much nicer if they provide two labels. One also for the batteries so that you do not have so much work.'
Having to procure return label themselves (4)
P1: Return label is needed but to print it out...
P5: neutral - I would expect that there would be a return label already be included in the package
P2: 'to print out the return label makes me... it's not so good
P7: Neutral - '...it's not ...not amazing when there are other better options... Better options as including the return label already in the package.'
P1: check the dangerous vs non-dangerous good
P2: have to have a look on the ACCU and then you need to go to the carrier and the carrier tells you what kind of label you need to print out
P8: 'would be much nicer if they provide two labels'
No need for receipt/ warranty (3)
No need for receipt/ warranty (2)
Keep receipt (P4): need to keep the receipt
Receipt & warranty (P8): 'Maybe there's warranty, maybe not, go find the bill.'
Don't remember: you do not know exactly when you bought it.
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P1: there's a bill but I never have to include a bill in any return so... Shouldn't be necessary, and check of course
Likes to procure the bill (1)
P3: 'I like for search... if I have the bill I know that the most important step is done.' - gives him a sense of completion
Social effort
No need to explain return (3)
No need for explaining (P5)
Need for explanation (P4): 'Go to the post office... and no discussion held'
No need for explaining (P1): you don't have to explain why you return it.
Unclear communication
Unexpected things (3)
Unexpected actions
Unreadable serial number (P9) 'I wanted to return or something and the sticker with a serial number was not readable or it was disappeared completely... companies didn't want the accept return because the serial number was not readable or missing
Unexpected things (extra material) (P2): need to stick on some special label that wasn't given
Unexpected fees
Unexpected things (fees) (P1): had to pay at the value of up to 30 Euro
Unexpected outcomes
Unexpected outcome (P4): 'And it's all depending on their goodwill, as to whether they're returning it or not.'
Overviewable, clear and simple communication (2)
Poor communication (P1): information about fee was written in terms & conditions
ease of communication (P7)
P5 you don't have to inform yourself a lot.

J. Quick assessment second idea generation

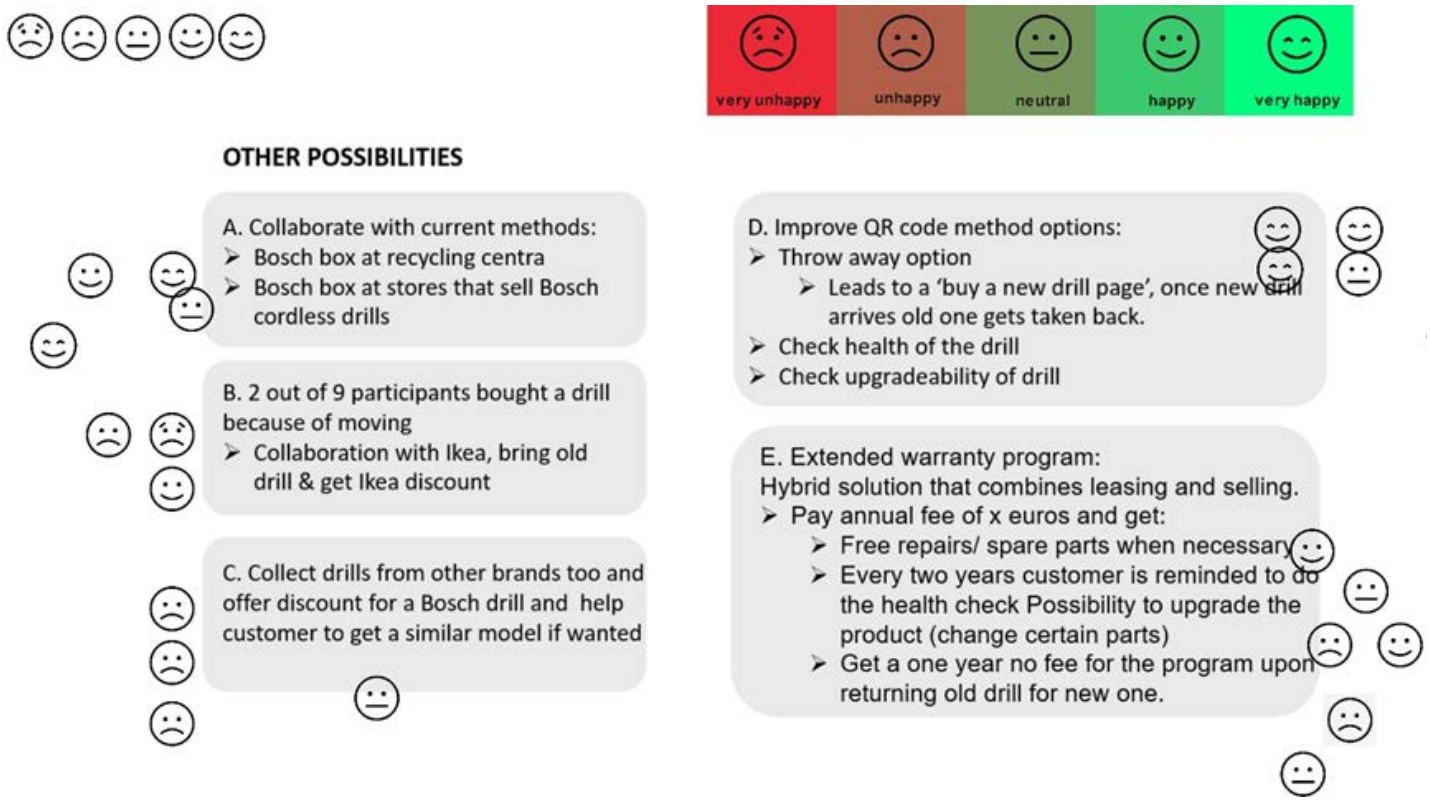


Fig: New idea directions with feedback from Bosch employees.

From the meeting the following points were concluded for the different solution spaces:

Solution A: Collaboration with current discard methods
Most user-friendly option since users indicated during customer research that they 'had to go to public waste providers anyways'. No additional task would be required on the users' end in this scenario. However, as pointed out during the meeting with Bosch, the solution is not very feasible. If every manufacturer would start doing this, the solution could become difficult to realize.

Solution B: Collaboration with furniture store
This option seemed like a valid idea since past collaborations were attempted with furniture stores. However, this idea was not feeasible in the end. Since Bosch does not have any stores of its own and needs a retailer to sell (or potentially rent their drills), it would be difficult to use additional touchpoints.

Solution C: All brand return
Due to the factors outlined in section 2.2.2 Internal Goals, the financial incentive for customers to return their drills is expected to be low. As a result, it is uncertain whether this incentive would be sufficient to motivate customers of other brands to switch to Bosch. Furthermore, by including drills from other brands, post-return processes could become significantly more complicated for Bosch.

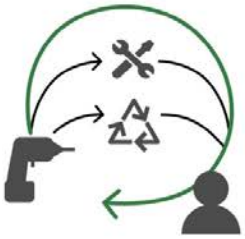
Solution D: QR code solution
Most easy return solution next to Solution A that also promotes the longevity and quality of the drill. This option was preferred out of all the options, also due to the solutions' flexibility towards integrating other services than the return service. Upgradability of the tool, however, would currently not be possible seen the current design of the drill 'that is designed for a specific use case'.

Solution E: Extended warranty program
Although providing interesting data to ease post-return processes through the health-checks, this option can be risky in terms of consumer interest. The consumer would need to pay an annual fee to make use of the drill and would get biyearly health-check reminders. This requires more effort from the user's end than the other options. This means that the user's motivation would need to be higher to partake in such a service-rental system. It might therefore be interesting for some users, but not for the entire customer base (which is the target group of this thesis).

K. Mock-up QR code website

BOSCH

Join the circle.
Contribute to the planet.



With the three-fold strategy: Reuse, Repair and Recycle, Bosch aims to minimise its environmental impact. Join the circular movement by repairing or returning your device!

Learn more about the circular movement

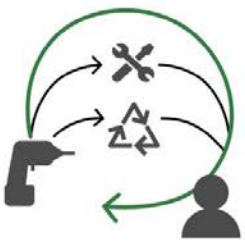
Repair

Return

Register and more

BOSCH

Join the circle.
Contribute to the planet.



With the three-fold strategy: Reuse, Repair and Recycle, Bosch aims to minimise its environmental impact. Join the circular movement by repairing or returning your device!

Learn more about the circular movement

Repair

Return

Compare different drill prices and features easily. Still have the old drill and want to get rid of it? No problem, easily return it and get a discount!

BOSCH

What would you like to return?

Return

Battery

< Back

Drill

Drill and Battery

BOSCH

Determine its residual value.

We buy the tool back and give you the money in voucher format.

Return

Value: X eu

< Back

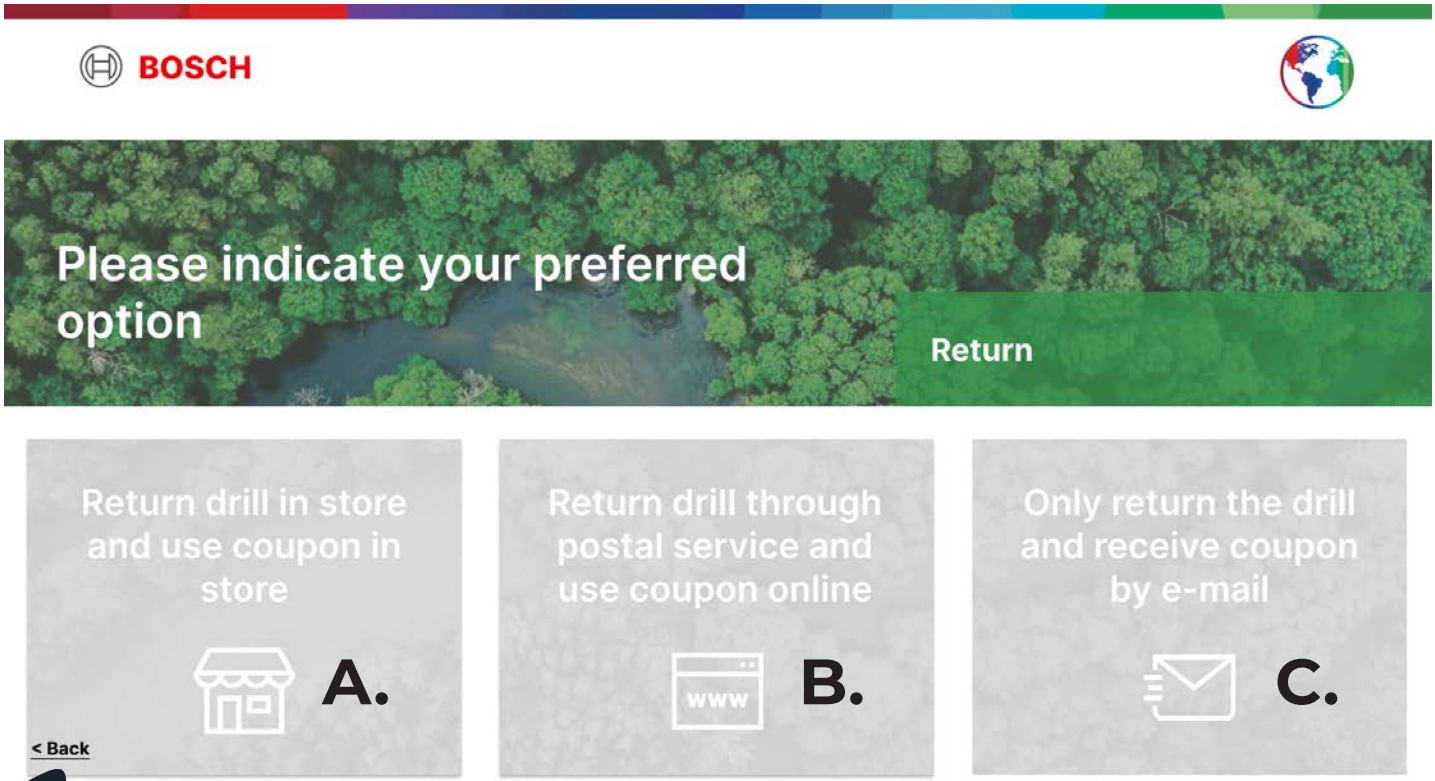
APPEARANCE

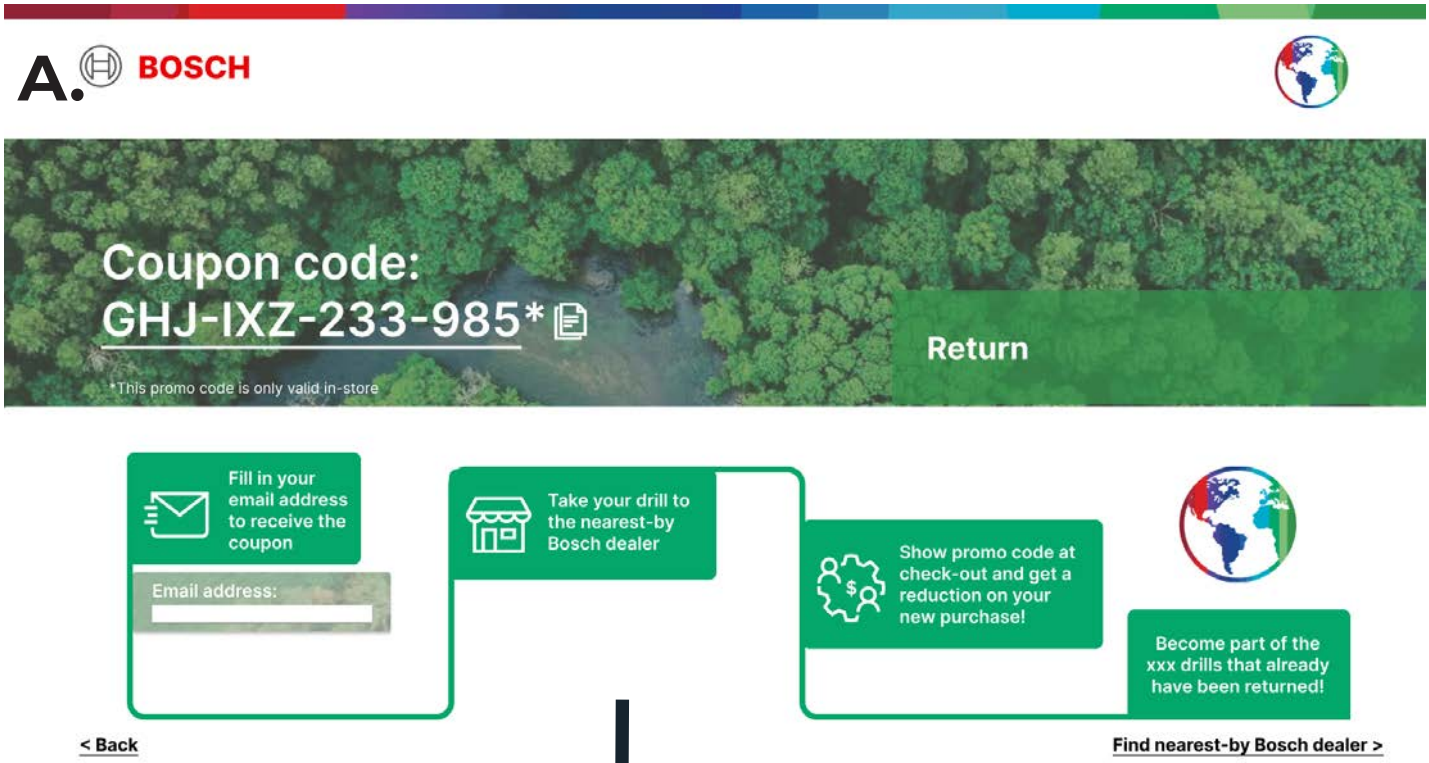
- Battery is not swollen
- There are no visible tears and dents

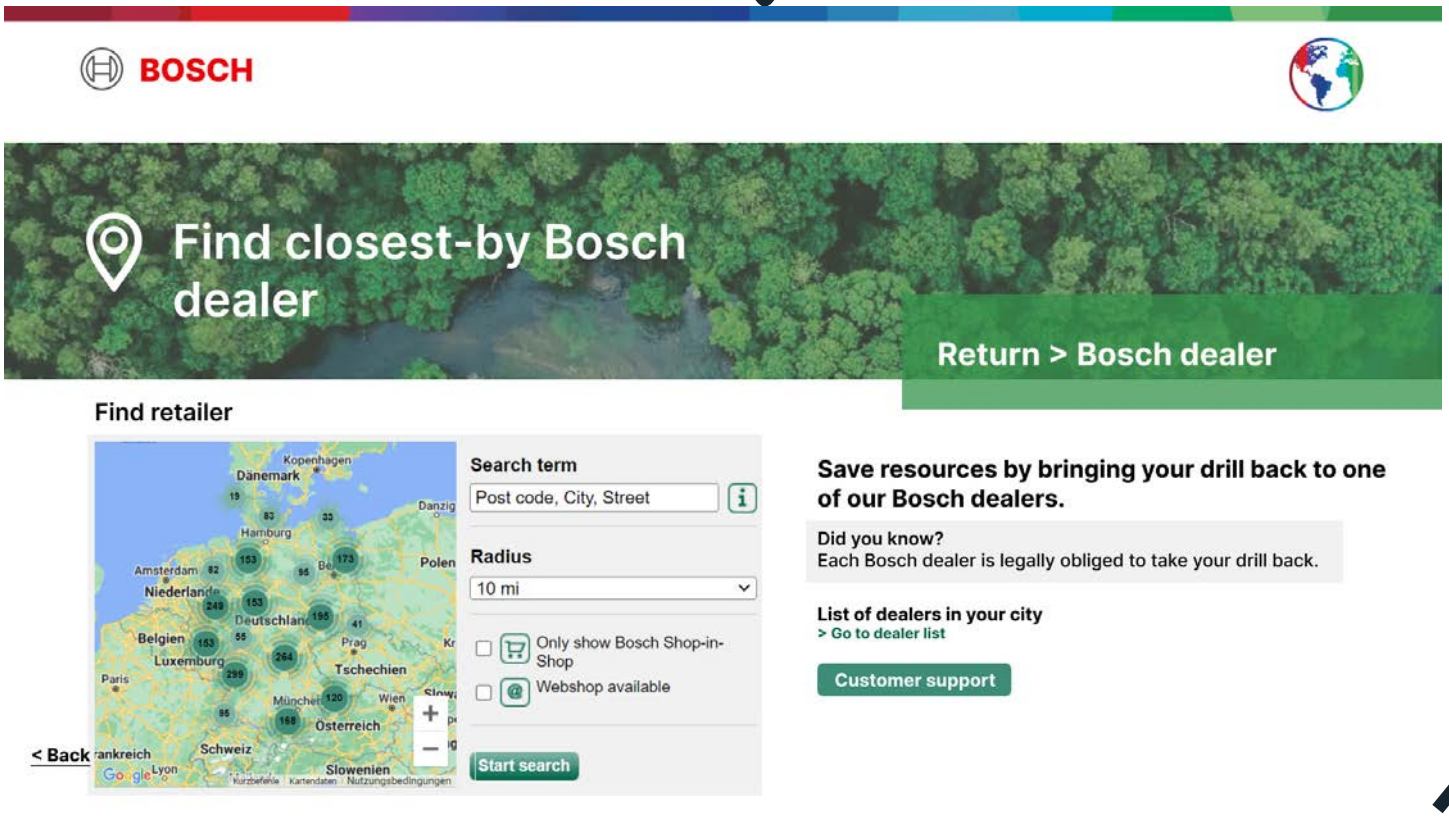
FUNCTIONALITY

- All buttons are still working
- You can turn the drill on and charge it

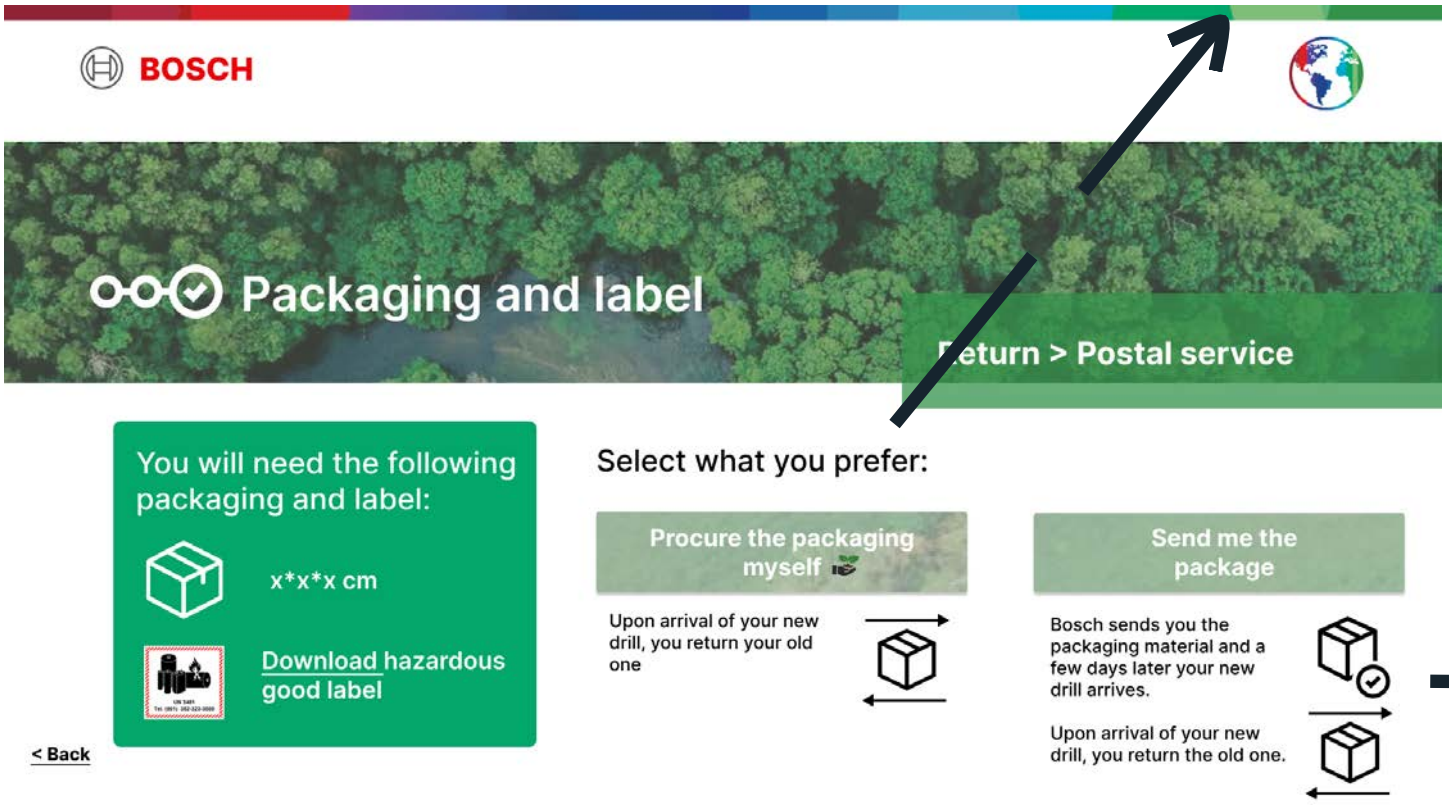
Next >


BOSCH
Please indicate your preferred option
Return
Return drill in store and use coupon in store
A.
Return drill through postal service and use coupon online
www
B.
Only return the drill and receive coupon by e-mail
C.
< Back


A.
BOSCH
Coupon code:
GHJ-IXZ-233-985*
*This promo code is only valid in-store
Return
Fill in your email address to receive the coupon
Email address:
Take your drill to the nearest-by Bosch dealer
Show promo code at check-out and get a reduction on your new purchase!
Become part of the xxx drills that already have been returned!
< Back
Find nearest-by Bosch dealer >



B. Return drill through postal service and use coupon online



1. BOSCH

Fill in your e-mail address:

Submit

< Back

In the email you will find:

Hazardous good label to stick on package

Shipment label

Necessary dimensions for the package

Next >

2. BOSCH

First name

Last name*

Street, nr.*

Postcode, city*

Email*

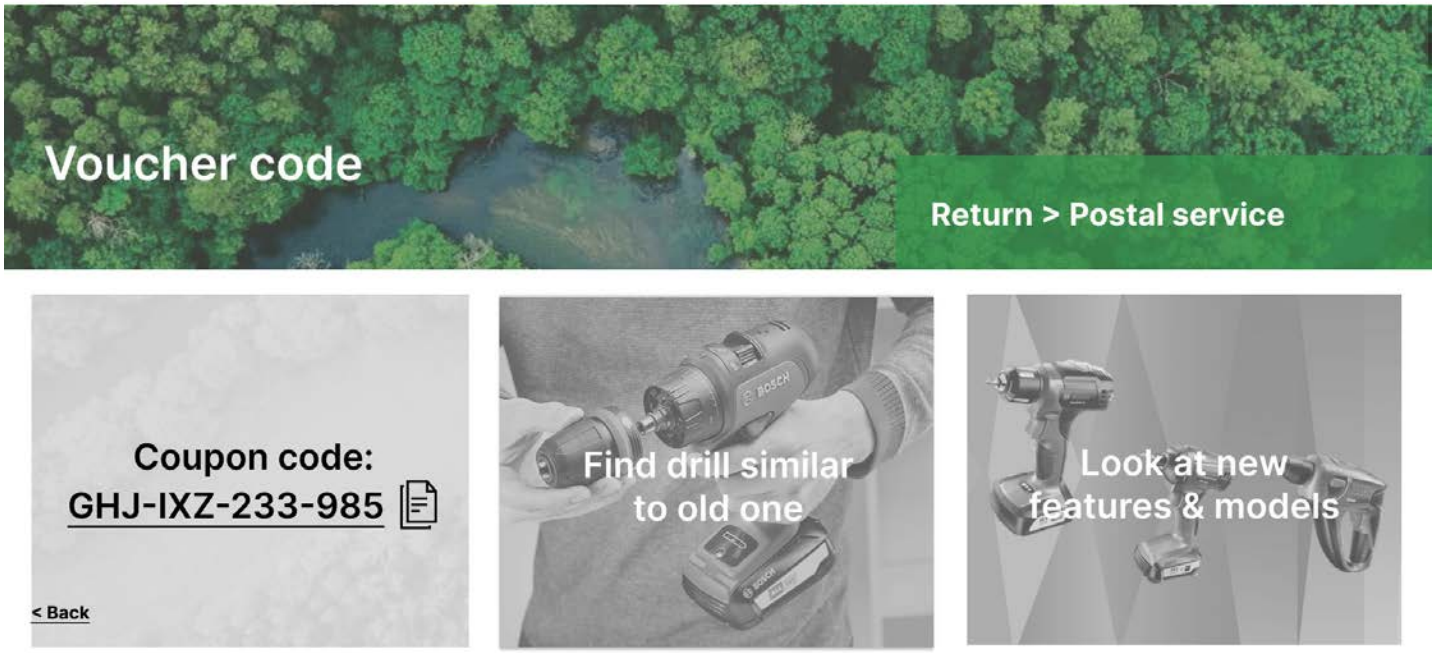
Phone*

< Back

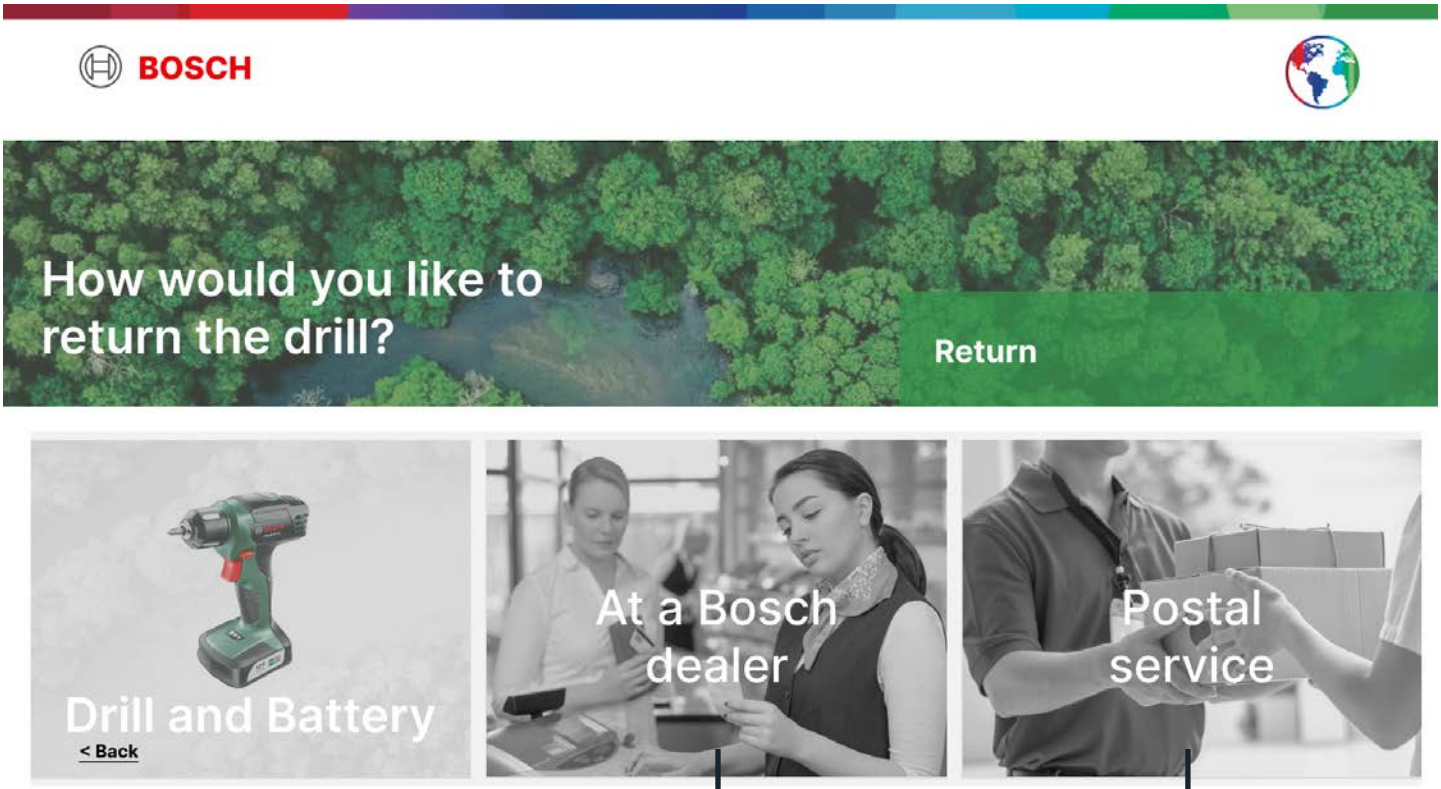
* All fields with an asterisk (*) are required.

Next >

> Next 1. & 2.


BOSCH
Voucher code
Return > Postal service
Coupon code:
GHJ-IXZ-233-985
< Back
Find drill similar
to old one
Look at new
features & models

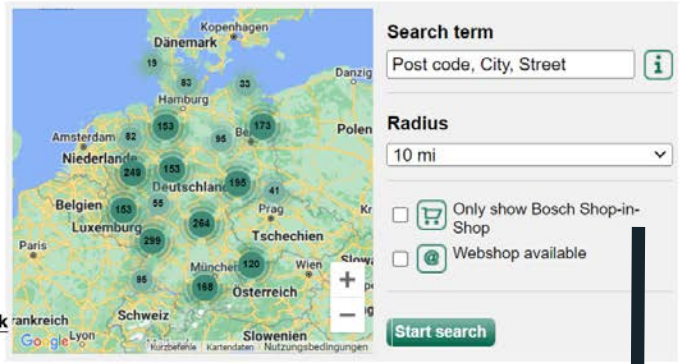
C. Only return drill and receive coupon by mail



1.

2.

Find retailer



Save resources by bringing your drill back to one of our Bosch dealers.

Did you know?
Each Bosch dealer is legally obliged to take your drill back.

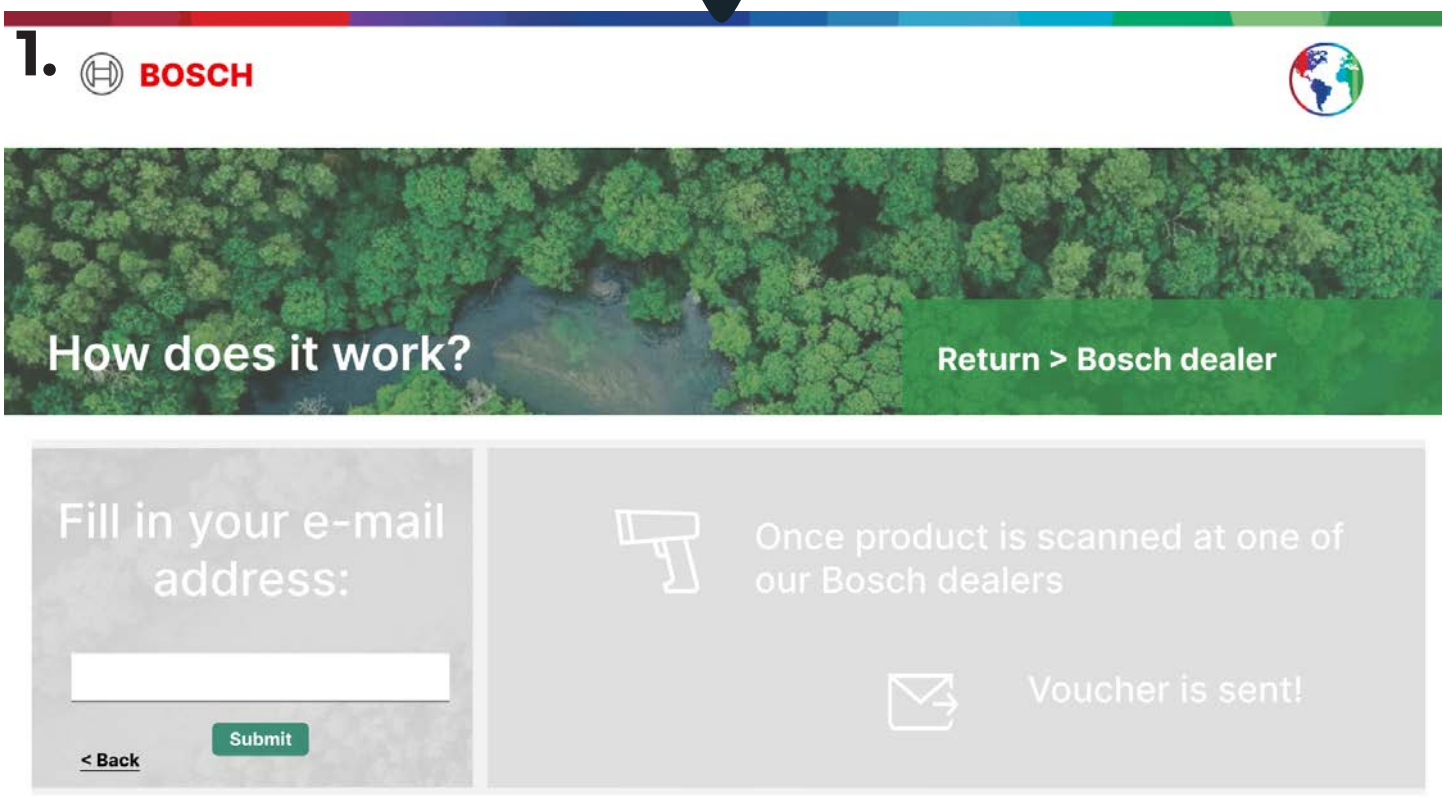
List of dealers in your city
> Go to dealer list

Customer support

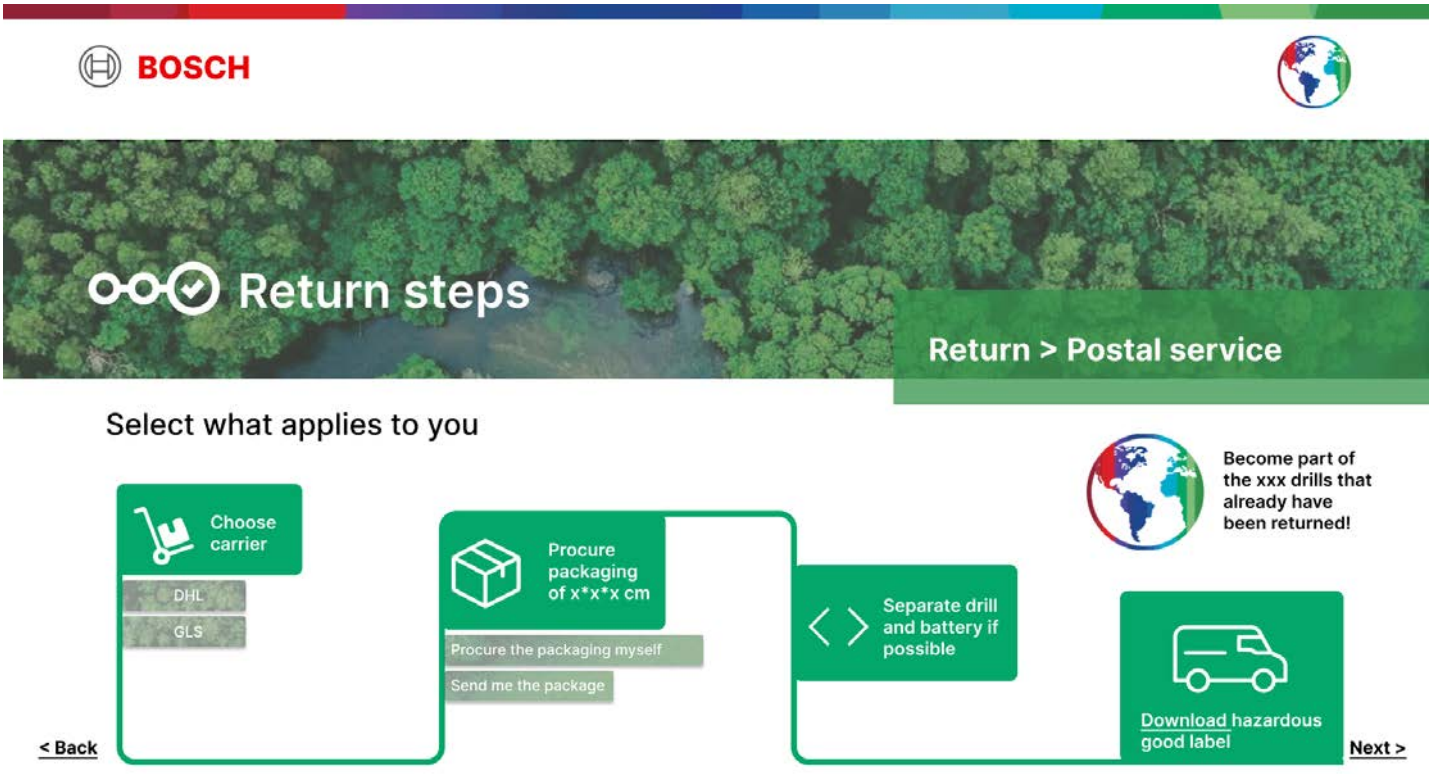
< Back

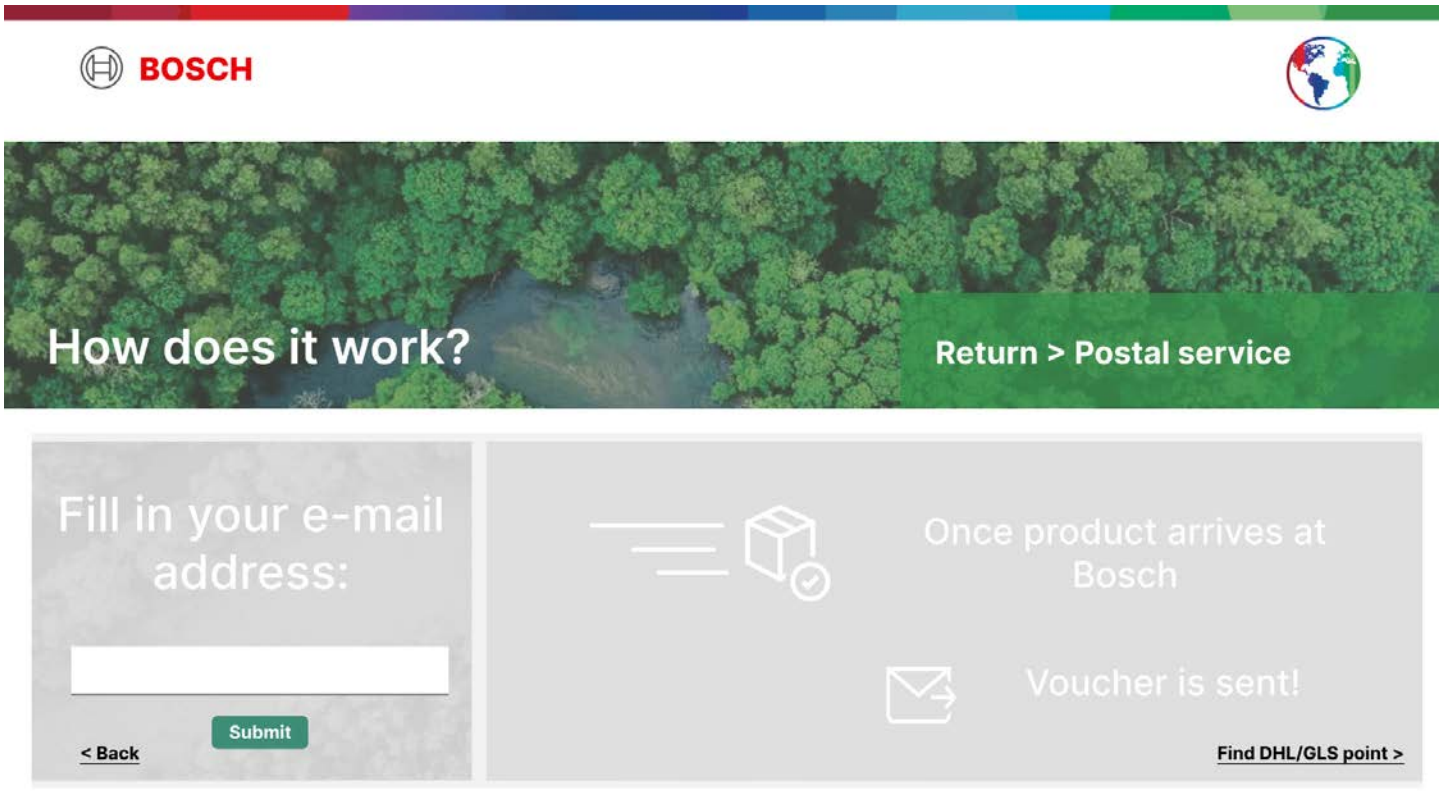
Next >

1.


BOSCH
How does it work?
Return > Bosch dealer
Fill in your e-mail address:
Submit
< Back
Once product is scanned at one of our Bosch dealers
Voucher is sent!

2.


BOSCH
Return steps
Return > Postal service
Select what applies to you
Choose carrier
DHL
GLS
Procure packaging of x*x*x cm
Procure the packaging myself
Send me the package
Separate drill and battery if possible
Become part of the xxx drills that already have been returned!
Download hazardous good label
< Back
Next >


BOSCH
How does it work?
Return > Postal service
Fill in your e-mail address:
Submit
< Back
Once product arrives at Bosch
Voucher is sent!
Find DHL/GLS point >

L. Economical viability assessment

Necessary system setup

This appendix compiles a list of things that Bosch must set up under the headings ‘evidence’, ‘backstage actions’ and ‘support processes’ and need further economical assessment.

Evidence

- These are the elements of the system with which the consumers interact. These include the following.
- Displays in store
- Descriptions on e-commerce platforms
- Bosch’s web shop
- YouTube shorts and videos to popularise the return service
- Notice and manuals with QR codes leading consumers to join the return service
- Return service website
- E-mail reminders and updates regarding the packaging, labelling and return process

Backstage actions

These are the elements of the system where the support processes and/or the people in charge of the system make decisions and act upon them. The elements are as follows

- Publicising the initiative in stores and with Bosch influencers
- New notice design to attract attention
- Server responding to the queries and actions of the consumers
- Post-return decision-making
- Evaluation of returned products and choosing the appropriate post-return process
- Sending vouchers for drill returns

Support processes

These are the elements of the system that must be set up for it to function properly.

- Training for Bosch staff
- IOT system leading the consumer from the app and/or the QR code to the initiative
- Database for each drill (category) to determine the residual value
- AI system estimating best post-return process
- Automated e-mail service that sends reminders and alerts
- System to match technical specifications of scanned drills with models available online
- Logistics system for the delivery of new drills
- Logistics and confirmation system for the returned drills
- Voucher generating system
- Data management system